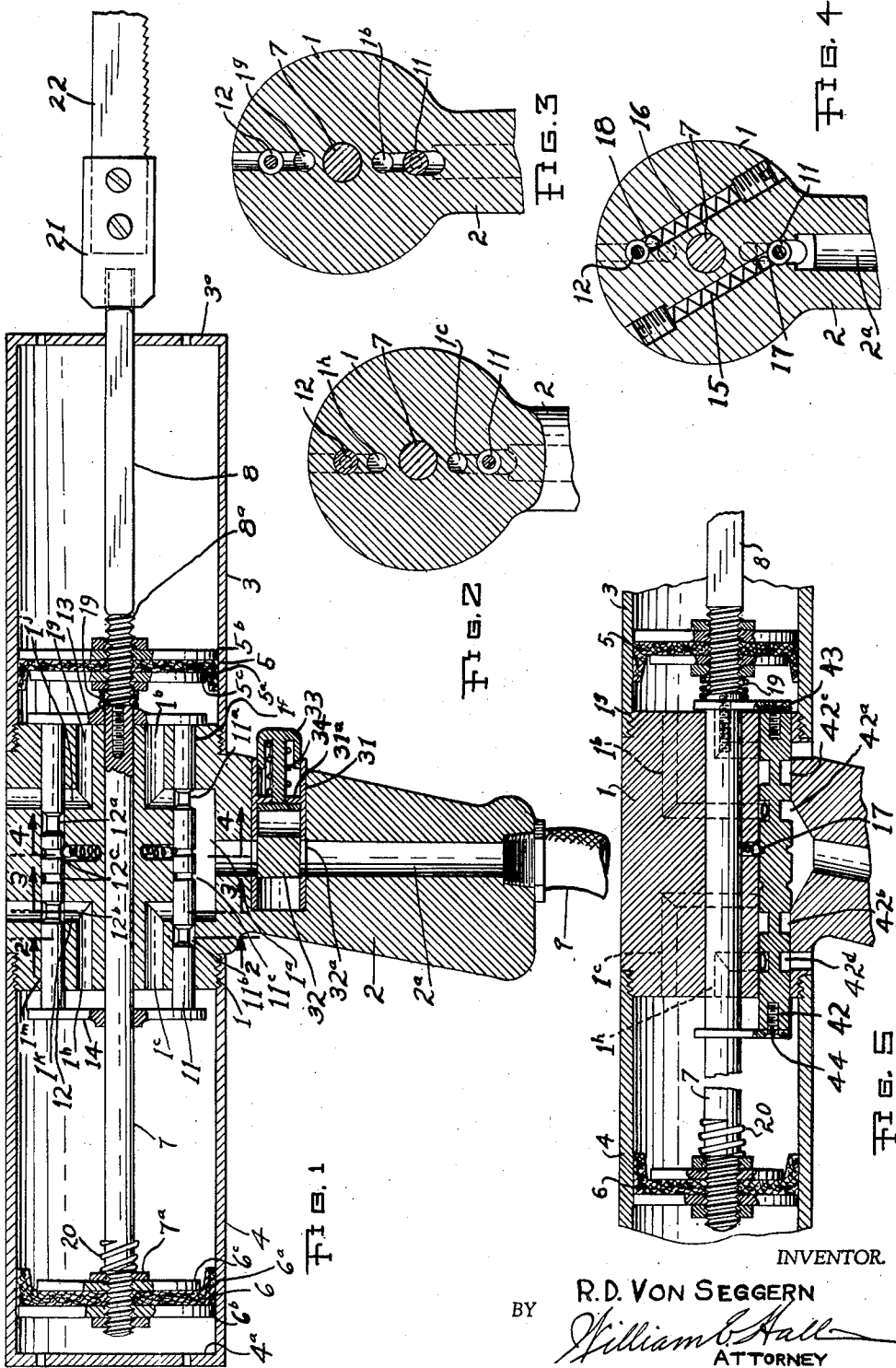


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PNEUMATIC SAW AND THE LIKE

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PNEUMATIC SAW AND THE LIKE

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My invention relates to a pneumatic tool.

One of the principal objects of this invention is to provide a pneumatic tool, particularly adapted to hack saws, files, and the like, which is particularly simple and economical of construction, and which is simple to manipulate and operate.

Although the term pneumatic, when applied to my tool, is used, it is to be understood that certain features of my invention may be also applied to, and is interpreted to be applied to, hydraulically operated tools.

An important object also of this invention is to provide a tool of this class which may be made relatively small and provided with a hand grip at the side and with the desired tool projecting from one end.

A further important object of this invention is to provide a simple valve mechanism for a tool of this class, one whereby the tool may be easily and economically made, and one which may be also easily cleaned.

Still another important object of this invention is to provide simple means for positively locating the valves in extreme positions to allow intake and exhaust of the operating fluid.

With these and other objects in view, as will appear hereinafter, I have devised a pneumatic tool having certain novel features of construction, combination, and arrangement of parts and portions, as will be hereinafter described in detail and particularly set forth in the appended claims, reference being had to the accompanying drawings, and to the characters of reference thereon which form a part of this application, in which:

Fig. 1 is a longitudinal sectional view of my pneumatic tool in one form, a portion of the pressure hose and the tool being broken away;

Figs. 2, 3 and 4 are fragmentary sectional views thereof, taken, respectively, through 2-2, 3-3 and 4-4 of Fig. 1;

Fig. 5 is a fragmentary longitudinal sectional view thereof, in a slightly modified form of construction.

The tool illustrated is built around a central member 1 which will be hereafter referred to as the valve head. From one side of the head extends a pistol grip 2 for manipulating the tool. At the front and rear ends of the head are front and rear cylinders 3 and 4, these cylinders being secured to externally threaded ends of the head. The outer ends of the cylinders 3 and 4 have perforated heads 3^a and 4^a. In the cylinders 3 and 4 are reciprocally mounted pistons 5 and

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6. These pistons may consist of cup leathers 5^a and 6^a which are secured between washers 5^b and 5^c for the piston 5, and 6^b and 6^c for the piston 6. These pistons are axially connected, the piston 5 being screwably secured to a threaded portion 7^a at the rear end of the piston rod 7 and the piston 6 being secured to a threaded inner end 8^a of the tool supporting arm 8. The inner end of the arm 8 is screwably connected to the forward end of the piston rod 7. The threaded portions 7^a and 8^a permit axial adjustment of the pistons with respect to each other for varying the stroke of the mechanism.

The motive power, which in this instance may be compressed air, is supplied from the lower end of the pivotal grip through a passage 2^a, there being shown an air hose 9 fitted to the lower end of the pistol grip. The air from the passage 2^a is connected to a distributing chamber 1^a within the head 1. The ends of the distributing chamber are connected by intake passages 1^b and 1^c to the adjacent ends of the cylinders 3 and 4. Each of these intake passages consist of transverse portions 1^d and 1^e which are connected to the cylinders 3 and 4 at their inner ends by portions which are parallel to the axis of the head. The transverse portions of the passages are intercepted by a cylindrical bore 1^f in which is reciprocally mounted a cylindrical intake valve 11, in the form of a rod.

The cylinders 3 and 4 are connected to the atmosphere by exhaust ports 1^g and 1^h. These exhaust ports also consist of transverse portions 1^j and 1^k, respectively, which extend inwardly from the peripheral portion of the head and which are connected at their inner ends by other portions extending parallel to the axis of the head. The transverse portions 1^j and 1^k are also intercepted by a cylindrical bore 1^m extending through the head and parallel to the axis of the head and the bore 1^f. In the bore 1^m is reciprocally mounted a cylindrical exhaust valve 12 also in the form of a rod. The coincident ends of the valves 11 and 12 are rigidly connected together by crossheads 13 and 14, so that both valves may move in unison.

The intake valve has two annular channels 11^a and 11^b, and the exhaust valve has two annular channels 12^a and 12^b, these annular channels allowing through or clear passage of fluid through the intake and exhaust passage.

When the valves are in the position shown by solid lines in Fig. 1 air is allowed to enter cylinder 3 by the channel 11^a through the intake port

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^{1b}. In the same position of the valves, the air from the cylinder 4 is allowed to be exhausted through the passage ^{1b} past the channel ^{12^b}. When the valves are shifted to other positions, the passage ^{1^b} permits air to enter the cylinder 4 5 through the port ^{1^c} and the channel ^{12^a} permits the air in the cylinder 3 to be exhausted through the passage ^{1^c}.

The portions of the valves intermediate the annular channels therein are provided with annular 10 grooves, designated ^{11^c} and ^{12^c} into which are forced, by means of springs ¹⁵ and ¹⁶, balls ¹⁷ and ¹⁸, respectively, these balls locating the valves in proper positions for sequentially admitting air to the cylinders and exhausting the 15 air from the other cylinders.

The valves ¹¹ and ¹² are shifted to their extreme positions by the pistons ⁵ and ⁶ when the same are moved to their inner positions. To obviate shock to the valves, I have provided concealed compression springs ¹⁹ and ²⁰ around 20 the piston rod, or, as shown, around the inner end of the arm ⁸ and the outer end of the piston rod ⁷, these springs being held against the inner sides of the pistons ⁵ and ⁶. These springs engage the outer sides and axial portions of the crossheads ¹³ and ¹⁴ in order to reciprocate the 25 valves. The arm ⁸ is preferably square of cross-section and extends through a square hole in the body ^{3^a} so as to prevent the arm, and the tool carried thereby, from turning. As shown, 30 there is provided a socket member ²¹ screwably secured to the outer end of the arm ⁸, and the tool, which is here shown as a hack saw blade, is detachably secured to the member ²¹.

The pistol grip ² is provided with a trigger for 35 operating the tool by one of the fingers of the hand gripping the handle ². This trigger is shown as a valve mechanism carried in a cylinder ³¹. In the cylinder is reciprocally mounted a valve ³² having a port ^{32^a} adapted to be aligned 40 with the passage ^{2^a}. Axially extending from one end of the cylinder ³² is a cup-shaped button ³³, and between the button and a wall ^{31^a} is a compression spring ³⁴ for holding the button in an outward position.

In the modified structure, shown in Fig. 5, I have incorporated the intake and exhaust valve means in a single reciprocating cylinder valve ⁴², 50 and this valve is provided with four annular channels ^{42^a}, ^{42^b}, ^{42^c} and ^{42^d}, the first two serving as intake channels for controlling the intake passages ^{1^b} and ^{1^c}, and the latter two controlling the exhaust passages ^{1^e} and ^{1^h}.

This modified structure also eliminates one 55 of the valve locating means, only one ball ¹⁷ being shown.

This modified structure has end plates ⁴³ and ⁴⁴ secured to the opposite ends of the valve ⁴² 60 instead of the crosshead above described.

Though I have shown and described a particular construction, combination, and arrangement of parts and portions, and a certain modification thereof, I do not wish to be limited to the same, but desire to include in the scope of my invention 65 the construction, combination, and arrangement, substantially as set forth in the appended claims.

I claim:

1. In a mechanism of the class described, a 70 valve head, aligned cylinders extending from opposite ends of the head, a piston in each cylinder, means connecting the pistons, the head having a cylindrical bore connecting the cylinders, a cylindrical valve reciprocally mounted in the bore 75

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and shiftable into opposed operative positions therein, the head having intake passages connected to each cylinder and intercepted by the bore, and exhaust passages connecting each 5 cylinder with the atmosphere, and also intercepted by the bore, said valve having pairs of transverse intake and exhaust channels, the intake channel of one pair allowing clear passage of fluid through the inlet passage of one cylinder and the exhaust channel of the other pair allowing clear passage of fluid through the exhaust passage of the other cylinder when the valve is in one position and alternately allowing clear passage of fluid through the other inlet and exhaust passages when the valve is in the opposite position, and means in association with the pistons for shifting the valve into said opposed positions.

2. In a mechanism of the class described, a 20 valve head, aligned cylinders extending from opposite ends of the head, a piston in each cylinder, means connecting the pistons, the head having cylindrical bore means connecting the cylinders, a cylindrical valve means reciprocally 25 mounted in the bore means and shiftable into opposed operative position therein, the head having intake passages connected to each cylinder and intercepted by the bore means, and exhaust passages connecting each cylinder with the atmosphere, and also intercepted by the bore 30 means, said valve means having pairs of transverse intake and exhaust channels, the intake channel of one pair allowing clear passage of fluid through the inlet passage of one cylinder and the exhaust channel of the other pair allowing clear passage of fluid through the exhaust passage of the other cylinder when the valve means is in one position and alternately allowing clear passage of fluid through the other inlet and exhaust passages when valve means is in the opposite position, and means in association with the pistons for shifting the valve means into said opposed positions.

3. In a mechanism of the class described, a 45 valve head, cylinders extending from the opposite end of the head, a piston in each cylinder, means connecting the pistons, the head having a bore connecting the cylinders, a valve reciprocally mounted in the bore and shiftable into opposed operative positions, the head having a fluid intake at one side and transverse intake passages connected with the fluid intake, the opposite inner ends of the intake passages being connected by 50 substantially right angle portions with each cylinder, the transverse portions of the intake passages being intercepted by the bore, the head having transverse exhaust passages extending into the head from the outer portion thereof, the inner ends of the transverse exhaust passages being connected by substantially right angle portions with each of the cylinders, the transverse portions of the exhaust passages being intercepted by the bore, said valve having pairs of transverse intake and exhaust channels, the intake channel of one pair allowing clear passage of fluid through the inlet passage of one cylinder and the exhaust channel of the other pair allowing clear passage of fluid through the exhaust passage of the other cylinder when the valve is in one position and alternately allowing clear passage of fluid through the other inlet and exhaust passages when the valve is in the opposite position, and means in association with

the pistons for shifting the valve into said opposed positions.

4. In a machine of the class described, a valve head, cylinders extending from the opposite end of the head, a piston in each cylinder, means connecting the pistons, the head having a cylindrical bore means connecting the cylinders, a valve means reciprocally mounted in the bore means and shiftable into opposed operative positions, the head having a fluid intake at one side and transverse intake passages connected with the fluid intake, the opposite inner ends of the intake passages being connected by substantially right angle portions with each cylinder, the transverse portions of the intake passages being intercepted by the bore means, the head having transverse exhaust passages extending into the head from the outer portion thereof, the inner ends of the transverse exhaust passages being connected by substantially right angle portions with each of the cylinders, the transverse portions of the exhaust passages being intercepted by the bore means, said valve means having pairs of transverse intake and exhaust channels, the intake channel of one pair allowing clear passage of fluid through the inlet passage of one cylinder and the exhaust channel of the other pair allowing clear passage of fluid through the exhaust passage of the other cylinder when the valve means is in one position and alternately allow-

ing clear passage of fluid through the other inlet and exhaust passages when the valve means is in the opposite position, and means in association with the piston for shifting the valve means into said opposed positions.

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