(No Model.) 2 Sheets—Sheet 1.

D. DRAWBAUGH.

PNEUMATIC TOOL.

No. 504,802. Patented Sept. 12, 1893.

Fig. 1.

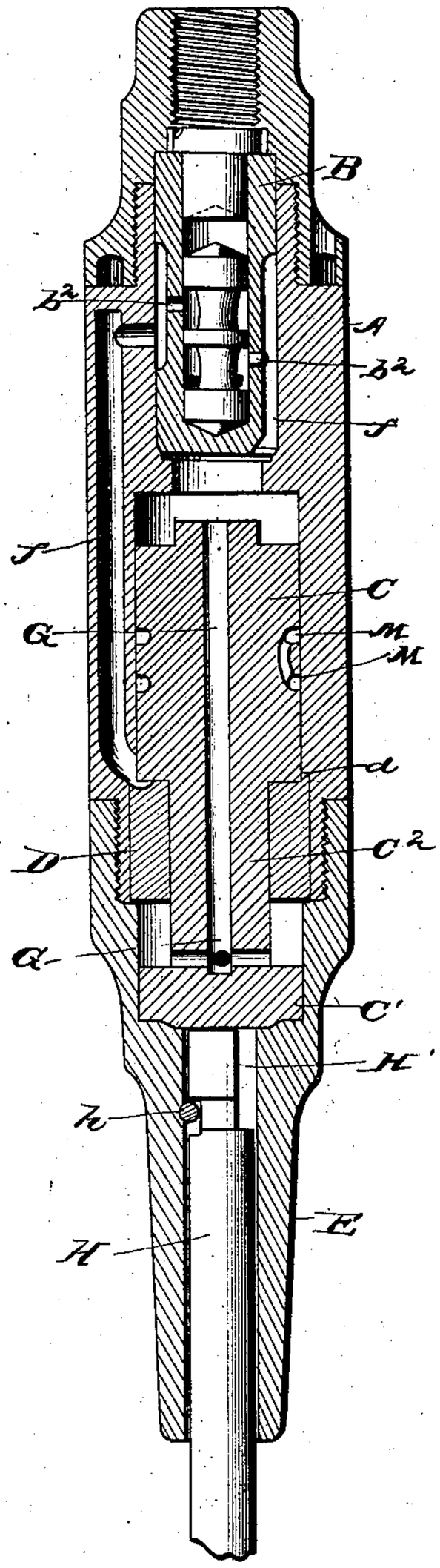
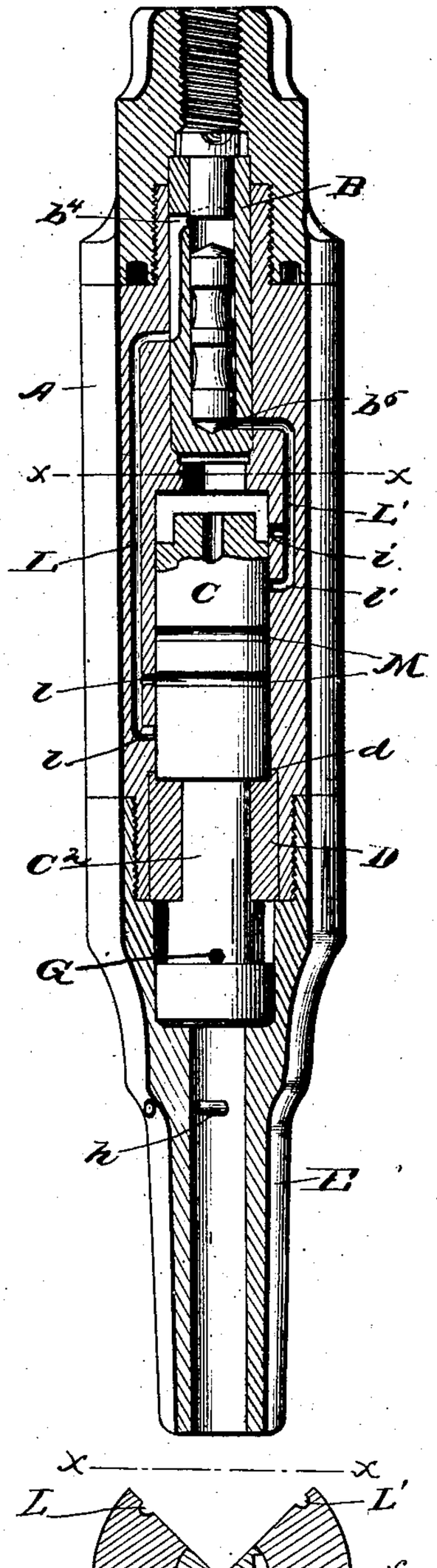


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

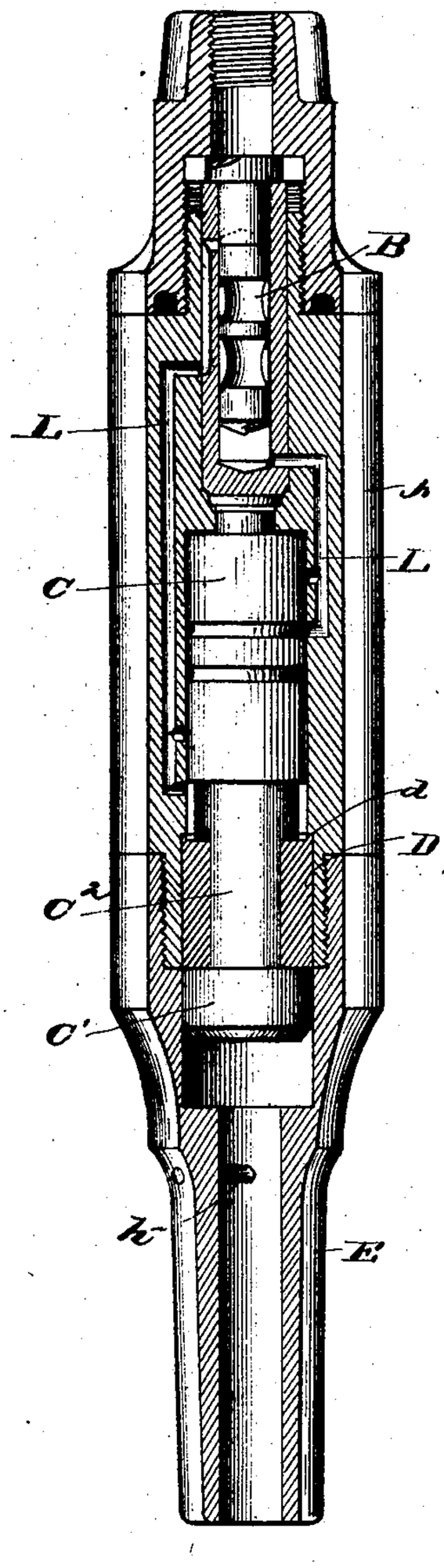


Fig. 5.

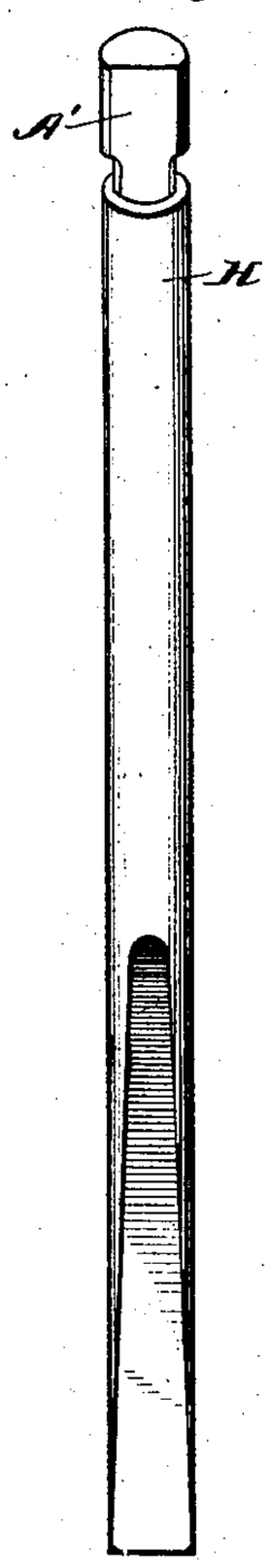
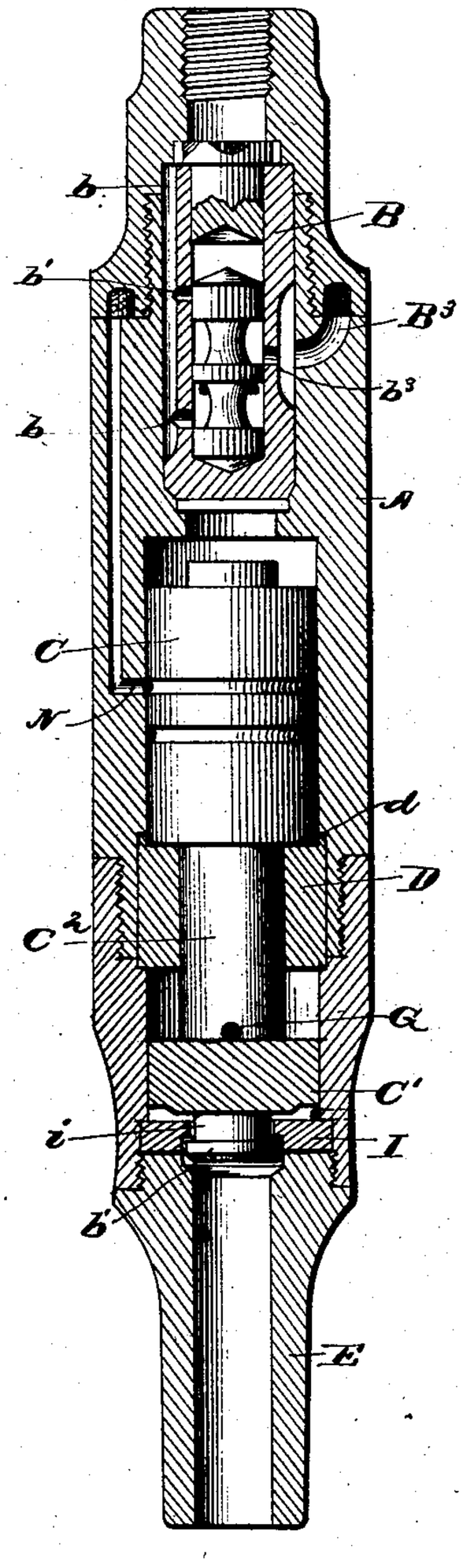


Fig. 4.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

DANIEL DRAWBAUGH, OF EBERLY'S MILL, PENNSYLVANIA, ASSIGNOR TO THE PNEUMATIC AND ELECTRIC TOOL COMPANY, OF NEW YORK, N. Y.

PNEUMATIC TOOL.

SPECIFICATION forming part of Letters Patent No. 504,802, dated September 12, 1893.

Application filed December 5, 1892. Serial No. 454,096. (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 for instance as illustrated and described in my prior patent, No. 472,495, dated April 5, 1892, to which reference is hereby made, although the specific features constituting this invention are applicable to other tools of this class as will be readily understood by those skilled in the art.

It is well known that tools of this kind, in order to be a practical success must not only be compact and of small diameter for a tool of given power, but the air ports and passages must be so arranged as to permit the air or other motive fluid to act promptly in performing its work and not be liable to clog or foul up with accumulations of oil, &c.

Now, it is the object of this invention, to provide a tool having an extremely simple arrangement of air ports with comparatively short passages connecting the same, and to provide for a stronger and more effectual forward stroke of the hammer or piston than has heretofore been deemed practical, with a comparatively light backward stroke, whereby the efficiency of the tool is greatly increased without increasing proportionately the vibration which is found prejudicial.

The invention consists primarily in a double or tandem arrangement of pressure surfaces or hammers connected rigidly together to form a single hammer, whereby the surface exposed to pressure during the forward stroke of the hammer is greatly increased without increasing the diameter of the hammer or tool.

The invention further 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.

Referring to the accompanying drawings: Figure 1 is a sectional view taken through a tool embodying my invention and showing the passages leading to opposite ends of the cylinder. Fig. 2 is a partial section and elevation showing the ports and passages controlling the pressure supply and exhaust for the valve. Fig. 3 is a similar view with the piston or hammer at the opposite extreme of its movement. Fig. 4 is a section taken at substantially right angles to Fig. 1 and showing the exhaust ports and passages for the piston and valve and a modified form of nose piece. Fig. 5 is a detail perspective of a tool or chisel.

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

As in said former patented device, a hammer or piston and the valve with its casing are preferably arranged in alignment within a cylindrical main case or shell A, and the valve with its casing is similar in all respects to said prior device, except that in this instance the live air passage for supplying pressure to the intermediate ports of the piston for distribution to opposite ends of the valve, is entirely omitted. Hence no particular description of the valve or of the arrangement of ports and passages in its exterior is necessary; sufficeth to say that, B indicates the said valve casing or box, b the live pressure passage having ports b', b' leading to the interior of the box; and b^2, b^2 the ports in said box for distributing the air to opposite ends of the piston or hammer.

b^3 is the exhaust port registering with an exhaust passage B^3 in the casing A, and b^4, b^5 are the ports leading to opposite ends of the valve box for supplying pressure to operate the valve.

The cylinder is formed immediately below the valve chamber for the reception of the piston or hammer, which in this instance, consists of a main hammer portion lettered C and an auxiliary hammer portion or piston lettered C′ connected with the main portion by a reduced stem C^2, the whole constituting a rigid hammer adapted to reciprocate within the cylinder under the influence of air admitted through the passages and ports as will be presently described.

Surrounding the stem C^2 is a collar or abut-

ment, which in the preferred construction, where the piston or hammer is turned up from an integral piece, consists of a split collar D inserted within the lower end of the casing and seating against a shoulder *d* formed in the cylinder. The auxiliary piston or hammer plays in the forward end of the cylinder and in this construction I have arranged the portion of the cylinder in which the auxiliary piston works in the nose piece E of the tool for the sake of convenience of construction. This nose piece E screws on to and forms a portion of the main casing. Hence in speaking of the main casing in broad terms, it will be understood that I refer to all the exterior parts necessary for inclosing the working parts. A passage *f* leads from the lower end of the main portion of the cylinder or from a point below the main portion of the piston up to the uppermost of the ports b^2, for conveying pressure below said piston or hammer to effect the return stroke and a passage *f'* leading directly into the upper end of the cylinder from the lower port b^3 serves to admit pressure to the upper end of the cylinder for advancing the piston or hammer to give its effective stroke. Now in order to supply the pressure simultaneously to the upper side of the main and auxiliary sections of the piston or hammer the passage G is preferably formed extending directly through the longitudinal center of the hammer or piston and stem C^2 and opening out immediately above the auxiliary section of said hammer. Thus, pressure admitted to the passage *f* acts not only on the upper end of the piston or hammer but, passing through the passage G acts simultaneously upon the upper surface of the auxiliary section. Hence the advance stroke is delivered with a strength equal to that which would be delivered by a piston or hammer of twice the superficial area or piston surface less the cross sectional area of the stem C^2, and that without increasing the diameter of the tool in the least. The return stroke is secured by pressure admitted through the passage *f* to the lower surface of the main section of the hammer which being of comparatively small area gives a slight stroke on the return movement, the intensity of which is further lessened by the air cushion at the upper end as described in the before mentioned patent. Obviously, the piston or hammer may be made in sections screwed together in the ordinary well known manner and the collar D may be formed integral without departing from the spirit of my invention. The forward end of the hammer is preferably shaped to give a good wearing or strengthening surface as for instance by giving the same a slightly convex shape as shown and the nose piece is formed with a straight opening directly in line with said hammer. A tool inserted through this opening will be struck by the hammer as shown for instance in Fig. 1 and the power imparted utilized in any desired manner.

In the preferred construction the shank H of the tool is formed with a peripheral groove through which a transverse pin *h* in the nose of the beater may pass to retain the tool in position while permitting it to have a limited longitudinal movement under the action of the hammer and in order to facilitate the insertion and removal of the tool a section of one side may be cut away or flattened as at H' thus allowing it to pass the pin *h* and when seated a slight turn will prevent its escape.

In some instances it may be desirable to employ a construction in which the hammer does not come directly into contact with the tool, and to accomplish this desirable end, a washer, such as I, Fig. 4, may be inserted in the nose of the tool with a longitudinally movable button *i* mounted therein and held in place by its enlarged head *i'* located beneath the washer. The stem of the button projects a very slight distance into the cylinder and is adapted to be struck by the hammer or piston and to impart its motion to the tool shank which rests against its head or outer portion. In both instances, it will be understood, that I preferably provide no air passage from the valve to the lower side of the auxiliary section C' of the hammer and in order to prevent any possible retardation of the hammer in its upward movement, the opening through which the tool and button enter is of sufficient size to permit the air to enter freely below the hammer. With this construction it will be seen, that when the valve is reciprocated pressure will be alternately admitted above and below the hammer, causing the same to reciprocate with a heavy forward stroke and light return and in order to operate the valve itself and control its movements through the movement of the hammer, passages L, L', leading respectively from the upper and lower ports of the valve box, extend down through the casing and terminate in ports *l' l'* and *l l*. These ports *l l'* are so located as that when the hammer is at its upper extreme of movement with pressure below it, one of the ports *l* will be open to the cylinder below the hammer, admitting pressure to the upper end of the valve, thereby reversing the valve and driving the hammer to the opposite extreme of its movement. When in this latter position, *i. e.*, forward, as shown in Fig. 3, one of the ports *l'* will be open to pressure in the cylinder above the hammer and the valve will be consequently driven to the opposite extreme of its movement. The ports *l l'* are so positioned that they are uncovered just as the hammer reaches its extreme of movement, hence the valve is not thrown until the effective stroke of the hammer has been given. The exhaust for the valves is preferably also controlled by the hammer and for this purpose the hammer, in the construction shown, is provided with two centrally arranged circumferential channels or grooves M, one or the other of which com-

municates with the centrally arranged exhaust port N when the hammer is at each extreme of its movement. The channel M not in communication with the exhaust port or passage N is in communication with one of either of the ports *l l'* at the moment when the port leading to the opposite end of the valve is open to pressure in the cylinder. It will be noted particularly, that the channels or grooves M extend entirely around the hammer and a spline or other device for preventing the rotation of the hammer is unnecessary for the ports and length of the hammer are so positioned and proportioned that at no time can the passages L L' be simultaneously in communication or open to the exhaust or cylinder above and below the hammer. In other words, the moment the hammer begins its movement in either direction the ports leading from the passages L L' are cut off until the hammer reaches almost the opposite extreme of its movement when one port is open to exhaust and the other port to the end of the cylinder receiving pressure.

A tool constructed in accordance with my present invention will be found to have a much more powerful stroke for a given size or diameter of hammer than those heretofore constructed, rendering the tool much more efficient and greatly extending its field of usefulness.

Besides the efficiency secured by the double or tandem arrangement of hammer the air ports and passages for controlling the valve are greatly simplified, one passage and corresponding ports, namely that leading from the constant source of pressure to the center of the hammer, being entirely dispensed with. By dispensing with this latter passage and port it is found that the hammer is more evenly balanced because during its reciprocation there is no pressure of any consequence at any point in its periphery tending to force it against the opposite side of the cylinder.

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

1. In a pneumatic tool, the combination with the casing having two cylinder chambers formed therein, the valve and air supply passages from the valve, communicating with the upper ends of both chambers, of the loose piston or hammer having separate piston heads working in said cylinder chambers whereby the superficial area of both heads is utilized in the forward stroke; substantially as described.

2. In a pneumatic tool, the combination with the shell or casing having the cylinder formed therein, and the collar formed separate from and inserted in said cylinder for dividing the same into separate cylinder chambers, of the loose hammer formed by the pistons working in said cylinders, and connected rigidly together by the reduced stem working through the collar; substantially as described.

3. In a pneumatic tool, the combination with the shell or casing having the cylinder formed therein and the removable collar dividing said cylinder into separate cylinder chambers, of the loose hammer formed by the piston working in said cylinders connected rigidly together by the reduced stem working through the removable collar; substantially as described.

4. In a pneumatic tool, the combination with the shell or casing having the cylinder opening formed therein, removable collar dividing said cylinder into separate cylinder chambers, and the removable nose section for holding said collar in place, of the piston working in said cylinder chambers and the reduced stem passing through the collar and uniting the piston to form a rigid hammer; substantially as described.

5. In a pneumatic tool, the combination with the casing having the cylinder formed therein, the forward or nose section having a cylinder formed therein and a collar separating said cylinders, of the loose hammer having piston sections working in said cylinders and air ports and passages leading to the respective cylinder chambers; substantially as described.

6. In a pneumatic tool, the combination with the casing having the separate cylinder chambers formed therein in alignment, of the hammer having piston sections working in said cylinders respectively, a valve and air passages for conveying pressure to the upper portions of both cylinder chambers and the lower portion of the upper chamber, substantially as described.

7. In a pneumatic tool, the combination with the casing having the piston chambers formed therein in alignment with each other, of the hammer having piston sections working in said chambers with a passage in said hammer leading to the lower chamber for supplying pressure thereto and a valve controlling the supply of air to said passage; substantially as described.

8. In a pneumatic tool, the combination with the casing having the cylinder chambers formed therein in alignment, the valve and air passages leading from the valve to opposite ends of the upper cylinder chamber, of the loose hammer having opposite sections working in said cylinder chambers and the center passage in said hammer leading from the valve to the lower chamber; substantially as described.

9. In a pneumatic tool, the combination with the casing having two piston chambers, a valve chamber formed in alignment therein with passages leading from the valve chamber to opposite ends of the upper cylinder chamber, of the valve and the hammer having pistons sections working in said cylinder chamber and a central passage for opening communication between the upper ends of the respective cylinder chambers; substantially as described.

10. In a pneumatic tool, the combination with the casing having the cylinder chamber

formed therein, the collar seating in said chamber and the nose section screwing on the casing for holding said collar in place and having the cylinder chamber and tool opening formed therein, of the hammer having the piston sections working in the respective cylinder chambers, a valve and air passages leading from said valve to the upper ends of both cylinder chambers and the lower end of the upper cylinder chamber; substantially as described.

11. In a pneumatic tool, the combination with the casing and hammer, substantially as described, of the nose section having the tool opening therein, the pin or projection in said opening and the tool shank having the peripheral groove co-operating with said pin or projection; substantially as described.

12. In a pneumatic tool, the combination with the casing having the nose section with the tool opening formed therein and the pin or projection projecting into said opening, of the tool shank having the peripheral groove co-operating with said pin or projection, one side of the tool shank above said groove being cut away to permit the tool to enter past the projection; substantially as described.

13. In a pneumatic tool, the combination with the casing having the cylinder and pressure actuated valve, of the hammer having a circumferential chamber extending entirely around the same, passages leading from opposite ends of the valve to points at the upper and lower ends of the cylinder and terminating in points *t*, *t* and *t' t'*, and an exhaust opening for communicating with the central circumferential chamber of the hammer, said hammer and the ports leading to said passages being so proportioned and positioned with relation to each other that when the hammer is at the upper extreme of its movement, pressure will be admitted from the opposite end of the cylinder to one end of the valve and the opposite end of the valve will be open to exhaust through the circumferential chamber in the hammer and vice versa; substantially as described.

14. In a pneumatic tool, the combination with the casing having the cylinder therein and the pressure actuated valve, with passages leading from opposite ends of the valve to opposite ends of the cylinder respectively with ports *l l* and *l' l'* leading from said passages into the cylinder, of the hammer working in the cylinder and having the central circumferential chamber M extending entirely around the same and the exhaust passage N adapted to communicate with the said circumferential chamber; substantially as described.

15. In a pneumatic tool, the combination with the casing and hammer working therein and the point section having the central opening for the reception of a tool shank, of a loose button mounted in the upper end of said opening and adapted to be struck by the hammer and impart its movement to the tool shank; substantially as described.

16. In a pneumatic tool, the combination with the casing, hammer mounted therein and nose section having the central opening for the reception of a tool shank, the washer held by said nose section and the headed button loosely mounted in the washer in line with the tool opening and adapted to be struck by the hammer, substantially as described, whereby the impact of the hammer is imparted to the button and through it to the tool shank; substantially as described.

DANIEL DRAWBAUGH.

Witnesses:
ERNEST MARX,
J. WILKINS ARMSTRONG.

Correction in Letters Patent No. 504,802.

It is hereby certified that in Letters Patent No. 504,802, granted September 12, 1893, upon the application of Daniel Drawbaugh, of Eberly's Mill, Pennsylvania, for an improvement in "Pneumatic Tools," an error appears in the printed specification requiring the following correction, viz.: In line 35, page 4, the words and reference letters "points *t t* and *t′t′*" should read *ports l l and l′l′;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed, countersigned, and sealed this 3d day of October, A. D. 1893.

[SEAL.]

WM. H. SIMS,
First Assistant Secretary of the Interior.

Countersigned:

S. T. FISHER,
Acting Commissioner of Patents.