(No Model.) 2 Sheets—Sheet 1.

D. DRAWBAUGH.

PNEUMATIC TOOL.

No. 458,291. Patented Aug. 25, 1891.

Fig. 1

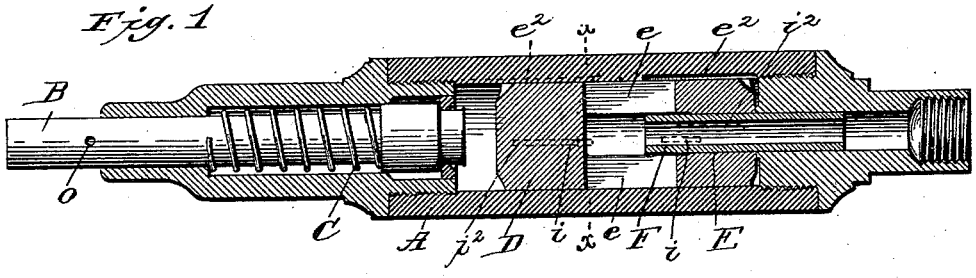


Fig. 2

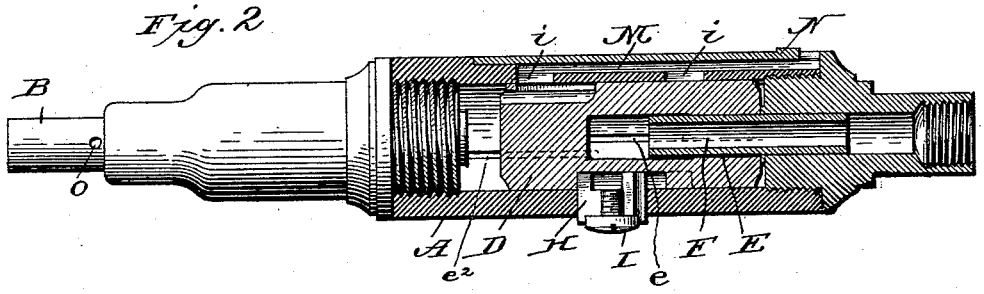


Fig. 3.

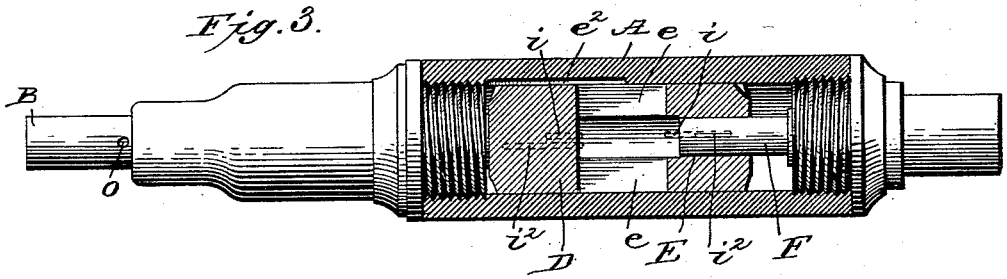


Fig. 4.

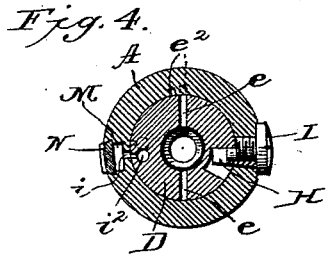
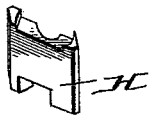


Fig. 6.



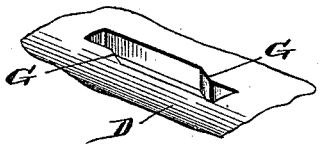
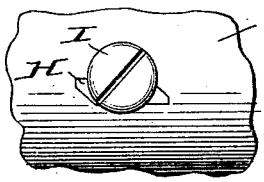


Fig. 5



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 7.

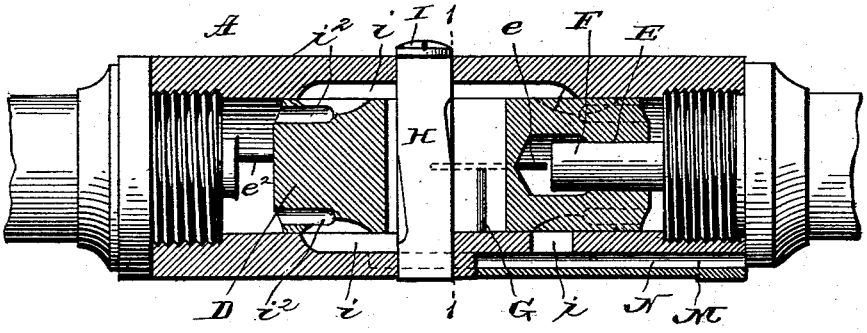


Fig. 8.

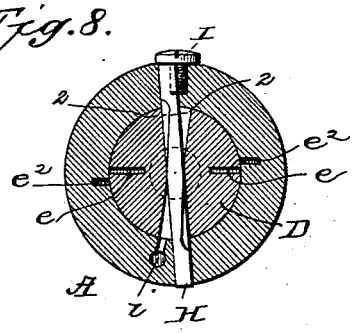


Fig. 9.

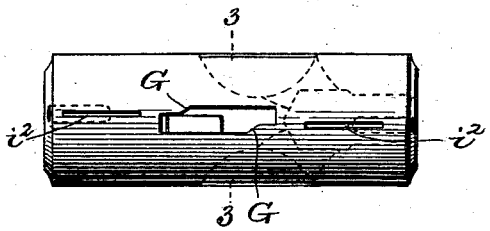


Fig. 10.

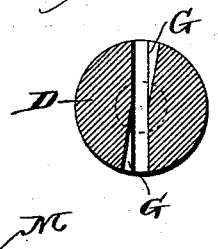
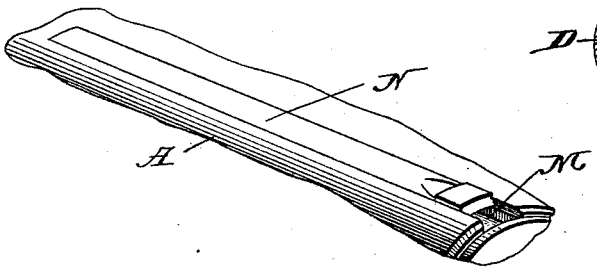


Fig. 11.

Fig. 12.



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UNITED STATES PATENT OFFICE.

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PNEUMATIC TOOL.

SPECIFICATION forming part of Letters Patent No. 458,291, dated August 25, 1891.

Application filed February 6, 1891. Serial No. 380,441. (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; 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.

This invention relates to improvements in pneumatic tools, such as are particularly designed for cutting stone and similar substance, the object being to provide an exceedingly simple tool having few parts to get out of order or become worn, and which shall be capable of running at a high rate of speed without detriment, to which ends it consists in certain novel details of construction and combinations and arrangements of parts to be hereinafter described, and pointed out particularly in the appended claims.

In the accompanying drawings, Figure 1 is a longitudinal sectional view of a tool constructed in accordance with my present invention. Fig. 2 is a similar view taken longitudinally through the tool at right angles to Fig. 1 with the hammer in the same position. Fig. 3 is a view similar to Fig. 1 with the hammer at the opposite end of its stroke. Fig. 4 is a section on the line $x x$, Fig. 1. Fig. 5 is a detail view of a portion of the cylinder, showing the piston-rotating projection. Fig. 6 is a perspective of the projection removed. Fig. 7 is a section similar to Fig. 1, showing the arrangement of parts when the hammer is perfectly balanced. Fig. 8 is a section on the line 1 1, Fig. 7. Fig. 9 is a side elevation of the hammer with the internal parts in dotted lines. Fig. 10 is a section on line 3 3, Fig. 9. Fig. 11 is a section through the hammer-oscillating projection or pin on line 2 2, Fig. 8. Fig. 12 is a detail perspective of the exhaust-gate.

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

In the drawings, the letter A indicates the cylinder, or, more properly speaking, the casing, as it incloses all the operating parts of the device, and also serves as a convenient hand-hold for the operator when the tool is used for certain purposes.

B indicates the tool-stock mounted in the casing at one end, with its end projecting into the chamber and normally held in such position by the coiled spring C located in a chamber in the end of the casing and bearing against an annular shoulder on the tool-stock.

The piston or what I shall herein term the "hammer" B, because it is independently movable and operates to drive the tool by a succession of quick sharp blows delivered on the end of the tool-stock is mounted and reciprocates in the chamber in the casing. This hammer and the tool-stock just described constitute the only moving parts in the device, and hence it will be seen that there can be little if any injurious effect from the great number of concussions while the tool is at work, which could not be the case were valves or other delicate or complicated parts employed. The taking of air and exhausting from opposite sides of the hammer is controlled entirely by giving the hammer itself a slight oscillation on its own axis during each excursion, the ports of course being so arranged that when the hammer is at or near one extreme of its movement the entrance-port for that end is opened and the exhaust-port for the opposite end also opened, and vice versa, the arrangement of ports and mechanism being, preferably, as follows: The hammer is provided at the end opposite the tool-stock with a cylindrical recess E into which fits and works, air-tight at all times, the cylindrical projection or elongation F of the induction-port, by which arrangement the compressed air or other motive gas is conveyed to the center of the hammer, from which point passages e open out to the walls of the casing, preferably on diametrically-opposite sides, in order to equalize the pressure on the hammer and prevent undue friction. In the walls of the casing and in position to register with the passages e, when the hammer is at the extreme of its stroke, are passages e^2, which convey the air to either end of the cylinder. The passages at opposite ends, it will be understood, are not directly in line with each other, but those at one end register with pas-

sages *e* when the hammer is at one extreme, and the other passages when it is at the opposite extreme of its movement, the turning of the hammer on its axis by means of the shoulders G and pin or projection H causing the passages to register and cut off at the proper moment. The shoulders just mentioned are preferably in a groove or slot in the hammer itself, with a relatively wide space between the shoulders, and during the time the projection travels through this space the ports for the proper end register, and the compressed air enters until the moment when the opposite shoulder strikes and shifts the ports to permit the air to pass to the opposite end of the hammer.

The exhaust-ports are arranged similar to the entrance-ports, save that I prefer to locate the ports *i* in the wall of the casing in line with each other and the ports i^2 in the hammer out of line with each other, their positions relative to each other being the same as that of the entrance-ports. In forming the last-mentioned ports a cylindrical passage is preferably made down into the hammer from the end and the ports are cut into these passages at the proper points.

The pin or projection H in the casing, for co-operation with the shoulders on the hammer is preferably made removable, so as to be easily renewed when worn, and for this purpose an opening is formed in the casing and the projection fitted therein, a screw-thread being formed partially in the projection and partially in the casing into which a screw I is passed to hold the projection rigidly in position. The ports are arranged to balance as nearly as possible the steam-pressure on the sides of the hammer to relieve all friction, and to increase this effect the exhaust-ports may be located at diametrically-opposite points similar to the arrangement of the entrance-ports, as shown, for instance, in Figs. 7 to 11, wherein, instead of having the pin or projection H operate on one side only of the hammer, it extends way through a slot in the same, which slot is provided with shoulders G at opposite sides, as shown in Figs. 9 and 10, and the pin is suitably inclined, as shown in Figs. 8 and 11, and engages the shoulders on opposite sides simultaneously. The exhaust-ports open directly into the exhaust-channel from one side, and from the opposite side they communicate with the said channel through the pin-slot, which is at all times open to the passage *i* in the casing. In order to avoid the said slot the entrance-ports extend down at an angle, as shown in dotted lines, Fig. 9, but otherwise are similar to those shown in the other figures of the drawings.

The speed of the hammer is preferably regulated and controlled by increasing or diminishing the size of the exhaust-opening, and to accomplish this result easily a channel M is formed in the outer wall of the casing, into which both exhaust-ports open, and a sliding cover N is provided for the channel, which can be moved to open more or less to give a restricted or free exhaust, as will be readily understood.

The tool-holding end of the stock may be of any preferred arrangement, but in every instance I prefer to form a lateral opening O at the base of the tool-opening, into which a pointed implement may be inserted to force the tool out.

In operation the power is secured through the medium of air, gas, or fluid under pressure, and the supply-pipe is attached to the rear end of the casing at the point shown. When the pressure is turned on, the air assuming that this is the power medium, operates to drive the hammer to one extreme of its movement, when the inclined shoulders and pin operate to oscillate the same and open the ports for causing the reverse movement, the hammer at each forward movement coming into contact with the tool-stock and imparting thereto a sharp effective blow, as will be readily understood by those skilled in the art.

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

1. In a tool such as described, the combination, with the casing having inlet and exhaust ports, as described, and the tool-stock movably mounted in said casing, of the hammer working independently within the casing and having the ports in its outer surface registering with the ports in the casing throughout a portion only of each excursion, whereby the entrance and exhaust are controlled by the movement of the hammer itself, said hammer being adapted to strike the tool-stock at one extreme of its movement.

2. In a tool such as described, the combination, with the casing having the inlet and exhaust ports, as described, and the tool-stock movably mounted within the casing, of the hammer working independently within the casing and having the ports in its outer surface registering with the ports in the casing during portions of each excursion to admit and exhaust from opposite ends of the hammer, and inclined shoulders and a co-operating pin for oscillating said hammer on its own axis during each excursion to cause the said ports to register at the proper moments to admit pressure and exhaust from opposite ends of the hammer alternately, substantially as described.

3. In a tool such as described, the combination, with the casing having the inlet and exhaust ports, as described, and the tool-stock movably mounted within the casing, of the hammer working independently within the casing and having the ports in its outer surface registering with the ports in the casing during portions of each excursion to admit and exhaust from opposite ends of the hammer, and inclined shoulders in an opening in the hammer, and a co-operating pin passing through the wall of the casing for oscillating

the hammer on its own axis to bring the ports into proper relative positions at the extremes of each movement, substantially as described.

4. In a tool such as described, the combination, with the casing having inlet and exhaust ports, as described, and the tool-stock movably mounted in said casing, of the hammer working independently within the casing and having steam-ports in its outer surface registering with the ports in the casing throughout a portion only of each excursion, whereby the entrance and exhaust are controlled by the movement of the hammer itself, and an adjustable gate controlling the exhaust-ports, whereby the rate of movement may be regulated, substantially as described.

5. In a tool such as described, the combination, with the casing having the inward extension forming the entrance-port, and the hammer working within the casing, having the cylindrical recess into which said extension projects, said casing and hammer having the entrance and exhaust ports registering during portions only of each excursion, of the inclined shoulders formed in an opening in the hammer, and the removable pin passing through the casing and co-operating with said shoulders to oscillate the hammer on its own axis and cause the proper registering of the ports, substantially as described.

6. In a tool such as described, the combination, with the casing, the tool-stock movably mounted therein, and a hammer independently movable within the casing, said hammer and casing having inlet and exhaust ports registering during portions only of each excursion of the hammer, and the casing having a common channel into which the exhaust-ports open, of the inclined shoulders on the hammer, the pin passing through the casing and co-operating with said shoulders, the screw for holding said projection in place, and the adjustable gate controlling the exhaust from the channel into which said exhaust-passages open, substantially as described.

7. In a tool such as described, the combination, with the casing, the tool-stock, and the hammer having the slot passing way through the same, said casing and hammer having entrance and exhaust ports caused to register during portions of each excursion by the oscillation of the hammer, of the pin passing through the slot in the hammer, and co-operating shoulders on the pin and hammer for oscillating the latter, substantially as and for the purpose set forth.

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