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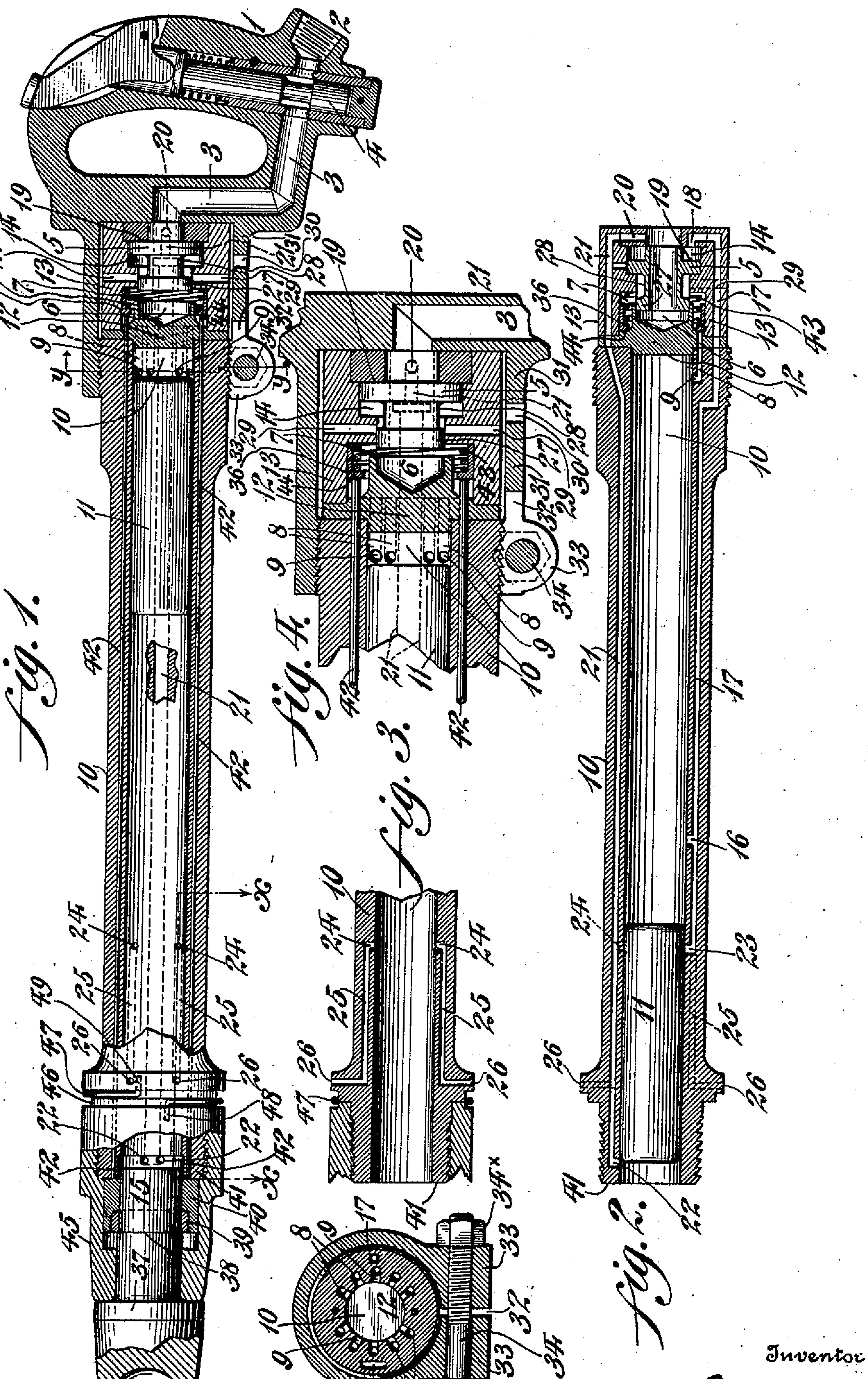
J. KELLER.

PNEUMATIC RIVETER.

(Application filed Mar. 22, 1902.)

(No Model.)



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PNEUMATIC RIVETER.

SPECIFICATION forming part of Letters Patent No. 710,197, dated September 30, 1902.

Application filed March 22, 1902. Serial No. 99,490. (No model.)

To all whom it may concern:

Be it known that I, JULIUS KELLER, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Pneumatic Riveters, of which the following is a specification.

My invention relates to pneumatic tools which are especially adapted for the purpose of riveting and the like, wherein the tool-cylinder is made of the so-called "long-stroke" type; and it consists of the following novel improvements: first, an improved manner of assembling the cylinder and handle, whereby the parts are normally prevented from disengagement and at the same time are capable of being readily disconnected, whereby the distribution-valve, stop-valve, and their adjuncts are easily accessible for the purposes of inspection or repairs; second, the provision of novel means for the prevention of the nosepiece from disengaging from the tool-cylinder during the action of the tool; third, in the provision of a novel construction of a stop-valve and means for operating same, whereby the reciprocating piston is rendered inoperative when the tool is removed from the work; fourth, in the novel arrangement of the distribution-valve, stop-valve, and ports coacting therewith, in conjunction with a series of novel exhaust-ports arranged at the forward extremity of the tool-cylinder, whereby very short exhaust-passages are provided.

It further consists of the novel details of construction, all as will be hereinafter fully set forth, and particularly pointed out in the claims.

Referring to the drawings, Figure 1 represents a longitudinal sectional view of a pneumatic riveter or other tool embodying my invention, certain of the parts being shown in elevation. Fig. 2 represents a longitudinal sectional view of Fig. 1, showing certain of the ports and passages which have been omitted from said Fig. 1 for the sake of clearness of illustration. Fig. 3 represents a sectional view on line $x\,x$ of Fig. 1, showing the location of the forward exhaust-ports of the tool-cylinder. Fig. 4 represents a longitudinal sectional view of certain of the parts seen in Fig. 1, on an enlarged scale. Fig. 5 represents a transverse vertical section on line $y\,y$ in Fig. 1.

Similar figures of reference indicate corresponding parts in the views.

The motive fluid enters the handle 1 at the inlet 2 and passes into the passage 3 when the manually-operated valve 4 is depressed into the position seen in Fig. 1, to which especial reference may now be had. The distribution-valve 5, which is preferably a differential hollow valve of the same general character as described in prior Letters Patent granted to me, is shown in Figs. 1 and 4 as being in its extreme right-hand position, the air going through the valve into the air-chamber 6, opening 7, passages 8, and entering the cylinder 10 through the ports 9, it being noted that said ports 9 are located a short distance away from the end of said cylinder in order that an air-cushion shall exist when the piston 11 in its rearward stroke closes these ports, whereby it is prevented from striking the plate 12, which, with the case, 13 constitutes the valve-box 14. The parts being in the position seen in Fig. 1, the motive fluid will force the piston 11 to the left, or into the position seen in Fig. 2; but before said piston strikes the shank 15 of the button-set 37 in its forward movement it opens the port 16, (best seen in Fig. 2,) and live air passes through said port 16 and passage 17 and enters the valve box or chamber at the port 18 and acts on the large pressure area 19 of the distribution-valve 5, whereby the latter will be forced forwardly, or into the position seen in Fig. 2, at which period the port 20 is opened to live air, which enters therein and passes through the passage 21 and port or ports 22 into the forward end of the cylinder, whereby the piston 11 is driven to the right or backwardly from the position seen in Fig. 2 to the position seen in Fig. 1. When the piston 11 in its backward stroke uncovers the port 23 in the passage 17, it at the same time uncovers the exhaust-ports 24, so that the air which acted on the large pressure area 19 of the valve 5 is released and exhausts through port 18, passage 17, port 23, port or ports 24, passages 25, and ports 26 into

the free air. The valve 5 now by reason of the constant pressure upon its smaller differential-pressure area 27 moves to the right, or from the position seen in Fig. 2 to the position seen in Fig. 1, so that the piston 11 can again be driven forward and the above-described cycle of operations repeated, it being understood that when the piston moves from the position seen in Fig. 2 to the position seen in Fig. 1 the exhaust takes place through the ports 9, passage 8, opening 7, past the groove 28 in the valve 5, and to the atmosphere through the ports 29 in the case 13 and the port 30 in the extension or sleeve portion 31 of the handle 1, it being apparent that the valve 5 is substantially in the position seen in Fig. 2 and the stop-valve 36, hereinafter referred to, is in the position seen in Figs. 1 and 4, while the last-mentioned exhausting operations take place. The extension 31 is in threaded engagement with the cylinder 10, and to prevent the parts from unscrewing I saw said extension or provide the recess 32 therein, and in the lugs 33 locate the thread stem or bolt 34, the threaded portion of said bolt being in engagement with the threaded portion of one of said lugs, and it will be apparent that by tightening the latter a very secure clamping device or union is formed between the parts, which I have found to be much superior to the nut-locking and ratchet devices now generally employed, and the parts 12 13 36 and the valve 5 are readily accessible. The bolt 34 is provided with a jam-nut $34^{\times}$.

36 designates an automatic stop-valve whose function is to cut off the air from the passages 8 when desired, whereby the tool is rendered inoperative except when pressed to its work, this being a necessary safety appliance to prevent accidents which might occur if the throttle-valve 4 was opened without the tool being against the work, in which case the piston would be thrown out of its cylinder. The construction of the stop-valve will be readily understood from Figs. 1 and 4, and its operation is as follows: The shank 15 of the button-set 37 has a reduced portion, whereby the shoulder 38 is formed, on which rests the button-set clamp 39, which is preferably a split ring. When the tool is held against its work, the button-set and its adjuncts are in the position seen in Fig. 1 and the stop-valve ring 40 rests on the clamp 39 and is pushed against the contiguous end 41 of the cylinder 10, the stop-valve rods 42 and the stop-valve 36 assume the position seen in Figs. 1 and 4, and all the passages 8 and ports 9 are opened to let live air passing through the valve 5 into the cylinder to drive the piston 11 forward. The moment the tool is released from its work the stop-valve spring 43 will force the stop-valve 36 forward upon its seat and all the passages 8 and ports 9 will be closed by the flange 44 of the stop-valve and no air can enter or exhaust behind the piston 11, and therefore the latter will stay in whatever position it may be when the tool is released from its work.

In order to prevent the nosepiece 45 from unscrewing from the cylinder 10, I construct the juxtaposed portions of said nosepiece and cylinder so that an annular channel or groove 45 is formed, in which I locate the band or spring 47, having the deflected terminals 48 and 49, which engage contiguous seats or openings in said nosepiece and cylinder, said openings being preferably in the walls of said channel 46, as will be evident from Fig. 1, although I do not of course desire to be limited thereto in every instance, as other equivalent constructions may be employed.

In my present invention, as in my others wherein the same general character of valve mechanism is employed, before the reciprocating piston strikes the shank of the working tool the valve will move in the same direction as the piston, and when the blow is delivered it serves to hold said valve more firmly seated instead of rebounding the valve from its seat, whereby all the ports are positively opened at the right time. The movement of the hammer is regular and unobstructed under all conditions, and the jumping or jarring which has heretofore been an objectionable feature in pneumatic tools of this character is practically overcome.

So far as I am aware I am the first to employ, broadly, a stop-valve 36 or its equivalent located in a valve-box or exteriorly to the cylinder which is normally seated by a spring or equivalent means and unseated by the act of pressing the tool to its work, and my claims to these features are therefore to be interpreted with corresponding scope. In contemporaneously-pending applications bearing the serial numbers 39,570 and 75,764 filed by me I have shown, described, and claimed a stop-valve seated normally by air-pressure and unseated by the act of pressing the tool to its work, while in my present invention the stop-valve is normally seated by the pressure of a coiled spring or its equivalent, and to none of the devices claimed in my pending applications aforesaid do I herein make my claim.

In the contemporaneously-pending application filed by me aforesaid and bearing the serial number 75,764 I have shown, described, and claimed a spring-clamp adapted to hug the shank of the working tool in combination with a stop-valve held normally seated by air-pressure; but to none of these constructions do I herein make my claim, since the stop-valve in the present instance is defined as being normally seated by spring-pressure.

It will be apparent that for the sake of clearness of illustration I have omitted from some of the views ports and passages which are, however, clearly seen in the other views and that while the constructions shown are what I have found in practice to be preferred forms I do not desire to be limited thereto in every instance, but reserve to myself the right to

make all such changes as may fall within the scope of my invention.

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

1. In a pneumatic riveter, a cylinder, a handle, an extension or sleeve on said handle in threaded engagement with said cylinder, a valve-box within said extension, a distribution-valve and a stop-valve contained within said valve-box, lugs projecting from said extension, a slot between said lugs, and a threaded bolt passing freely through one of said lugs and being in threaded engagement with the other of said lugs, said bolt having a jam-nut therefor.

2. In a pneumatic riveter, a cylinder, a handle, an extension or sleeve on said handle in threaded engagement with said cylinder, lugs projecting from said extension, a slot between said lugs, and a threaded bolt passing freely through one of said lugs and being in threaded engagement with the other of said lugs, said bolt having a jam-nut therefor, in combination with a valve-box containing a distribution and a stop valve located within said extension, a plate intermediate said valve-box and cylinder, said plate, valve-box and extension being held in position by the tightening of said bolt.

3. In a pneumatic riveter, the combination of a cylinder, a handle, an extension or sleeve on said handle, said extension being in engagement with said cylinder, a valve-box containing a distribution-valve and a stop-valve located in said extension, lugs projecting from said extension and a threaded bolt engaging said lugs and having a nut thereon.

4. In a pneumatic riveter, the combination of a cylinder, a handle, an extension or sleeve on said handle, said extension being in threaded engagement with said cylinder, a valve-box containing a distribution-valve and a stop-valve located in said extension, lugs projecting from said extension and a threaded bolt engaging said lugs and having a nut thereon.

5. In a pneumatic riveter, the combination of a cylinder, a nosepiece in engagement therewith, and a band or lock-spring located in juxtaposition to said nosepiece and cylinder, said spring having deflected terminals and recesses in said cylinder and nosepiece respectively adapted to be engaged by said terminals.

6. In a pneumatic riveter, the combination of a cylinder, a nosepiece in threaded engagement therewith, and a band or spring located in juxtaposition to said nosepiece and cylinder and surrounding the same, said spring having deflected terminals and recesses in said cylinder and nosepiece respectively adapted to be engaged by said terminals.

7. In a pneumatic riveter the combination of a cylinder, a nosepiece in threaded engagement therewith, a groove located in the juxtaposed walls of said cylinder and nosepiece, a band or spring located in said groove and having deflected terminals, and recesses in said cylinder and nosepiece respectively, said terminals being adapted to engage said recesses.

8. In a pneumatic riveter, the combination of a cylinder, a nosepiece therefor, an annular groove common to said cylinder and nosepiece, a spring located in said groove and means whereby the ends of said spring, engage said cylinder and nosepiece respectively.

9. In a pneumatic riveter, the combination of a cylinder, a valve-box, means for holding said cylinder and valve-box in assembled position, a distribution-valve in said valve-box, a stop-valve in said valve-box, ports intermediate said valves and cylinder, means for normally holding said stop-valve in closed or seated position, and means for unseating said stop-valve when the tool is pressed against the work.

10. In a pneumatic riveter, a cylinder, a distributing-valve, a stop-valve located exteriorly of said cylinder and in proximity to said distributing-valve, which latter is adapted to be operated when the said stop-valve is unseated, means for normally holding said stop-valve in closed or seated position, and means for unseating said stop-valve when the tool is brought in contact with the work.

11. In a pneumatic riveter, a cylinder, a stop-valve for controlling the admission of the motive fluid behind the piston, a distribution-valve adapted to be operated when said stop-valve is unseated, a spring normally pressing said stop-valve forwardly and holding it in closed or seated position, a stop-valve ring, a clamp adapted to engage the shank of the working tool, and to be in contact with said stop-valve ring, when the working tool is pressed to the work, and devices intermediate said stop-valve ring and stop-valve whereby the latter is actuated by the act of pressing the tool to its work.

12. In a pneumatic riveter, the combination of a cylinder, a valve-box therefor, a cylindrical stop-valve within said valve-box, a spring normally pressing said valve forward whereby the same is normally seated, a clamp adapted to engage the shank of a working tool, said shank having a shoulder thereon in contact with said clamp, a stop-valve ring adapted to contact with said clamp, and devices intermediate said stop-valve ring and stop-valve for actuating the latter against the pressure of said spring.

13. In a pneumatic riveter, a cylinder, a valve-box separable therefrom, a cylindrical stop-valve for controlling the admission of motive fluid to the rear end of said cylinder, a spring normally pressing said stop-valve forward, a working tool carried by the front end of the cylinder, a shoulder on the shank of said working tool, a clamp engaging said shoulder, a stop-valve ring, and rods extending longitudinally through the cylinder be-

tween said stop-valve ring and stop-valve, whereby the latter is actuated by the act of pressing the tool to the work.

14. In a pneumatic riveter, the combination of a manually-operated throttle-valve, controlling the initial admission of the motive fluid to the tool, a stop-valve for controlling the admission of the motive fluid to the rear end of the cylinder, a spring normally pressing said stop-valve forward, a working tool carried by the front end of the cylinder, a clamp engaging the shank of said working tool, a stop-valve ring adapted to contact with said clamp and rods extending longitudinally through the cylinder between said stop-valve ring and stop-valve, whereby the latter is actuated by the act of pressing the tool to the work.

15. In a pneumatic riveter, the combination of a manually-operated throttle-valve controlling the initial admission of motive fluid to the tool, a cylinder, a piston therein, a distribution-valve, a valve-box intermediate said throttle-valve and cylinder, a stop-valve located in said valve-box, a spring normally pressing said stop-valve to its seat, a working tool carried by the front end of the cylinder, a clamp engaging the shank of said working tool, a stop-valve ring adapted to contact with said clamp, and rods extending longitudinally through the cylinder between said stop-valve ring and stop-valve whereby the latter is actuated by the act of pressing the tool to the work.

16. In a pneumatic riveter, the combination of a cylinder, a manually-operated throttle-valve controlling the initial admission of motive fluid to said cylinder, a stop-valve intermediate said first-mentioned valve and the working parts of the tool, a spring normally holding said stop-valve closed and cutting off the motive fluid from said cylinder, a working tool having its shank engaged by a clamp, a stop-valve ring adapted to contact with said clamp, and rods extending longitudinally of said cylinder between said stop-valve ring and stop-valve, whereby the latter is opened by the act of pressing the tool to its work.

17. In a pneumatic riveter having a grasping-handle secured to its rear end, the combination of a manually-operated throttle-valve located in said handle for controlling the initial admission of motive fluid to the tool, a stop-valve located intermediate of said first-mentioned valve and the working parts of the tool and within said handle, a spring normally holding said stop-valve closed and cutting off the motive fluid behind the piston, a clamp engaging a shank of the working tool, a stop-valve ring, and rods intermediate said stop-valve ring and stop-valve whereby the latter is opened by the act of pressing the tool to its work.

18. In a pneumatic riveter, the combination of a cylinder, a piston therein, a distribution-valve, ports intermediate of said piston and valve, a nosepiece in threaded engagement with said cylinder, a spring having its ends interlocked with said nosepiece and cylinder, a clamp contained within said nosepiece and adapted to engage the shank of the working tool, a stop-valve ring adapted to contact with said clamp, a stop-valve and rods intermediate said stop-valve ring and said stop-valve.

19. In a pneumatic riveter, a cylinder, a piston therein, a distribution-valve therefor, ports serving as inlet and exhaust ports, controlled by said distribution-valve and leading to the rear end of said cylinder, a stop-valve controlling said ports only, a spring for normally holding said stop-valve to its seat, and means for unseating said stop-valve when the working tool is pressed to its work.

20. In a pneumatic riveter, a cylinder, a piston therein, a distribution-valve controlling the inlet of the motive fluid to both ends of said cylinder, a stop-valve, a spring for keeping said stop-valve normally against its seat, and means for unseating said stop-valve when the working tool is pressed to its work.

21. In a pneumatic riveter, a cylinder, a piston therein, a differential valve therefor, said valve controlling the inlet to both ends of said cylinder, a stop-valve controlling said inlet and exhaust ports for one end of said cylinder only, and means for unseating said stop-valve and effecting the reciprocation of said piston when the working tool is pressed to its work.

22. In a pneumatic riveter, a cylinder, a piston therein, a hollow differential distribution-valve for said cylinder, said valve being located exteriorly to said piston, in alinement therewith, and adapted to move in the same direction as the latter, inlet-ports controlled by said valve and leading to both ends of the cylinder, and exhaust-ports located at the forward end of said cylinder and uncontrolled by said distribution-valve.

23. In a pneumatic riveter, a cylinder, a piston therein, a hollow differential distribution-valve for said cylinder, said valve being located exteriorly to said piston, in alinement therewith, and adapted to move in the same direction as the latter, inlet-ports controlled by said valve and leading to both ends of the cylinder, and exhaust-ports located at the forward end of said cylinder and uncontrolled by said distribution-valve, in combination with a stop-valve adapted to control the inlet-ports at the rear end of said cylinder.

24. In a pneumatic riveter, a cylinder, a piston therein, a distribution-valve having differential pressure areas, said valve having an opening therethrough and being constantly subjected to live-air pressure, a series of ports controlled by the forward end of said valve leading to the rear end of said cylinder, said ports serving as both inlet and exhaust ports and the exhaust from the rear end of said cylinder being controlled by said valve, a series of inlet-ports controlled by said valve and leading to the forward end of said cylinder, a port controlled by said piston for

intermittently admitting live-air pressure to the large area of said distribution-valve, exhaust-ports in the front end of said cylinder always open to the atmosphere and means for permitting the exhaust from the large pressure area of said valve.

25. In a pneumatic riveter, a cylinder, a piston therein, a hollow differential distribution-valve, a series of ports leading into said cylinder at the rear end thereof, said ports serving respectively for the inlet and exhaust of the motive fluid, a series of inlet-ports leading to the forward end of said cylinder, and controlled by said valve, a series of exhaust-ports located at the forward end of said cylinder leading to the atmosphere and uncontrolled by said distribution-valve, a passage controlled by the piston for intermittently admitting live-air pressure to the larger differential area of said valve, and a passage also controlled by said piston for permitting the exhaust from the larger area of said valve to the atmosphere.

26. In a pneumatic riveter, a cylinder, a piston therein, a hollow differential distribution-valve, ports leading to the rear end of said cylinder and controlled by the forward end of said distribution-valve, said ports serving for the inlet and exhaust of the motive fluid to said rear end of said cylinder and said valve controlling said exhaust from said rear end, inlet-ports controlled by the rear end of said valve and leading to the forward end of said cylinder, and exhaust-ports controlled by the piston for permitting the exhaust from the larger area of said valve to escape through the forward extremity of said cylinder.

27. In a pneumatic riveter, a cylinder, a piston therein, a distribution-valve, a valve-box therefor, a stop-valve in said valve-box, ports intermediate said valves and cylinder, a spring for holding said stop-valve against its seat, and means for unseating said stop-valve when the tool is pressed against its work.

28. In a pneumatic riveter, a cylinder, a piston therein, a distribution-valve, a valve-box therefor, a stop-valve in said valve-box, ports intermediate said valves and cylinder, a spring for holding said stop-valve against its seat, and means for unseating said stop-valve when the tool is pressed against its work, in combination with a grasping-handle, having an air-supply duct therethrough leading to said valve-box and a manually-operated throttle-valve in said handle for controlling said duct.

29. In a pneumatic riveter, a cylinder, a piston therein, a distribution-valve, a valve-box therefor, a stop-valve in said valve-box, ports intermediate said valves and cylinder, a spring for holding said stop-valve against its seat, and means for unseating said stop-valve when the tool is pressed against its work, in combination with a grasping-handle, having an air-supply duct therethrough leading to said valve-box, a manually-operated valve in said handle for controlling said duct, and an extension on said handle in engagement with said cylinder for inclosing said valve-box.

30. The combination in a pneumatic riveter, of a cylinder, a valve-box, a grasping-handle having an extension engaging said cylinder and inclosing said valve-box, a distribution-valve in said valve-box, a stop-valve in said valve-box, a spring for normally seating said stop-valve and means for unseating said stop-valve when the riveter is pressed to the work.

31. The combination in a pneumatic riveter of a cylinder, a valve-box, a grasping-handle having an extension engaging said cylinder and inclosing said valve-box, a distribution-valve, a stop-valve in said valve-box, a spring for normally seating said stop-valve, and means for unseating said stop when the riveter is pressed to its work.

32. In a pneumatic riveter, a cylinder, a piston therein, a valve-box, a distribution-valve, a stop-valve in said valve-box, a spring for holding said stop-valve in seated position, and means for unseating said stop-valve, operated by the act of pressing the tool to its work.

33. In a pneumatic riveter, a cylinder, a piston therein, a valve-box, a distribution-valve, a stop-valve located wholly exterior to said cylinder, a spring for holding said stop-valve in seated position, and means for unseating said stop-valve, operated by the act of pressing the tool to its work.

34. In a pneumatic riveter, a cylinder, a piston therein, a distribution-valve located wholly exterior to said cylinder, a stop-valve also located wholly exterior to said cylinder, a spring for holding said stop-valve in seated position, and means for unseating said stop-valve operated by the act of pressing the tool to its work.

35. In a pneumatic riveter, a cylinder, a piston therein, a distribution-valve located wholly exterior to said cylinder, a stop-valve also located wholly exterior to said cylinder, a spring for holding said stop-valve in seated position, and means for unseating said stop-valve operated by the act of pressing the tool to its work, in combination with a grasping-handle having a manually-operated throttle-valve therein, said handle having an extension inclosing said valves and in engagement with said cylinder.

36. In a pneumatic riveter, a cylinder, a piston therein, a stop-valve located exteriorly to said cylinder, a spring for keeping said stop-valve normally seated, means for unseating said stop-valve by the act of pressing the tool to the work, and devices coacting with said stop-valve for effecting the reciprocation of said piston after said stop-valve is unseated.

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