Dec. 8, 1942. F. H. SEMPLE 2,304,425

PNEUMATIC RIVETER

Filed Jan. 18, 1940 3 Sheets-Sheet 1

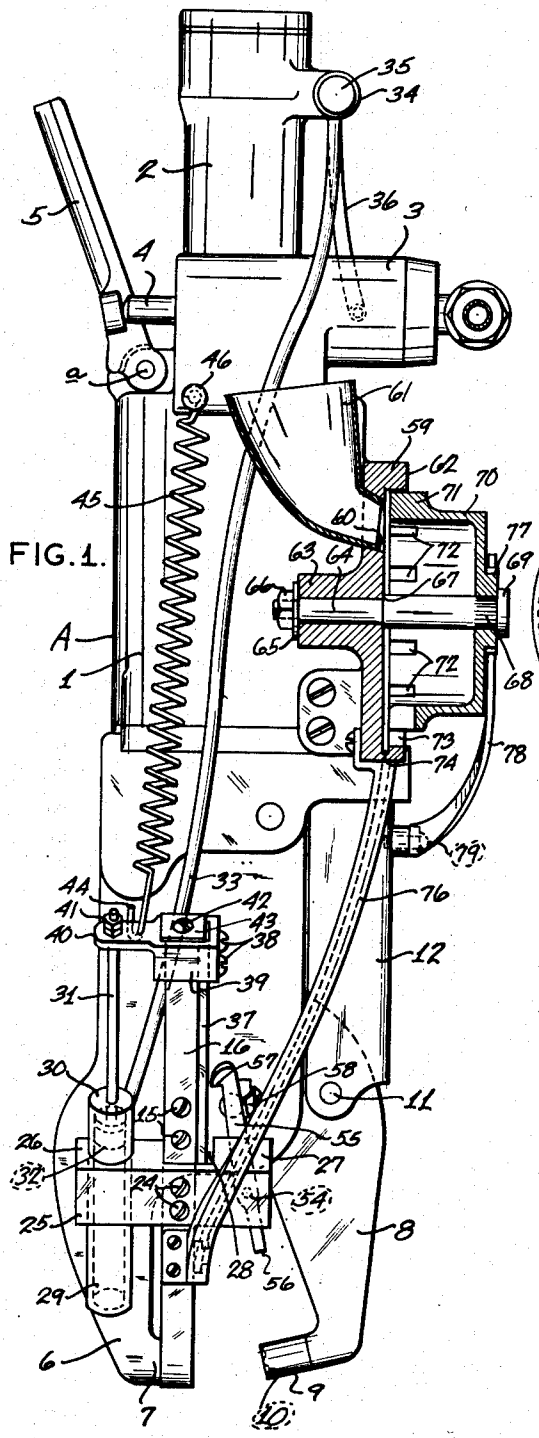
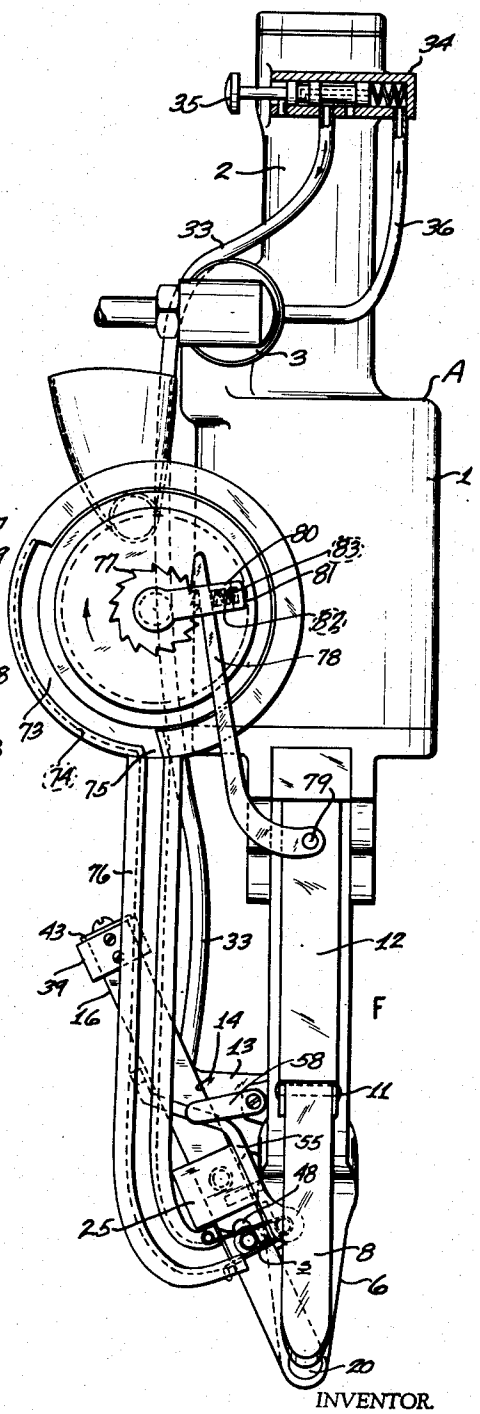


FIG. 1.



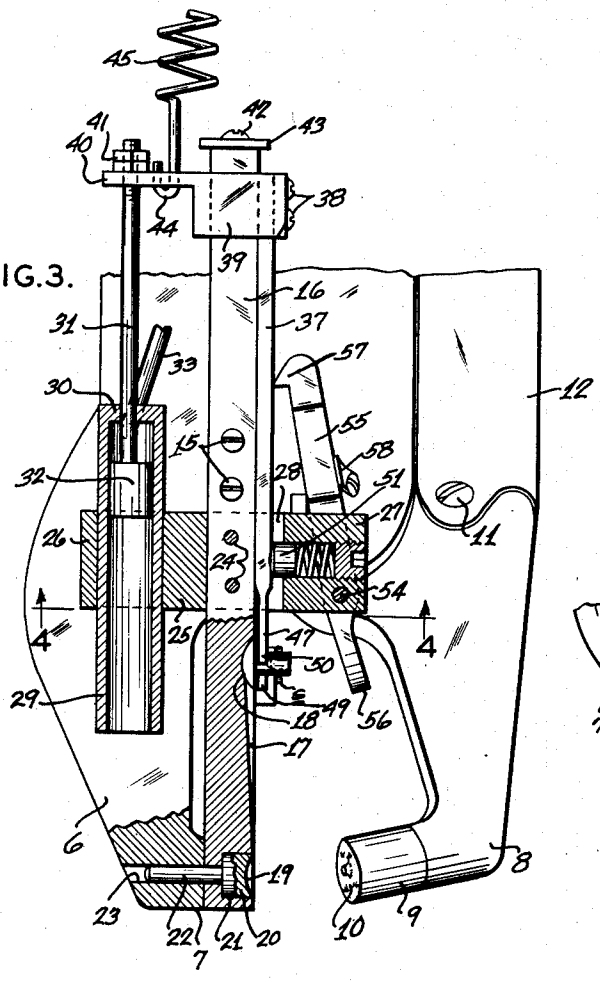
INVENTOR.
FREDERICK H. SEMPLE
BY
ATTORNEY.

Dec. 8, 1942. F. H. SEMPLE 2,304,425

PNEUMATIC RIVETER

Filed Jan. 18, 1940 3 Sheets-Sheet 2

FIG.3.



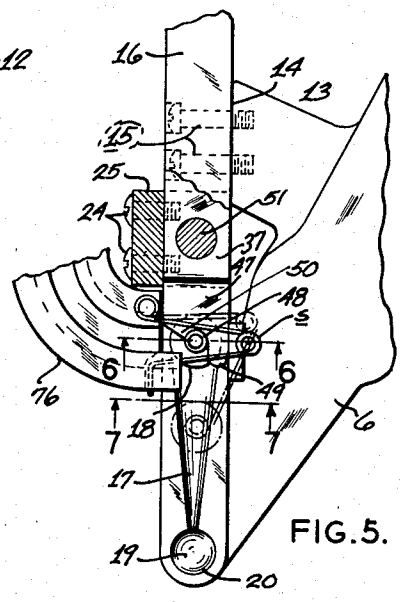


FIG.5.

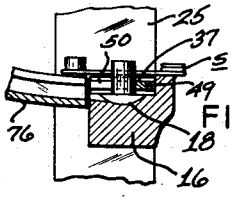


FIG.6.

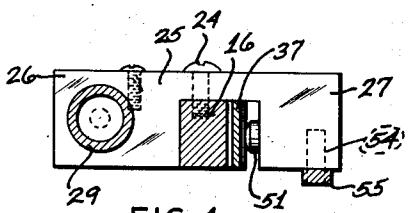


FIG.4.

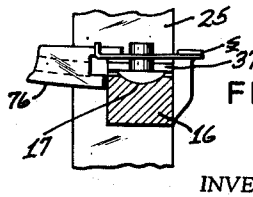


FIG.7.

INVENTOR.
FREDERICK H. SEMPLE
BY
ATTORNEY.

Dec. 8, 1942. F. H. SEMPLE 2,304,425

PNEUMATIC RIVETER

Filed Jan. 18, 1940 3 Sheets-Sheet 3

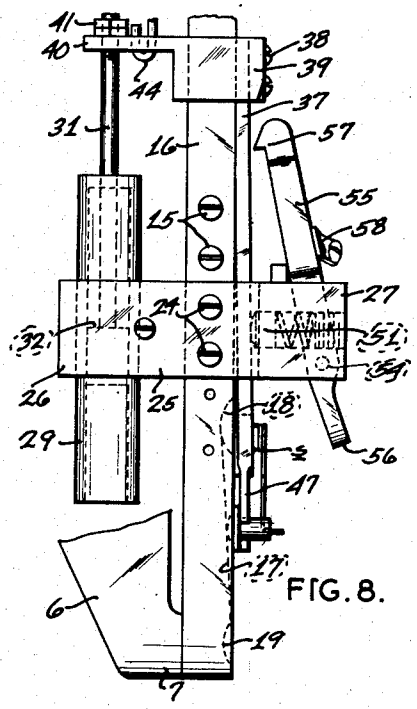


FIG. 8.

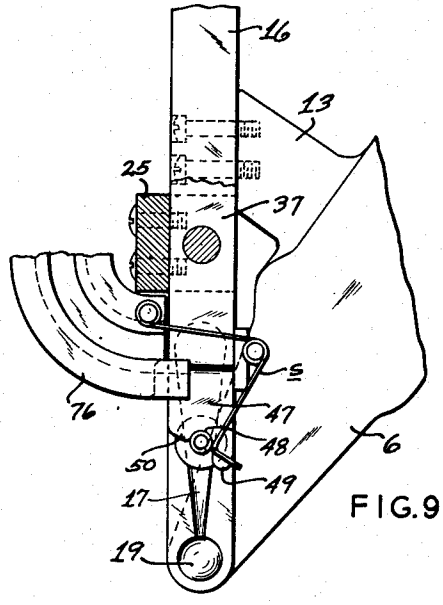


FIG. 9.

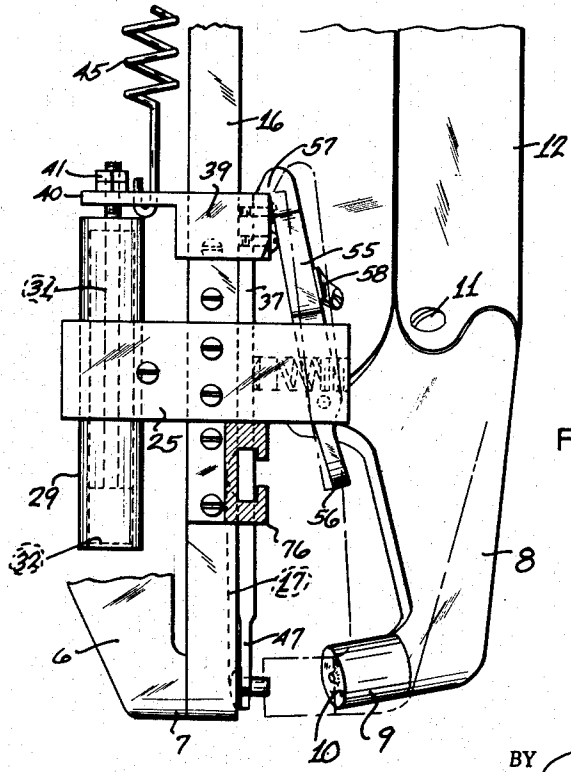


FIG. 10.

INVENTOR.
FREDERICK H. SEMPLE
BY
ATTORNEY.

Patented Dec. 8, 1942

2,304,425

UNITED STATES PATENT OFFICE

2,304,425

PNEUMATIC RIVETER

Frederick H. Semple, Clayton, Mo.

Application January 18, 1940, Serial No. 314,491

13 Claims. (Cl. 218—19)

This invention relates generally to riveters and, more particularly, to riveters of pneumatic type.

My invention has for its primary objects the provision in particularly a riveter of the type stated of mechanism uniquely constructed and actuable for automatically feeding a succession of rivets to the jaws of the riveter for upsetting.

My invention has for a further object the provision of rivet-feeding mechanism which is rugged, durable, and economical in construction, which is convenient and facile in operation, which enables a material increase in the speed of riveting operations, which is automatically operable by the same source of power as the jaws of the riveter, and which is highly efficient in the performance of its stated functions.

And with the above and other objects in view, my invention resides in the novel features of form, construction, arrangement, and combination of parts presently described and pointed out in the claims.

In the accompanying drawings (3 sheets)—

Figure 1 is a side elevational view, partly broken away and in section, of a pneumatic riveter equipped with automatic rivet-feeding mechanism constructed in accordance with and embodying my invention;

Figure 2 is a top plan view, partly broken away and in section, of the riveter;

Figure 3 is an enlarged fragmentary view, partly broken away and in section, of the riveter, showing in detail the rivet positioning slide of the feeding mechanism;

Figure 4 is a detail sectional view of the riveter, taken approximately along the line 4—4, Figure 3;

Figure 5 is a fragmentary plan view of the rivet positioning slide of the feeding mechanism;

Figures 6 and 7 are detail transverse sectional views on the lines 6—6 and 7—7, respectively, Figure 5;

Figures 8 and 9 are, respectively, fragmentary side elevational and plan views of the riveter head, showing the rivet ejecting slide in partially advanced or intermediate position for seating a rivet between the jaws for upsetting; and

Figure 10 is an enlarged fragmentary side elevational view of the riveter head, illustrating the rivet positioning slide in its projected forward or rivet-seating position.

Referring now in more detail and by reference characters to the drawings, which illustrate a preferred embodiment of my invention, A designates a standard or conventional pneumatic riveter, which, as far as is pertinent here, comprises a housing 1 providing a hand grip 2, and a main air valve 3 having an outwardly extending plunger 4 for engagement by a control handle 5 pivoted, as at a, on the housing 1 for swingable movement, the riveter, in practice, during the setting of a rivet, being normally held in a substantially horizontal or somewhat downwardly inclined position. At its forward or head end, the housing 1 is provided with a stationary jaw 6 having an anvil 7. Rockably mounted also at the forward or head-end of the housing 1, is a movable jaw 8 having a conventional peening head 9 provided in its outer face with a suitable rivet upsetting recess 10. Pivotally connected, as at 11, to the movable jaw 8, is a longitudinally shiftable jaw-actuating link 12 connected for operation in any conventional or standard manner at its other end to the internal driving mechanism (not shown) of the tool.

Formed upon a side face of the housing 1 rearwardly of the stationary jaw 6, is a laterally presented lug or boss 13 having an oblique face 14, fixed on which, as by screws 15, is an elongated guide-bar 16 terminating at its forward end over the anvil 7 and being longitudinally provided on its upper face with a rivet positioning groove 17 sized, at its inner end, as at 18, for accommodating the particular rivet head, as best seen in Figure 3. The width and length of the groove 17 are gradually reduced, as shown, as the groove 17 continues forwardly to adjacent the forward end of the bar 16, where the groove 17 communicates with a concave rivet positioning recess 19 formed in the outwardly presented face of a plug or seat 20 snugly fitted removably in a suitable pocket 21 in the bar 16, the seat 20 having a stem 22 fitting in a bore 23 suitably provided in the jaw 6 and bar 16, all as best seen in Figures 3 and 5.

Secured at its bight, as by means of screws 24, to and upon the side face of the bar 16, is a U-shaped cross-bar 25 having an elongated leg 26 flush upon its inner face with the under face of the bar 16 and a short leg 27 spaced from the bar 16 in the provision of a clearance slot 28 between its inner face and the opposed parallel upper face of the bar 16.

Mounted in, and extending longitudinally through, the leg 26 of the cross bar 25 in outwardly spaced parallel relation to the bar 16, is a suitably elongated cylinder 29 open at its forward end and provided at its rear end with an end wall 30 centrally apertured for slidably accommodating a close fitting piston rod 31 engag-

ing at its inner end with a piston or plunger head 32 working in the cylinder 29.

Mounted in the side wall of the cylinder 29 forwardly of the end wall 30 for communication with the cylinder-interior intermediate the wall 30 and the piston 32, is a fluid inlet or compressed air supply tube 33 extending rearwardly along the side of the housing 1 and communicating at its rear end with a valve casing 34 formed preferably integrally with the hand grip 2 and housing a conventional spring-pressed plunger 35 for controlling the flow of compressed air from a supply tube 36, the latter opening at one end into the casing 34 and communicating at its other end with the main air valve 3, all as best seen in Figures 1 and 2.

37 indicates an ejector, which is slidably mounted upon the upper face of, and which has substantially the same width as, the bar 16, the ejector 37 having a thickness somewhat smaller than the width of the clearance slot 28. At its rear end, the slide or ejector 37 is substantially co-terminous with the bar 16 and is secured, as by means of suitable screws 38, upon the inner face of a rectangular frame 39 sized for snug-fitting slidable disposition around the bar 16 and preferably integrally provided with an outwardly extending arm 40 for engagement, as by lock-nuts 41, with the rear end of the piston rod 31.

Secured transversely over and upon the rear end of the bar 16, as by means of an attachment screw 42, is an end plate 43 suitably sized for providing a stop-abutment for the slide frame 39.

Intermediate the piston rod 31 and the slide frame 39, the arm 40 is apertured for receiving the hooked end 44 of a tension spring 45 secured at its rear end, as by means of a stud 46, to the housing 1. It may be here stated that the piston rod 31 is of such length in relation to the position of the end plate 43 and the cylinder end wall 30 that the plunger 32 will be spaced forwardly from said end wall 30 and form the outlet end of the tube 33 when the slide frame 39 is positioned at the rear limit of its travel, all as best seen in Figures 1 and 3 and for purposes presently fully appearing.

At its forward end, the ejector slide 37 is preferably integrally formed longitudinally with a relatively thin blade-like extension 47 projecting normally over the rear end 18 of the rivet guiding recess 17 and having in its forward end a centrally disposed arcuate recess or seat 48 for snugly accommodating the shank of a rivet, the seat 48 being flanged on one side by a suitably elongated retention finger 49 and on its other side a short obliquely cutoff guide-finger 50, all as best seen in Figures 3, 5, and 9 and for purposes presently more fully appearing.

Spring-pressed in a bore suitably provided in the short leg 27 of the cross bar 25 for yielding engagement with the ejector slide 37, is a retainer pin 51, and mounted in and projecting outwardly from a side face of said cross bar leg 27, is a pin 54 for pivotally accommodating a latch-bar 55 provided at its forward end with a finger 56 disposed adjacent to and presented laterally in the path of the movable jaw 8. At its opposite or rear end, the latch-bar 55 is bent obliquely to project across the ejector slide 37 and is provided with a detent hook 57 yieldingly urged downwardly by means of a leaf spring 58 suitably fixed upon a side face of the housing 1 for latching engagement with the slide frame 39. In this connection, it should be stated that the bar 55 and its hook 57 are so formed and positioned with relation to the slide frame 39 and the length of the ejector slide 37 that the ejector slide 37, when engaged by the hook 57, will be releasably retained in its fully extended forward position, as will be presently more fully pointed out and as indicated in Figure 10.

Suitably mounted upon a side face of the housing 1 forwardly of the hand grip 2, is a hopper mounting-disk 59 suitably apertured, as at 60, for receiving the reduced discharge end of a filling-chute 61, the disk 59 being formed with an upstanding peripheral flange 62 and being centrally provided with an enlarged concentric hub 63 axially bored for rotatively receiving a hopper-stud 64 conventionally provided at its outer end with a washer 65 and retainer nut 66, the stud 64 being diametrally enlarged, as at 67, for engagement with the face of the disk 59 for preventing axial translation or play of the stud 64.

At its other extremity, the stud 64 is provided with a serrated section 68 and a head 69 for tight-fitting, non-rotative, press-fitted engagement with a cylindrical hopper 70 formed with an enlarged peripheral lip 71 loosely fitting for rotation within the disk-flange 62 and provided with a circumferential series of uniformly spaced radial slots 72. As best seen in Figure 1, the hopper lip or wall 71 is spaced at its free end face from the disk 59 by a distance slightly greater than the thickness of the heads of the particular rivets to be passed out of the hopper 70 and the several slots 72 are each sized for accommodating free movement therethrough of the shanks of said rivets.

As best seen in Figure 2, the disk-flange 62 is segmentally cut away or relieved for a portion of its circumferential length in the provision of an arcuate slot 73, for permitting the respective rivets to successively travel outwardly through the hopper slots 72, the outer side wall of the slot 73 being undercut, as at 74, to receive and retain the heads of the rivets.

The disk-flange 62 is further radially cut away in the provision of a discharge slot 75 opening at its one or inner end into the arcuate slot 73 and at its other or outer end communicating with a conventional C-shaped delivery chute 76 suitably fixed at its rear end to the disk 60 and extending obliquely downwardly and forwardly and, at its forward end, arcuately for rivet delivering registration with the rear end 18 of the rivet delivery recess 17 of the bar 16, to which latter the delivery chute 76 is likewise suitably fixed at its forward end, all as best seen in Figures 1 and 2 and for purposes presently fully appearing.

Suitably secured at its one end upon the chute 76 adjacent its point of attachment to the bar 15 and extending over the ejector slide 37, is a V-shaped hair spring *s* free at its other end to guide the successive rivets from the chute 76 into the rear end-portion 18 of the rivet positioning recess 17 and to retain the successive rivets in such position until the same are each positively shifted by, and on forward movement of, the ejector slide 37, the spring *s*, at its free end, readily giving yieldingly to permit rivet movement by the ejector slide 37, as shown in dot-dash lines in Figure 5.

Formed preferably integrally upon the top of the hopper 70, is a concentric ratchet 77, engaging with which is a pawl-like arm 78 extending forwardly over the hopper 70 and being curved or bent downwardly for pivotal attach-

ment by means of a pin 79 to the actuating link 12.

Formed preferably integrally with, and extending radially outwardly from, the stud head 69 over the arm 78, is an arm 80 having a bent-over flanged end 81 longitudinally bored in the provision of an inwardly opening recess 82 for retentively housing a compression spring 83 for resiliently urging the arm 78 into engagement with the ratchet 77, all as best seen in Figure 2 and for purposes presently fully appearing.

In use and practice, the hopper 70 is filled with the particular rivets for which it is designed through the chute 61 and, with the device held in a vertical or somewhat upright position, the hopper 70 is then rotated manually in the direction indicated by the arrow in Figure 2 until a sufficient number of the rivets have passed through the hopper slots 72 and the arcuate slot 74 into the chute 76 to completely fill the chute 76. Thereafter, during normal handling and movement, the device will be held in such upright position frequently enough to maintain the flow of rivets from the turret 70 and keep the chute 76 well filled.

The first rivet traveling by gravity down the chute 76 will move into the enlarged end 18 of the rivet positioning slot 17, being held therein by the hair spring *s*. Thereupon, the valve stem 35 is depressed, permitting compressed air or other motive fluid to flow through the inlet tube 33 to the cylinder 29, forcing the plunger 32 forwardly in the cylinder 29 and quickly shifting the ejector slide 37 forwardly, picking up the particular rivet between its fingers 49, 50, and shifting the rivet forwardly. The side of the slide 37 as it moves forward closes the end of the chute 76, thus preventing any rivets from falling out.

During such forward movement, the rivet head pushes upon the hair spring *s* and rides along the rivet positioning recess 17, which, by reason of its gradual decrease in width and depth, causes the rivet to move bodily outwardly and the ejector slide 37 to be deflected slightly outwardly against the tension of the holding-pin 51 from the upper face of the guide bar 16, thereby maintaining a sufficient amount of tension to prevent the rivet from accidentally dropping out of the seat 48 of the ejector slide 37.

As the ejector slide 37 reaches the forward limit of travel, the rivet head drops into the concave recess 19 and the slide frame 39 is retentively latched by the hook 57 of the latch bar 55, the particular rivet being retained to its seat in the recess 19 by the slide fingers 49, 50.

The riveter A is ordinarily then disposed with its jaws 6 and 8 horizontally disposed upon opposite sides of the work and the supported rivet inserted in the aperture in the work in which the rivet is to be secured. Thereupon, the main control handle 5 is depressed, admitting motive fluid to the conventional driving mechanism within the riveter housing 1, causing the actuator link 12 to shift forwardly and thereby swinging the movable jaw 8 for engaging the peening head 9 with the rivet shank for upsetting the latter in the conventional manner. This movement of the link 12 causes forward movement of the link 78, which, through its connection with the hopper 70, causes a partial rotation of said hopper, with the result that the rivets will move through the slots 72 into the arcuate slot 74. Thus, as the tool A is moved into and out of operative position with reference to the work, such movement will cause the rivets to slide downwardly through the chute 76. At the same time, the shifted jaw 8 comes into engagement with the latch finger 56 and effects pivoted movement of the latch-arm 55 against the tension of the leaf spring 58 for releasing the slide frame 39 and the ejector slide 37, which then yieldingly returns to initial position under the influence of the spring 45, the particular rivet being entirely released by the slide 37 just prior to the final compressive action of the jaw 8, so that the rivet may be securely "driven home."

Upon completion of its riveting action, the movable jaw 8 returns automatically to initial position and the work is released, when the riveter A may be quickly shifted for a successive riveting operation, a successive rivet automatically moving from chute 76 down into, and occupying, the seat 48 as soon as the ejector slide 37 returns to its initial position, when the above described series of operations may be repeated.

It should be understood that changes and modifications in the form, construction, arrangement, and combination of the several parts of the riveter and its feeding mechanism may be made and substituted for those herein shown and described without departing from the nature and principle of my invention.

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

1. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a shiftable rivet ejector, pneumatic means for shiftably actuating the ejector for disposing a rivet over the anvil, and means for actuating the rockable jaw for upsetting the disposed rivet.

2. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar fixed upon the stationary jaw and having a rivet-positioning pocket over the anvil, an ejector member shiftable on said bar, pneumatic means for actuating the ejector for shifting a rivet along the bar and into the pocket, and means for actuating the rockable jaw for upsetting the seated rivet.

3. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar fixed upon the stationary jaw and having a longitudinally extending groove terminating in a pocket over the anvil, an ejector member shiftable on said bar, pneumatic means for actuating the ejector for shifting a rivet along said groove and into the pocket, and means for actuating the rockable jaw for upsetting the seated rivet.

4. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar terminating at an end over the anvil, a yielding ejector member having fingers for engaging the shank of a rivet, means for shifting the ejector member along the bar for seating the engaged rivet over the anvil, means for releasably retaining the ejector member in shifting rivet-seating position, and means for actuating the rockable jaw for upsetting the seated rivet and said retaining means for releasing the ejector member for return to initial rivet-engaging position.

5. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar having a longitudinally extending groove terminating in a pocket over the anvil, a yielding ejector member having fingers for engaging the shank of a rivet, means for shifting the ejector member along said bar for pro-

gressing the engaged rivet along, and with its head disposed in, said groove for seating the rivet at its head in said pocket, means for releasably retaining the ejector member in shifted rivet-seating position, and means for actuating the rockable jaw for upsetting the seated rivet and said retaining means for releasing the ejector member for return to initial rivet-engaging position.

6. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar having a longitudinally extending groove terminating in a pocket over the anvil, a yielding ejector member having fingers for engaging the shank of a rivet, means for successively feeding rivets to the fingers of the ejector member, means for shifting the ejector member along said bar for progressing the engaged rivet along, and with its head disposed in, said groove for seating the rivet at its head in said pocket, means for releasably retaining the ejector member in shifted rivet-seating position, and means for actuating the rockable jaw for upsetting the seated rivet and said retaining means for releasing the ejector member for return to initial rivet-engaging position.

7. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar fixed upon the stationary jaw and having a longitudinally extending groove terminating in a pocket over the anvil, an ejector member having fingers for engaging the shank of a rivet, means for successively feeding the rivets to the fingers of the ejector member, pneumatic means for lengthwise shifting the ejector member along said bar for progressing the engaged rivet along, and with its head disposed in, said groove for seating the rivet at its head in said pocket, and means for actuating the rockable jaw for upsetting the seated rivet.

8. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar fixed upon the stationary jaw and having a longitudinally extending groove of gradually decreasing depth and communicating at an end in a pocket over the anvil, an ejector member having fingers for engaging the shank of a rivet, means for successively feeding the rivets to the fingers of the ejector member, pneumatic means for lengthwise shifting the ejector member along said bar for progressing the engaged rivet along, and with its head disposed in, said groove for seating the rivet at its head in said pocket, means co-operable with the fingers for retaining the rivet on the bar during movement along the bar, and means for actuating the rockable jaw for upsetting the seated rivet.

9. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar fixed upon the stationary jaw and having a longitudinally extending groove of gradually decreasing depth and communicating at an end in a pocket over the anvil, an ejector member having fingers for engaging the shank of a rivet, means including a yielding member for successively feeding the rivets to the fingers of the ejector member, pneumatic means for lengthwise shifting the ejector member along said bar for progressing the engaged rivet along, and with its head disposed in, said groove for seating the rivet at its head in said pocket, and means for actuating the rockable jaw for upsetting the seated rivet, said yielding member also co-operating with the fingers for retaining the engaged rivet on the bar during movement therealong.

10. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a yieldingly shiftable ejector member having fingers for engaging the shank of a rivet, means for shifting the ejector member for seating the engaged rivet over the anvil, means for releasably retaining the ejector member in shifted rivet-seating position, and means for actuating the rockable jaw for upsetting the seated rivet and said retaining means for releasing the ejector member for return to initial rivet-engaging position.

11. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar fixed upon the stationary jaw and terminating at an end over the anvil, an elongated ejector member lengthwise shiftable on said bar, pneumatic means for actuating the ejector for shifting a rivet along the bar for disposing the engaged rivet over the anvil, means engageable with the ejector member for releasably retaining the same in projected rivet-disposing position, and means for actuating the rockable jaw for upsetting the seated rivet.

12. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar fixed upon the stationary jaw and having a longitudinally extending groove terminating in a pocket over the anvil, an ejector member yieldingly shiftable on said bar, pneumatic means for actuating the ejector for shifting a rivet along said groove and into the pocket, latch-means engageable with the ejector member for releasably retaining the same in projected rivet-seating position, and means for actuating the rockable jaw for upsetting the seated rivet.

13. In a riveter, in combination, a stationary jaw having an anvil, a rockably co-operable jaw, a rivet guide bar fixed upon the stationary jaw and terminating at an end over the anvil, an ejector strip lengthwise yieldingly shiftable on said bar, pneumatic means for actuating the ejector strip for shifting a rivet along the bar for disposing the engaged rivet over the anvil, latch means engageable with the ejector strip for releasably retaining the same in projected rivet-seating position, means for actuating the rockable jaw for upsetting the seated rivet, and means comprising an arm interposed in the path of the rockable jaw for releasing the latch means for yielding return of the ejector-strip to initial position.

FREDERICK H. SEMPLE.