No. 871,756. PATENTED NOV. 19, 1907.

F. S. GRAHAM.

VALVELESS PNEUMATIC TOOL.

APPLICATION FILED NOV. 9, 1906.

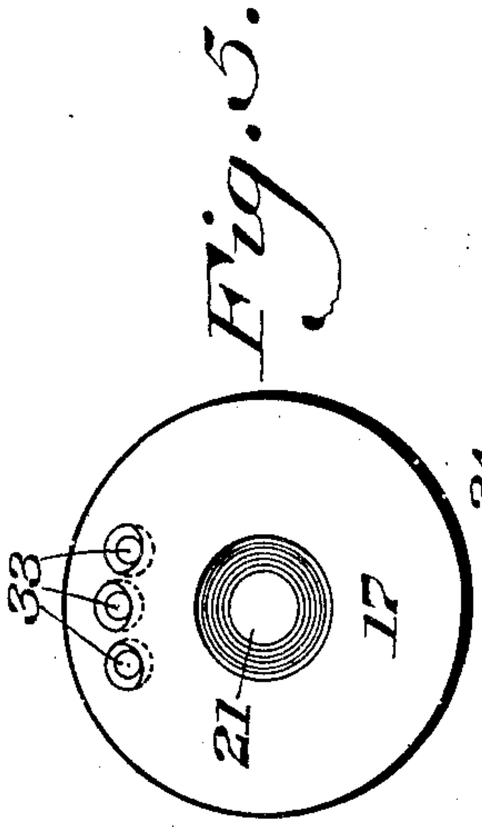
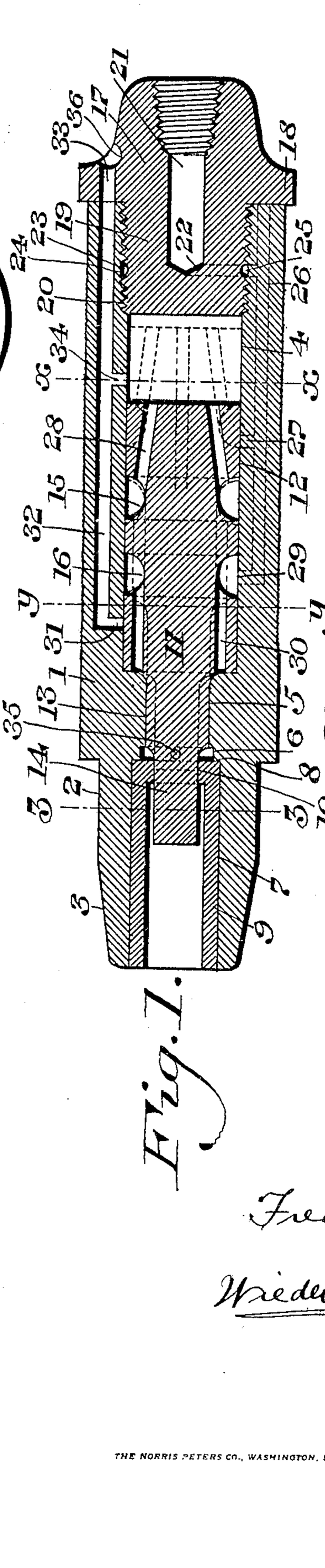


Fig. 5.



1.

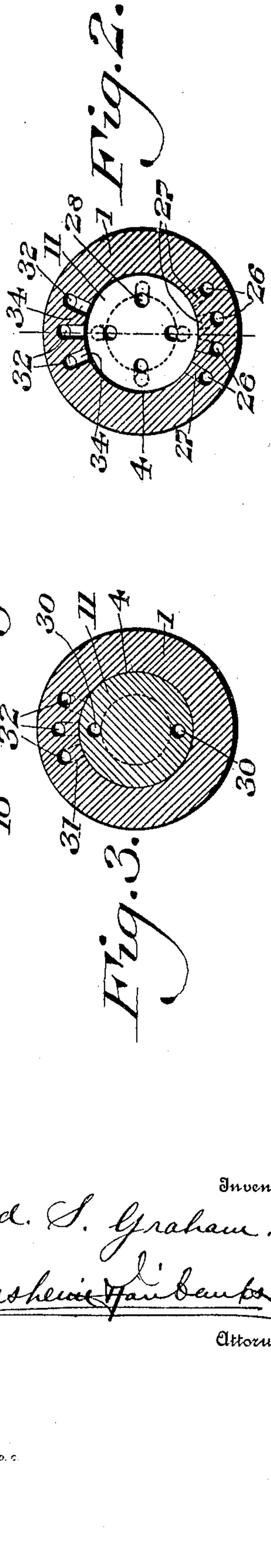


Fig. 2.

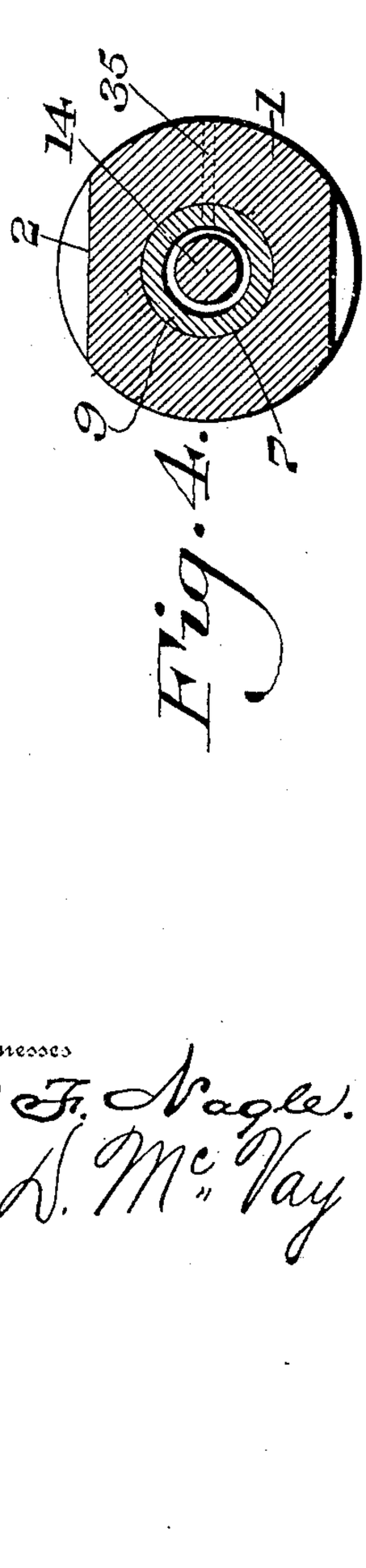


Fig. 4.

Fig. 3.

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VALVELESS PNEUMATIC TOOL.

No. 871,756. Specification of Letters Patent. Patented Nov. 19, 1907.

Application filed November 9, 1906. Serial No. 342,714.

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.

My invention consists of a novel and simplified construction of a valveless pneumatic tool which is especially adapted to be used in dressing and carving stone and in all cases in which a mallet or chisel are employed.

It further consists of a novel construction of pneumatic tool in which the number of parts are reduced to a minimum and the noise and vibration, which is ordinarily found in tools of this character, practically eliminated.

My invention further consists of the novel arrangement and location of the inlet and exhaust ports and passages in the casing and the inlet passages and grooves in the piston whereby the piston is reciprocated and the exhaust from the piston chamber permitted at the proper intervals so that an efficient and powerful blow is imparted to the working tool.

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 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 may be variously arranged and organized and that my invention is not limited to the exact arrangement and organization of these instrumentalities, as herein shown.

Figure 1 represents a sectional view of a pneumatic tool embodying my invention. Fig. 2 represents a sectional view on line *x*—*x* Fig. 1. Fig. 3 represents a sectional view on line *y*—*y* Fig. 1. Fig. 4 represents a sectional view on line *z*—*z* Fig. 1. Fig. 5 represents a top plan view of Fig. 1.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings. 1 designates a casing which is cut away near its forward end, as seen at 2, in order that the same may be readily placed in a vise or other device when it is desired to assemble or dissemble the tool. The forward portion of the casing contiguous the cut away portion is preferably tapered as seen at 3. The casing 1 is provided with differential bores or diameters 4, 5, 6 and 7, it being noted that the bores 6 and 7 form a shoulder 8 against which the end of a chisel bushing 9 abuts, said chisel bushing being adapted to receive the working tool and said bushing at its rear end being apertured, as seen at 10.

11 designates a piston having a diameter 12 which engages the inner bore 4 of the casing 1, a diameter 13 which engages the bore 5 and at its forward end a reduced diameter or striker 14, which is adapted to pass through the aperture 10 in the chisel bushing 9 and impart a blow to the working tool. The piston 11 is provided with a plurality of annular grooves, in the present instance two annular grooves 15 and 16 being employed.

17 designates an inlet piece having a flange 18 which is adapted to abut against the end of the tool casing 1 and provided with a threaded extension 19 which engages an internal thread 20 in the tool casing 1.

21 designates an inlet passage for the motive fluid which is suitably threaded in order that it may be readily connected with the hose or other conduit leading to the motive fluid supply.

22 designates a passage leading from the inlet passage 21 and communicating with a groove 23 in the outer periphery of the threaded extension 19, said groove 23 registering with a groove 24 in the casing 1 when the parts are in assembled position.

In order to more clearly describe the construction and arrangement of the ports and passages in the casing 1 and in the piston 11, I will now describe the manner in which the motive fluid passes to actuate the tool. The motive fluid enters through the inlet passage 21 and passes through the passage 22 into the annular grooves 23 and 24, thence through a port 25 into a passage 26 and assuming that the piston 11 is at the rear end of its stroke, the motive fluid will pass through port 27 around the annular groove 15 which at this time registers with said port and thence through the angularly inclined passages 28 in the piston into the chamber 4 in rear of the piston and acting against the rear

end thereof causes said piston to move forwardly so that the striker 14 thereof imparts a blow to the working tool. As the piston moves forwardly the annular groove 16 therein will register with the port 29, which communicates with the inlet passage 26, and live motive fluid may now pass through said port around the annular groove 16 and through a plurality of passages 30 which extend through the forward portion of the diameter 12 so that live motive fluid acting against the forward end of the diameter 12 of the piston causes said piston to move rearwardly so that the annular groove 15 will register with the inlet port 27 whereupon the operation just described will be repeated. As the piston moves forwardly the motive fluid in front of the diameter 12 may pass through the port 31, passage 32 and passage 33 in the inlet piece 17 to the atmosphere. On the forward movement of the piston, as soon as the port 34 is uncovered, the motive fluid in rear of the piston will exhaust therethrough and through passages 32 and 33 to the atmosphere.

35 designates an exhaust port extending through the casing 1 in order that any fluid in the chamber formed between the end of the chisel bushing and the diameter 13 of the piston may readily escape to the atmosphere.

I have found in practice that by employing two ports 30, a sufficient quantity of air passes to the forward portion of the tool to return the piston in a reliable and accurate manner.

Owing to the provision of the diameter 13 which engages the inner bore 5, the piston is always accurately guided in its movement. The threaded extension 19 is preferably tapered so that there will be less liability of the same becoming disengaged from the internally threaded portion of the casing.

Owing to the novel construction and arrangement of the ports and passages the piston is suitably cushioned on its rearward movement so that the vibration usually present in tools of this character is reduced to a minimum. Owing to the provision of the grooves 15 and 16 the diameter 12 of the piston is divided into a forward, rear and intermediate head of uniform diameter, as will be clearly understood with reference to Fig. 1.

It is further to be noted that the passage 33 at its outer end is provided with a curved wall 36, whereby the exhaust motive fluid is directed away from the operator when the device is properly held.

It will now be apparent from the foregoing that I have produced a novel and useful construction of a valveless pneumatic tool which embodies the features of advantage enumerated in the statement of invention and the above description and while I have shown herein the preferred embodiment thereof, which has given satisfactory and reliable results in practice, it is to be understood that it is susceptible of modification in various particulars without departing from the spirit and scope of my 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 its forward end cut away adapting the same to be held by a vise, and its extreme forward end tapered, a differential piston therein having a rear head of uniform diameter, an intermediate head of reduced diameter, and a striker of less diameter than said latter head, an annular groove in said rear head controlling admission of motive fluid to advance the piston, an annular groove in said rear head controlling admission of motive fluid to return the piston, passages extending angularly from said first groove through the rear end of said rear head, passages extending from said second groove through the forward end of said rear head, inlet and exhaust ports and passages in said casing controlled by said rear head, an inlet piece engaging said casing, and exhaust passages therethrough communicating with the exhaust passage of said casing.

2. In a pneumatic tool, a casing, a differential piston therein having a rear head of uniform diameter, an intermediate head of reduced diameter, and a striker of less diameter than said latter head, an annular groove in said rear head controlling admission of motive fluid to advance the piston, an annular groove in said rear head controlling admission of motive fluid to return the piston, passages extending angularly from said first groove through the rear end of said rear head, passages extending from said second groove through the forward end of said rear head, inlet and exhaust ports and passages in said casing controlled by said rear head, an inlet piece engaging said casing, and exhaust passages therethrough communicating with the exhaust passage of said casing and having their outer ends provided with a curved wall for deflecting the exhausting motive fluid.

3. In a pneumatic tool, a casing having its forward end cut away adapting the same to be held by a vise, and its extreme forward end tapered, a differential piston therein having a rear head of uniform diameter, an intermediate head of reduced diameter, and a striker of less diameter than said latter head, an annular groove in said rear head controlling admission of motive fluid to advance the piston, an annular groove in said rear head controlling admission of motive fluid to return the piston, passages extending angularly from said first groove through the rear end of said rear head, passages extending

from said second groove through the forward end of said rear head, inlet and exhaust ports and passages in said casing controlled by said rear head, an inlet piece engaging said casing, and exhaust passages therethrough communicating with the exhaust passage of said casing and having their outer ends provided with a curved wall for deflecting the exhausting motive fluid.

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