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PNEUMATIC RIVET HOLDER.

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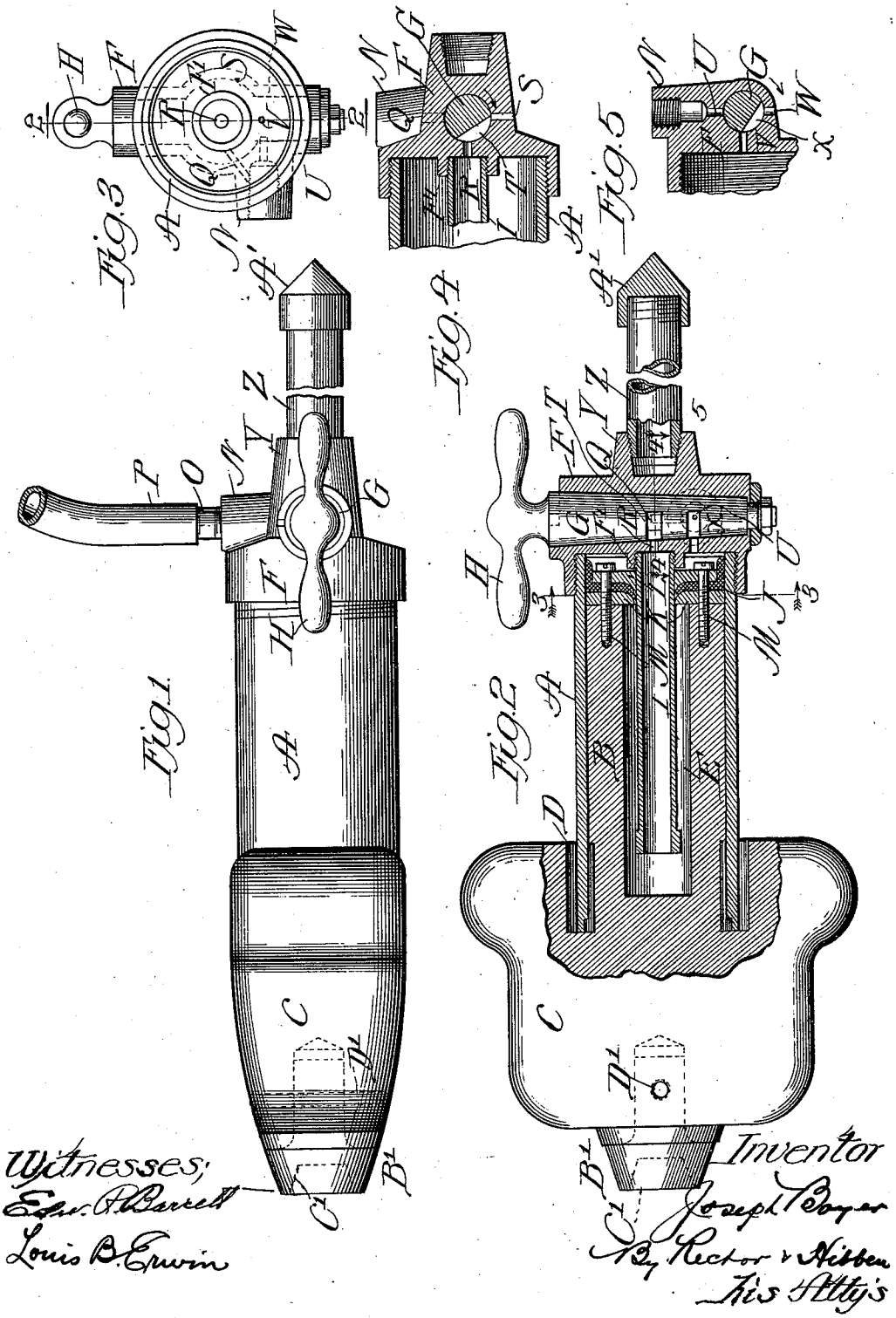

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PNEUMATIC RIVET-HOLDER.

1,013,371. Specification of Letters Patent. Patented Jan. 2, 1912.

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To all whom it may concern:

Be it known that I, JOSEPH BOYER, a citizen of the United States, formerly residing at the city of St. Louis, in the State of Missouri, but now residing at the city of Detroit, in the State of Michigan, have invented a certain new and useful Improvement in Pneumatic Rivet-Holders, of which the following is a description, reference being had to the accompanying drawing, forming part of this specification.

My invention relates to that class of devices known as rivet-holders or "holders-on", which are used for holding rivets in position while being hammered down and headed, the device being applied to the head of the rivet after the latter has been passed through the holes in the plates which are to be riveted together, and serving to hold the head of the rivet up against one side of the plates while the blows of the hammer are delivered to the other end of the rivet to batter it down and form a head on the opposite side of the plates.

The object of my invention is to provide a simple and efficient device of this character in which pneumatic pressure is employed to hold the rivet in position during the riveting operation, and which can be readily moved from one position to another and quickly applied to a series of rivets in succession. Its novelty will be hereinafter more fully set forth and particularly pointed out in the claim.

I do not herein claim broadly the fluid pressure actuated mechanism herein shown and described which may be employed for compression or holding devices for other purposes but have made the same, broadly considered, the subject matter of my original application filed by me on January 4, 1897, Serial No. 617,980, of which the present application is divisional.

In the accompanying drawing Figure 1 represents a top plan view of my new rivet-holder; Fig. 2 a side elevation, partly in middle vertical section on line 2—2 of Fig. 3; Fig. 3 a side elevation of the left or forward side of the valve casing, being a view on the line 3—3 of Fig. 2, with the cylinder and its contents removed instead of shown in section; and Figs. 4 and 5 horizontal sectional views on the lines 4—4 and 5—5 of Fig. 2.

The same letters of reference represent corresponding parts in the several views.

The structure of my new rivet-holder consists, as a whole, of a cylinder containing a piston carrying an enlarged and weighted head exterior to the cylinder at one end, a valve at the opposite end of the cylinder for controlling the admission and exhaust of the motive fluid to and from the cylinder, and preferably also, an extension upon the opposite side of the valve from the cylinder and in line with the latter, which carries a centering or bearing point adapted to be placed in contact with a suitable abutment or support to sustain the end thrust as the motive fluid forces the piston in the opposite direction.

The cylinder A constitutes the middle portion of the structure and contains the piston B which in the present instance is of approximately the full length of the cylinder, and which carries at its forward end, outside the cylinder, a large weighted head or block C, in the present instance formed integral with the piston, said head being provided upon its rear face with a deep circular groove or recess D adapted to pass over the forward end of the cylinder A when the piston is moved rearward to its limit of movement as in Fig. 2. The piston B is provided with a central bore E closed at its forward end but opening through the piston at its rear end, for a purpose hereafter explained.

Screwed upon the rear end of the cylinder A is the valve casing F containing the plug valve G having a handle H by which it may be turned. Screwed into an internally threaded boss F′ formed upon the forward or left hand side of the valve casing F at its center is the rear end of an open-ended tube I which extends forward to a point adjacent the front end of the bore E in the piston when the latter is in rearward position. Surrounding this tube I and snugly fitting between it and the cylinder A is a double-cup leather packing J confined between washers K and L and secured to the rear end of the piston B by screws M M. This packing J serves to pack both the exterior of the tube I and the interior of the cylinder A.

The valve casing F has formed upon one side near its lower end an internally threaded boss N into which is screwed a nipple O, Fig. 1, over which may be slipped the end

of a flexible tube P leading to the air reservoir or other motive fluid supply. This inlet communicates by an upwardly and inwardly extending port Q with the valve chamber in the casing F, and opening into said chamber in the same horizontal plane as the upper end of the port Q is a port R extending through the forward wall of the casing and communicating with the interior of the tube I, while also opening through the wall of the valve chamber to the exterior atmosphere, in the same plane as the ports Q and R, is an exhaust port S, Figs. 3 and 4. The valve G is provided, in the horizontal plane of these three ports, with a segmental cut or recess T, Figs. 2 and 4. When the valve is in the position shown in the drawings, which is its normal or closed position, this recess or passage T places the port R in communication with the exhaust port S, and consequently opens the interior of the tube I and bore E of the piston to the exhaust. When the valve is turned from normal position in the direction of the arrow in Fig. 4 the exhaust port S will be closed and the inlet port Q be placed in communication with the port R, to admit the motive fluid to the tube I and bore E in the piston, with the result hereafter explained.

In addition to the inlet port Q above described there is provided a second inlet port U, Figs. 2, 3 and 5, opening into the valve chamber at a point some distance below the ports R and S and upper end of the port Q. Opening through the front wall of the valve chamber in the same horizontal plane as this second inlet port U is a port V, Figs. 2, 3 and 5, which communicates with the rear end of the piston chamber or interior of the cylinder A outside the central tube I. There is also provided a second exhaust port W opening through the wall of the valve chamber in the same plane as the ports U and V, as seen in Figs. 3 and 5, and the valve G is provided, in the same horizontal plane as these three last mentioned ports, with a second segmental cut or recess X. When the valve is in its normal position this recess or passage X places the port V in communication with the exhaust port W, as seen in Fig. 5, so that the rear end of the piston chamber is open to the exhaust. When the valve is turned from normal position in the direction of the arrow port W will be first closed and the rear end of the piston chamber thereby cut off from the exhaust, and when the valve has been turned far enough the port V will be placed in communication with the inlet port U, and the motive fluid be thereby admitted to the rear end of the piston chamber outside the central tube I, for a purpose and with the result hereafter explained.

The valve casing is provided upon its rear side with an internally threaded boss Y into which is screwed a rod or pipe Z which carries upon its rear end a head A′ provided with a centering or bearing point. This rod or pipe Z is employed simply to bridge the space between the rivet-holder proper, as above described, and the support or abutment which is employed to take the end thrust of the device, and will be of suitable length for the purpose, a number of such rods of varying lengths being provided with each holder if desired.

At the extreme opposite end of the structure the head C is provided with a suitable recess or bore to receive the stem of the removable "set" B′ which is provided in its forward face with a recess C′ of suitable shape to fit the head of the rivet which is to be held in position for the riveting operation. This set B′ is temporarily held in place in the head C by a pin D′ passed through a transverse hole in its stem and coincident holes in the head C, as shown in Fig. 1.

From the foregoing description of the mechanical construction of my new rivet-holder its operation may be described as follows: When it is brought to position to cooperate with the first rivet of the series, that is, brought substantially into line between said rivet and the abutment or support against which the rear end of the holder is to rest, the valve is first turned just sufficiently to close the exhaust ports S and W and bring the inlet port Q into communication with the port R opening into the rear end of the tube I, Fig. 4, but not sufficiently to place the second inlet port U in communication with the port V, Fig. 5. Under the proportions shown in the drawings an eighth of a turn of the valve will be proper for this purpose. The result of thus admitting the motive fluid to the tube I and internal bore E of the piston, without admitting it to the rear end of the piston chamber proper, outside the tube I, is that the motive fluid has but a comparatively small area of the piston to exert its pressure upon an area equaling in size the external diameter of the tube I. This will serve to drive the piston forward with a slight and yielding pressure, which will permit the set B′ to be readily fitted over the rivet head, and the structure adjusted as a whole to exactly the desired position before full pressure is turned on preparatory to the riveting operation. The pressure thus exerted upon the piston will not be so great but that it may be easily overcome by hand and the piston pressed rearward in the cylinder, to permit disengagement of the set B′ from the head of the rivet, or any desired adjustment of the device. After the latter has been adjusted to the desired position the valve will be turned onward to its limit of movement, say a quarter turn, and the inlet port U be thereby placed in communication with the port V opening into the rear end of the piston

chamber outside the tube I. The motive fluid thus admitted to the rear end of the piston chamber will exert its pressure upon the full area of the annular end of the piston B, and the latter will be pressed forward by the motive fluid acting upon its full area, partly within its bore E and partly against its annular end, and the piston will thus be pressed forward with maximum force to hold the head C against the rivet head while the opposite end of the rivet is battered down and headed. Upon turning the valve G back to normal position the rear end of the piston chamber and the internal bore of the piston will be placed in communication with their respective exhaust ports, to permit the escape of the motive fluid and relieve the piston of the pressure which has moved it forward, thereby allowing the piston and its enlarged head to be pressed rearward and disengaged from the head of the finished rivet, and moved into position to cooperate with the next rivet; and this may be the operation of the device if desired. It is preferable, however, to retain the pressure within the central bore of the piston while the device is being moved from one rivet to the next, this pressure, as before explained, being sufficiently yielding to permit the piston to be pressed rearward by hand and disengaged from one rivet head and readily applied to the next one when the device is moved into line with the latter. By retaining this yielding pressure upon the piston the adjustment of the device to successive rivets is materially facilitated, and to this end the recess X in the valve G, Fig. 5, is of such size and so located with respect to the ports V and W that said ports will be placed in communication with each other, at the backward or return movement of the valve, before the valve has reached normal position, and consequently before the ports Q and R, Fig. 4, have been cut off from each other and the ports R and S placed in communication with each other; with the result that when the valve is turned backward from its full forward position the exhaust from the rear end of the piston chamber behind the annular rear end of the piston will be opened before the inlet of the motive fluid to the central bore of the piston is cut off and the exhaust therefrom opened. In the present instance the inlet to the rear end of the piston chamber behind the piston is cut off as soon as the valve is started backward from its forward position (at a quarter turn) and when it is turned backward approximately half way to normal position the exhaust is opened and the motive fluid from the rear end of the piston chamber behind the piston permitted to escape, while the inlet to the central bore of the piston remains open and the exhaust therefrom closed. The valve may be provided with a suitable index to readily indicate to the operator this halfway position, and when operation upon one rivet is finished the valve will be turned to this position and left there while the device is adjusted to the next rivet, and be then turned forward again to its limit of movement, to admit full pressure to the piston, as before explained. This feature of my device, consisting in providing the piston with a plurality of rearwardly facing pressure areas to which the motive fluid may be admitted in succession by a suitable valve, and in which the pressure against one of the piston areas may be relieved at will without relieving that against its other area, is a highly advantageous and useful feature of my new device, and it will be understood that the same principle may be carried further and the piston be provided with more than two pressure areas if desired, and the admission and exhaust of the motive fluid thereto and therefrom be controlled by a suitable valve for the purpose and in the manner required.

The head C carried by the piston is made of the large size shown in order to give it great weight, since its inertia is an important factor in holding the rivet in position against the blows of the hammer upon its opposite end. In a full-sized device for practical use upon rivets of from one-half inch to three-quarter inch in diameter this head should weigh from twenty to thirty pounds to obtain the most satisfactory results and relieve the device from the shocks of the hammer blows to as great an extent as may be conveniently done.

I am aware that it has heretofore been proposed to employ pneumatic rivet-holders of the same general nature as mine, to-wit, consisting of a cylinder and piston, a valve controlling the admission and exhaust of motive fluid behind the piston, and a variable or adjusting extension at the rear of the device adapted to be placed in contact with a suitable abutment to take the end thrust of the device when the motive fluid forces the piston forward to hold the rivet in position; but in the only form of such device with which I am familiar the motive fluid is necessarily admitted to the entire pressure area of the piston at once, with the result that it is unwieldy and awkward to handle, the piston being driven forward with great speed and force, so that the forward end of the piston or the set carried thereby often violently strikes the head of the rivet or the face of the plate adjacent thereto, producing shock and liability of damage; and, further than this, if, when the piston is so driven forward by the admission of the motive fluid its front end, or the device carried thereby to fit over the head of the rivet, does not strike the latter with exact accuracy, so as to properly fit against and hold it, the piston cannot

be pressed rearward by hand to effect the proper adjustment, so that it is necessary to turn the valve to exhaust position and release the motive fluid from the cylinder, and then again try to properly adjust the device and turn on a new supply of motive fluid, and possibly only secure proper adjustment after repeated trials, while in the meantime the rivet has become cold. My new rivet-holder embodies a very important advantage over such prior ones in this respect, since, as before explained, the motive fluid may be admitted at first to a comparatively small area of the piston, so that the latter will be pressed forward by a slight and yielding pressure, as though by means of a spring, permitting it to be properly adjusted to the rivet, and moved from one rivet to another with great ease and facility. Again, the provision of the large weighted head carried by the front end of the piston in my new device presents a very important advantage over the prior devices with which I am familiar having no such large weighted head, since the inertia of this mass of metal is more effective in sustaining the blows delivered upon the opposite end of the rivet than is the pressure of the motive fluid, and the weight of metal serves to absorb the shock of the blows and relieve the structure from them, to which it would be subjected in the absence of such large weighted head. Where the blows upon the opposite end of the rivet are delivered by what are known as pneumatic hammers, instead of hand hammers, they are so extremely rapid (sometimes several thousand per minute) that the provision of this weighted head is not only an advantage, for the reasons heretofore explained, but is in many cases a necessity, in order to properly hold the rivet in position with its head firmly against the plates. In the absence of this weighted head the piston will be driven backward by each blow delivered to the opposite end of the rivet, and where these blows are delivered by a hammer moving at high velocity the piston, being light and held in position only by an elastic pressure, will not hold the rivet head tightly against the plate, and it becomes extremely difficult if not impossible to properly drive down the opposite end of the rivet and effect a tight joint. In my new rivet-holder, however, the inertia of the large weighted head is sufficient to resist the force of the blows delivered upon the opposite end of the rivet, and prevent the piston being driven backward by them to any appreciable extent, so that no matter how rapidly such blows may be delivered the rivet will be maintained in proper position with its head held firmly against the surface of the plate.

Having thus fully described my invention, I claim:

A pneumatic rivet-holder, comprising the cylinder A, the piston B, the enlarged weighted head C formed integral with the piston B and provided with the annular groove or recess D adapted to pass over the front end of the cylinder A, and a valve for controlling the admission of the motive fluid to the cylinder A behind the piston B.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."