

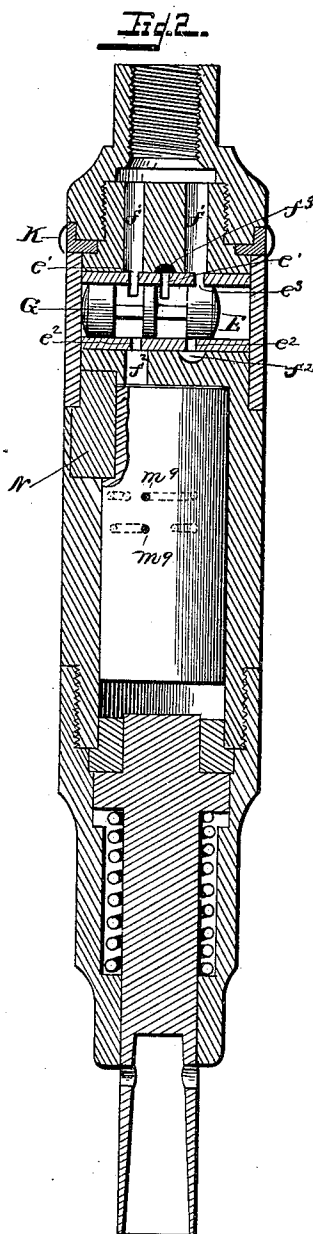
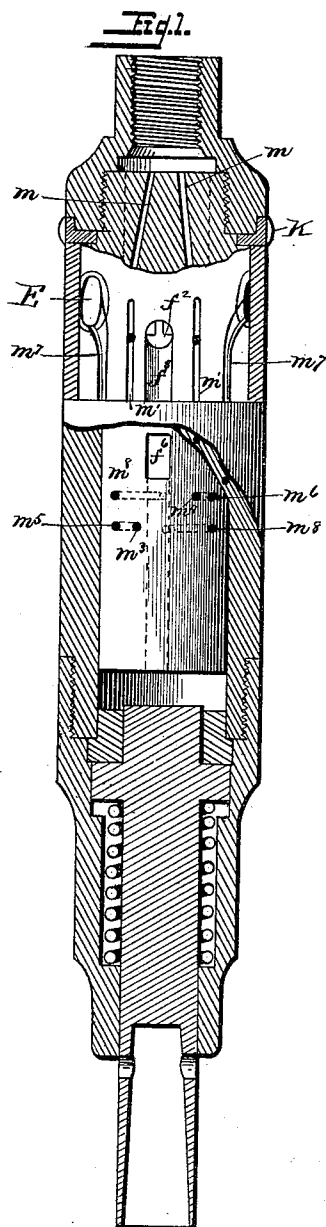
(No Model.)

2 Sheets—Sheet 1.

D. DRAWBAUGH.
PNEUMATIC TOOL FOR ROCK CUTTING.

No. 464,821.

Patented Dec. 8, 1891.



Witnesses
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Aly Stewart

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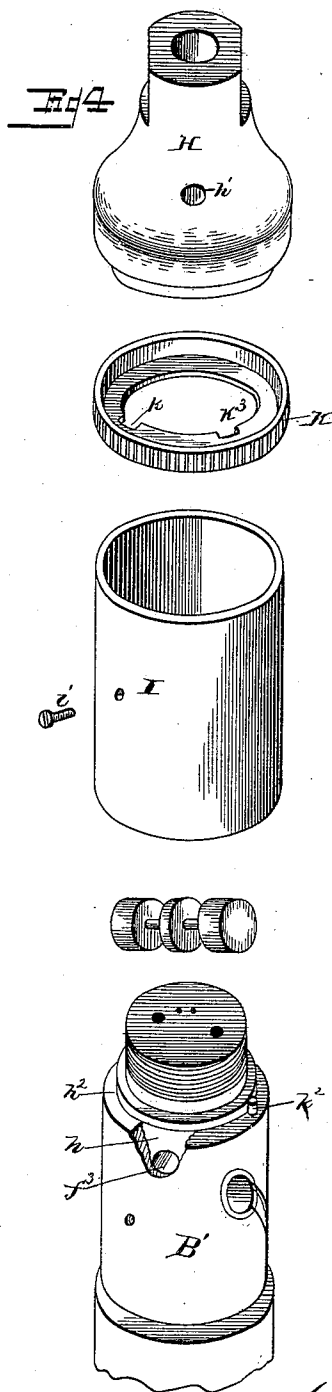
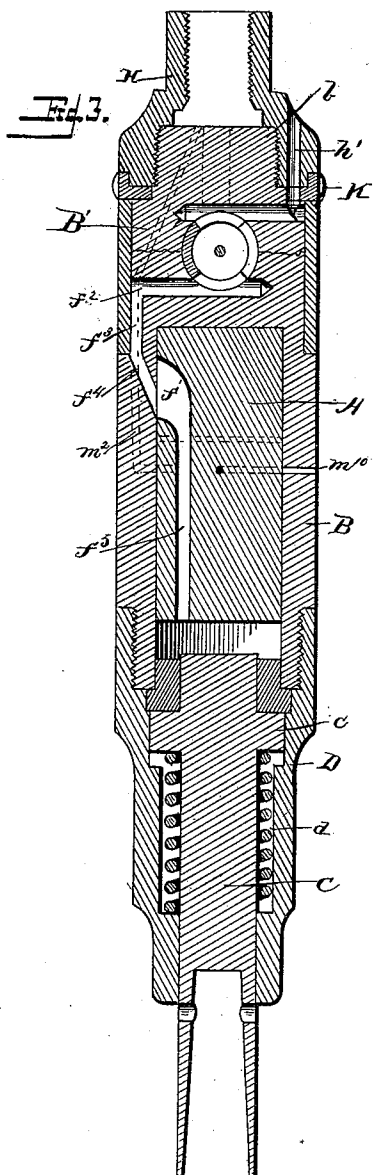
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2 Sheets—Sheet 2.

D. DRAWBAUGH.
PNEUMATIC TOOL FOR ROCK CUTTING.

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UNITED STATES PATENT OFFICE.

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PNEUMATIC TOOL FOR ROCK-CUTTING.

SPECIFICATION forming part of Letters Patent No. 464,821, dated December 8, 1891.

Application filed October 15, 1891. Serial No. 408,762. (No model.)

To all whom it may concern:

Be it known that I, DANIEL DRAWBAUGH, of Eberly's Mill, in the county of Cumberland and State of Pennsylvania, have invented certain new and useful Improvements in Pneumatic Tools for Rock-Cutting, &c.; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and to the letters of reference marked thereon.

The invention relates to improvements in pneumatic tools in which the work is performed by a hammer or piston which, under the influence of the motor medium, delivers a rapid series of sharp blows on the tool or part connected therewith, adapting the latter for an almost infinite variety of uses, particularly, however, for stone-cutting, boiler-calking, &c.

The invention consists in certain novel details of construction and combinations and arrangements of parts, all as will be hereinafter described, and pointed out in the appended claims.

Referring to the accompanying drawings, Figure 1 is a sectional view of a tool constructed in accordance with my present invention, parts being shown in elevation to illustrate more clearly the positions of the channels and ports. Fig. 2 is a sectional view looking from the opposite side and taken longitudinally of the valve. Fig. 3 is a similar view at right angles to Fig. 2. Fig. 4 is a view in perspective of the parts forming the top of the tool separated from each other.

Similar letters of reference in the several figures indicate the same parts.

In a contemporaneous application, Serial No. 304,876, filed August 27, 1891, I have shown and described in detail a tool constructed in essential particulars the same as the present device, and therefore will not describe in detail the construction and operation of the parts herein further than is necessary for an understanding of this invention.

The letter A indicates the hammer or beater; B, the cylinder or casing in which it reciprocates; C, the tool-stock with which the hammer co-operates; D, the point-section screw-

ing on the lower end of the casing B and containing spring *d*, which co-operates with a shoulder *c* on the tool-stock to return the same to normal position. In said former device the upper end of the casing was open and an independent or separate valve-block was mounted thereon and held in place by the cap, which, fitting around the same, inclosed depressions therein, constituting certain air-channels, the cap itself screwing onto the central casing; but in the present invention I design to dispense with the necessity of providing separate parts, as just described, and to provide a structure in which the main casing, while preserving the characteristics of the former device, has the valve-block formed integral therewith at the upper end, the passages being formed entirely by boring or channeling the outside of the block.

The letter B' indicates the part of the casing which I have termed the "valve-block," being formed integral therewith, as shown, but of slightly smaller diameter and having a screw-threaded extension *b* at the upper end for the attachment of a cap-piece, as will presently appear.

Passing transversely through the valve-block immediately above the hammer is an opening for the valve, and in this opening is accurately fitted the valve-casing E, consisting of the cylinder of hardened metal, having the ports *e'* *e'* *e*² *e*² and port *e*³ formed therein by transverse cuts, which may be made easily and quickly before its insertion in the casing. To form passages co-operating or registering with these ports, holes are bored into the valve-block before the insertion of the casing, forming passages *f'* *f'*, *f*² *f*², and *f*³. Thus it will be seen that the passages and ports may be formed with minimum labor, and when formed will be accurate in every respect, owing to the fact that the slots in the casing are exposed to view while being made, and may be thus finished with the utmost nicety, and it is only necessary that the drill-holes should register with some portion of the same. The passages *f'* *f'*, co-operating with the ports *e'* *e'*, are the live-air passages, and the ports and passages *e*² *f*² lead from the valve-chamber, respectively, to the opposite ends of the cyl-

inder. The passage e^2 for the upper end of the cylinder is a direct one; but the passage f^2 for the lower end of the cylinder is bored transversely of the valve-block and merges in the channel or depression f^3 , which latter communicates at the lower end with a bored channel f^4 , opening into the cylinder at a point near the upper end, but below the top of the hammer when at the lower extreme of its movement. The continuation of the passage to the lower end of the cylinder is formed in the hammer itself, and is lettered f^5 , the upper end of the passage f^5 being elongated, as shown at f^6 , whereby it is open to the passage f^4 , at all times affording a free way for the air and doing away with the necessity of forming expensive borings or passages in the casing itself. The exhaust-passage f^3 , communicating with the port e^2 , is formed by boring transversely into the valve-block from the opposite side, as shown in Fig. 3, and at the outer end merges in the enlargement h , from whence the air is conducted through a passage h' in the cap-piece H. The valve-block is surrounded by a cylinder or removable case I, which fits accurately thereon, and is held in place by the cap-piece H, and, further, if desired, by a set-screw i , as shown in Fig. 4, said case inclosing the channels or depressions in the outer surface of the valve-block.

Fitting between the cap H and case I and resting upon a shoulder h^2 is what I shall herein term the "annular cut-off ring" K, which consists of a ring having an inwardly-extending flange with an opening or cut-out portion k , adapted to register with the opening h and form the connecting-passage between said opening h and the exhaust-passage h' . This annular cut-off is movable slightly, being limited in its movement by the pin k^2 passing into a recess k^3 therein, and when moved serves to vary the cut-off opening, thereby throttling to a greater or less extent the exhaust from the cylinder, as will be readily understood by those familiar with these tools.

The valve G is moved longitudinally of the valve-casing, and is formed and operates essentially as that described in my before-mentioned application, being moved by the air, which is admitted at each end and controlled by the movement of the hammer. The air-passages to the valve in the present instance are formed by boring relatively-small openings m m from the top of the valve-block diagonally out to points at one side, where said passages merge into recesses or depressions m' m' , adapted to be inclosed by the case I, and at the lower ends opening into bored passages m^2 , (see dotted lines, Fig. 3,) which at a point some distance from the top of the cylinder open into the same, forming air-ports, which register with the ports m^3 m^4 , respectively, when the hammer is at opposite extremes of its movement. The ports m^3 m^4 communicate directly with the ports m^5 m^6 , respectively, which latter are adapted to reg-

ister with passages m^7 , leading to opposite ends of the valve-casing at the moment when the ports m^3 register with the ports from passages m^2 , the result being that air is admitted alternately to opposite ends of the casing and serves to throw the valve in one direction or the other. It will be noted that the ports m^5 m^6 are to one side of the ports m^3 m^4 , and in a vertical line therewith, but adapted to register with the passages m^7 when the hammer is at opposite extremes of its movement, are ports m^8 , the passages from which extend way through the hammer, terminating in ports m^9 , Fig. 2, adapted to alternately register with the exhaust-port m^{10} .

The operation of the parts thus described will be readily understood by those skilled in the art, the valve-block controlling the passage of air alternately to opposite ends of the hammer and the hammer controlling the passage of air alternately to opposite ends of the valve, and it will be particularly noted, in connection with the last-mentioned operation, that when the air is admitted to the valve-passages to shift the valve it is cut off quickly and sharply after having moved the valve, such cut off being preferably arranged to take place at the moment before the entire exhaust from the opposite end has taken place, whereby the valve is cushioned, as it were, and excessive vibration of the tool in the hands of the operator is thereby prevented, to say nothing of the decreased wear on the valve and case. A feather n , Fig. 2, prevents the hammer from rotating, thus keeping the ports in line to register with the ports of the cylinder. The ports for the upper end of the hammer are preferably arranged to cut off just before it reaches the extreme of its movement to prevent any pounding of the hammer against the casing on the upstroke, while on the downstroke the full force of the stroke is developed and expended upon the inner end of the tool-stock. The force of the blows delivered is easily and quickly controlled or regulated by shifting the annular cut-off K so as to throttle to a greater or less extent the exhaust from the cylinder, and, if desired, the exhaust from the valve may be throttled, as described in my before-mentioned application, for the purpose of regulating the speed at which the blow is to be delivered without materially decreasing the force of the same.

The tool is simple, and is so constructed and arranged as to permit of the ready formation of all the air passages and channels by simply boring and drilling operations, thus greatly simplifying and reducing the cost of manufacture, besides enabling an accuracy of construction to be secured impossible with the old formations without careful and expensive processes of manufacture.

Having thus described my invention, what I claim as new is—

1. In a pneumatic tool having the casing, tool-stock, hammer, and valve, and in combination with the casing thereof, of the valve-

block formed integral with said casing at the upper end and having the passages and external grooves or depressions into which said passages merge, the casing inclosing said valve-block, and the cap secured to said valve-block for holding said case in position, substantially as described.

2. In a pneumatic tool having the casing, tool-stock, hammer, and valve, and in combination with said casing, of the valve-block formed integral therewith but of less diameter, the case inclosing said valve-block, and the cap for holding said case in position, said valve-block having the passages and depressions, substantially as described and set forth.

3. The combination, with the tool-stock, hammer having a passage therein at the lower end, and the valve, as described, of the casing and valve-block having the air-passages for both ends of the hammer opening into the cylinder at the upper end, the passage for the lower end of the hammer registering with the passage in the hammer, and the case surrounding the valve-block, substantially as described.

4. In a pneumatic tool, the combination, with the casing and valve-block forming the cylinder and having the passage for the lower end of the cylinder opening into the same at a point near the upper end, of the hammer having the passage extending longitudinally thereof to the lower end and registering at the upper end with the before-mentioned passage in the casing, substantially as described.

5. In a pneumatic tool having the tool-stock, casing, valve-block, valve, and passages and ports, as described, and in combination with said valve-block, of the independent cylindrical valve-casing inserted therein having the ports as described, substantially as described.

6. In a pneumatic tool having the tool-stock, casing, valve-block, valve, and hammer, and in

combination with said valve-block, the independent removable cylindrical valve-casing having the ports cut transversely thereof before being inserted in the valve-block, substantially as described.

7. In a pneumatic tool, the combination, with the casing, hammer, and valve, of the valve-block having the passages bored therein, and the cylindrical valve-case having the ports cut transversely therein and registering with the passages bored in the valve-block, substantially as described.

8. In a pneumatic tool, the combination, with the casing, the hammer, tool-stock, the valve-block, and valve, as described, of the independent cylindrical valve-casing having the ports cut therein inserted in the valve-block, and the casing surmounting and inclosing the valve-block, substantially as described.

9. In a pneumatic tool, the combination, with the casing, hammer, valve, and valve-block with passages, substantially as described, of the annular cut-off ring, substantially as described.

10. In a pneumatic tool, the combination, with the casing and valve-block having passages, substantially as described, and the valve and hammer, of the annular cut-off ring surrounding and seated in the upper end of the tool, substantially as described.

11. In a pneumatic tool, the combination, with the casing and valve-block having the passages, substantially as described, and the valve and hammer, of the annular cut-off ring seated on the valve-block and having the opening therein for the exhaust-passage, substantially as described.

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