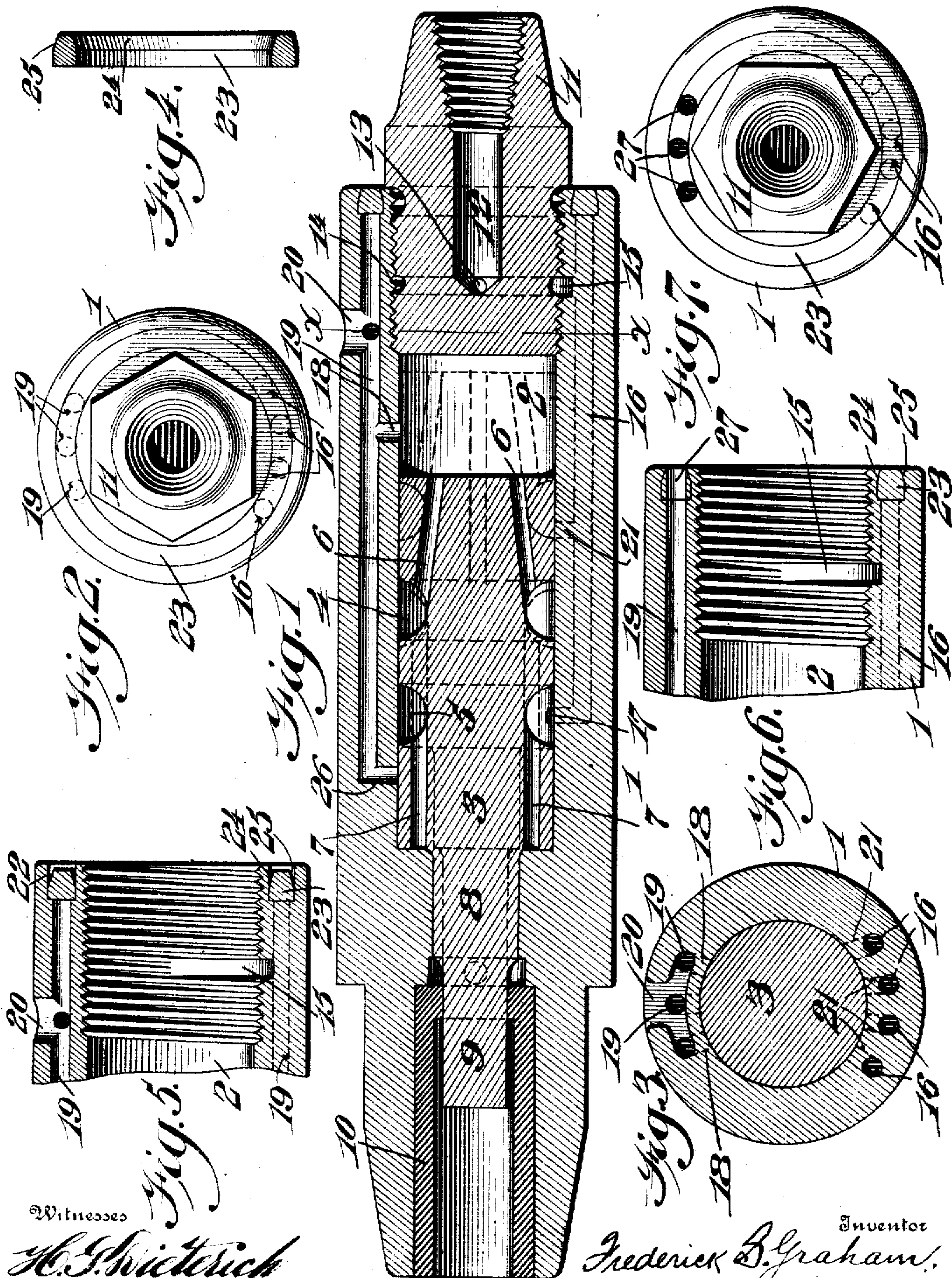


F. S. GRAHAM.
VALVELESS PNEUMATIC TOOL.
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Witnesses

H. J. Winterich
L. Douville.

Inventor

Frederick S. Graham.
By Niederstein & Kibbans.

Attorneys

UNITED STATES PATENT OFFICE.

FREDERICK S. GRAHAM, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR TO QUAKER CITY PNEUMATIC TOOL CO., OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

VALVELESS PNEUMATIC TOOL.

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To all whom it may concern:

Be it known that I, FREDERICK S. GRAHAM, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Valveless Pneumatic Tool, of which the following is a specification.

In the construction of portable pneumatic tools, such as chipping hammers and riveters and especially in the construction of what is commonly known as stone tools, if the cylinder or casing has the holes and passages therein closed by plugs there is always a liability of said plugs working loose, thereby permitting leakage of the motive fluid, with the result that the efficiency of the tool is greatly impaired and there is a consequent loss of power and waste of the motive fluid.

In my present invention I have devised a novel construction in which the longitudinally extending passages in the casing may all be drilled from one end and in order to close the outer end of said passages, instead of employing plugs which are liable to work loose owing to the excessive vibration of the tool, I have dispensed entirely with such plugs and employ in lieu thereof an annular ring which, after being inserted, may be rigidly secured therein by deflecting thereover the outer portion of the casing and thus forming an absolutely air tight joint under all conditions which arise in practice.

It further consists of other novel features of construction, all as will be hereinafter fully set forth.

For the purpose of illustrating my invention I have shown in the accompanying drawings one embodiment thereof which has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of these instrumentalities as herein set forth.

Figure 1 represents a longitudinal section of a pneumatic tool embodying my invention. Fig. 2 represents an end view of Fig. 1. Fig. 3 represents a section on line x—x, Fig. 1. Fig. 4 represents a sectional view of the annular ring employed. Fig. 5 represents a sectional view of a portion of the tool showing the annular ring in the annular

groove at the end of said tool before said ring has been swaged or otherwise secured in place. Fig. 6 represents a sectional view of a portion of a tool showing a modified form in which the exhaust instead of passing through the side of the casing, passes through the annular ring. Fig. 7 represents an end view of Fig. 6.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings:—1 designates a casing which, in the present instance is composed of a single piece of material, said casing having the piston chamber 2 therein in which is adapted to reciprocate the piston 3, which is provided with annular grooves 4 and 5, it being noted that the annular groove 4 is provided with deflected passages 6, which extend through the end of said piston while the groove 5 is provided with forwardly extending passages 7 which open through the forward end of said piston. The piston 3 is provided with a reduced neck 8 and a striker 9, which latter is adapted to pass through the apertured end of the bushing 10 in which the chisel or other working tool is adapted to be held. The end of the piston chamber 2 is closed by means of a plug 11, the end of which is threaded or otherwise adapted to be connected with the motive fluid supply, whereby the motive fluid may enter the chamber 12, passing therefrom to the apertures 13, to the annular groove 14 and thence by port 15 to the forwardly extending passage 16 and assuming that the parts are in the position indicated in Fig. 1, the motive fluid will pass through port 17 into the chamber formed between the annular groove 5 and the piston chamber 2, thence through the forwardly extending passages 7 and acting against the forward portion of the piston chamber 2 will cause the piston to be moved rearwardly, whereupon the motive fluid in the rear of the piston may escape through port 18 into the longitudinally extending passage 19 and therefrom through the main exhaust 20, which in this form of my invention is shown as being located on the side of the casing. The exhaust from the front of the piston chamber passes through port 26, passage 19 and main exhaust port 20 to the atmosphere. On the rearward movement of the piston 3 the port 17 will be closed and the port 21 will communicate with the an-

nular groove 4 whereupon live motive fluid may pass to said annular groove 4, thence through the rearwardly extending passages 6 into the rear end of the piston chamber and cause the piston 3 to be rapidly moved forwardly so that a blow will be imparted to the working tool by the striker 9.

In prior constructions with which I am familiar it has been necessary to employ plugs threaded or otherwise, in order to close the holes in the ends of the casing which were made during the drilling of the longitudinally extending passages, the result being that in many cases owing to the small size of these plugs and the excessive vibration which is present in tools of this character, that after awhile such plugs work loose and thus permit leakage of the motive fluid.

In my present invention I have designed a construction in which this defect has been overcome and in order to accomplish this I form at the outer end of the cylinder in alignment with the longitudinally extending passages, an annular groove 22, as will be clearly understood by reference to Fig. 5.

23 designates an annular ring, the lower portion of which is adapted to closely engage the annular groove or chamber 22 while its outer ends are beveled or inclined inwardly as is indicated at 24 and 25. After the holes have been drilled and the end of the groove 22 formed, the annular ring 23 is placed in position in said groove, as shown in Fig. 5, after which the outer end of the casing 1 is deflected or swaged so that it will closely engage the beveled portions 24 and 25 of said annular ring and positively prevent the same from being loosened by the vibration of the tool.

It will be noted that a considerable portion of the material is deflected over the upper end of the ring and since the forward portion thereof closely engages the forward portion of the annular groove 22, it will be apparent to those skilled in this art that an air tight joint will be produced which will not be affected in any way by the actual working of the tool.

It will be noted that the communication from the piston chamber 2 to the longitudinally extending passages in the casing is made by cutting away a portion of the casing from the inside so that in my present construction the necessity of employing plugs of small size is wholly avoided.

In the embodiment seen in Figs. 6 and 7 I have shown a cylinder of modified form in which the exhaust passes to the atmosphere through the rear end of the tool instead of through the side walls of the casing, it being understood that in practice both of these constructions are employed. In this embodiment the annular ring 23 is provided with apertures 27 which communicate with the longitudinally extending passages 19, as

will be readily understood by reference to Fig. 6.

It will be seen from the figures that in the present instance I provide the inlet piece or plug 11 with a hexagonal nut in order that the same may be the more easily adjusted to its desired position with respect to the cylinder.

It will now be apparent that I have devised a novel construction of a pneumatic tool in which novel means are employed for closing the outer end of the longitudinally extending passages in the casing and while I have in the present instance shown an embodiment thereof which has been found in practice to give satisfactory and reliable results, it is to be understood that the same is susceptible of modification in various particulars without departing from the spirit or scope of the invention or sacrificing any of its advantages.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:—

1. In a pneumatic tool, a casing having motive fluid passages therein a piston chamber extending longitudinally of said casing, a piston in said chamber having its reciprocation controlled by the flow of motive fluid through said passages and an annular groove communicating with said passages, and a ring seated in said groove to close said passages.

2. In a pneumatic tool, a casing having motive fluid passages therein and a groove communicating with said passages, and an annular ring having one of its outer walls beveled, immovably seated in said groove.

3. In a pneumatic tool, a casing having motive fluid passages therein and a groove communicating with said passages, and a closure having inclined walls seated in said aperture, said closure being secured in place by deflecting a portion of said casing against said walls.

4. In a pneumatic tool, a casing having fluid ports and passages and an annular groove at one end communicating therewith, and an annular ring having its forward portion adapted to closely engage said groove and having its rearward portion beveled, whereby said ring closes said passages when a portion of said casing has been deflected into contact with said beveled portion.

5. In a pneumatic tool, a casing having fluid ports and passages therein and an annular groove communicating with the end of said passages, and an annular ring, the forward portion of which closes said passages, said ring being secured in position by deflecting the outer end of said casing there against.

FREDERICK S. GRAHAM.

Witnesses:

RALPH M. SEAMAN,
H. S. FAIRBANKS.