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STAPLING DEVICE

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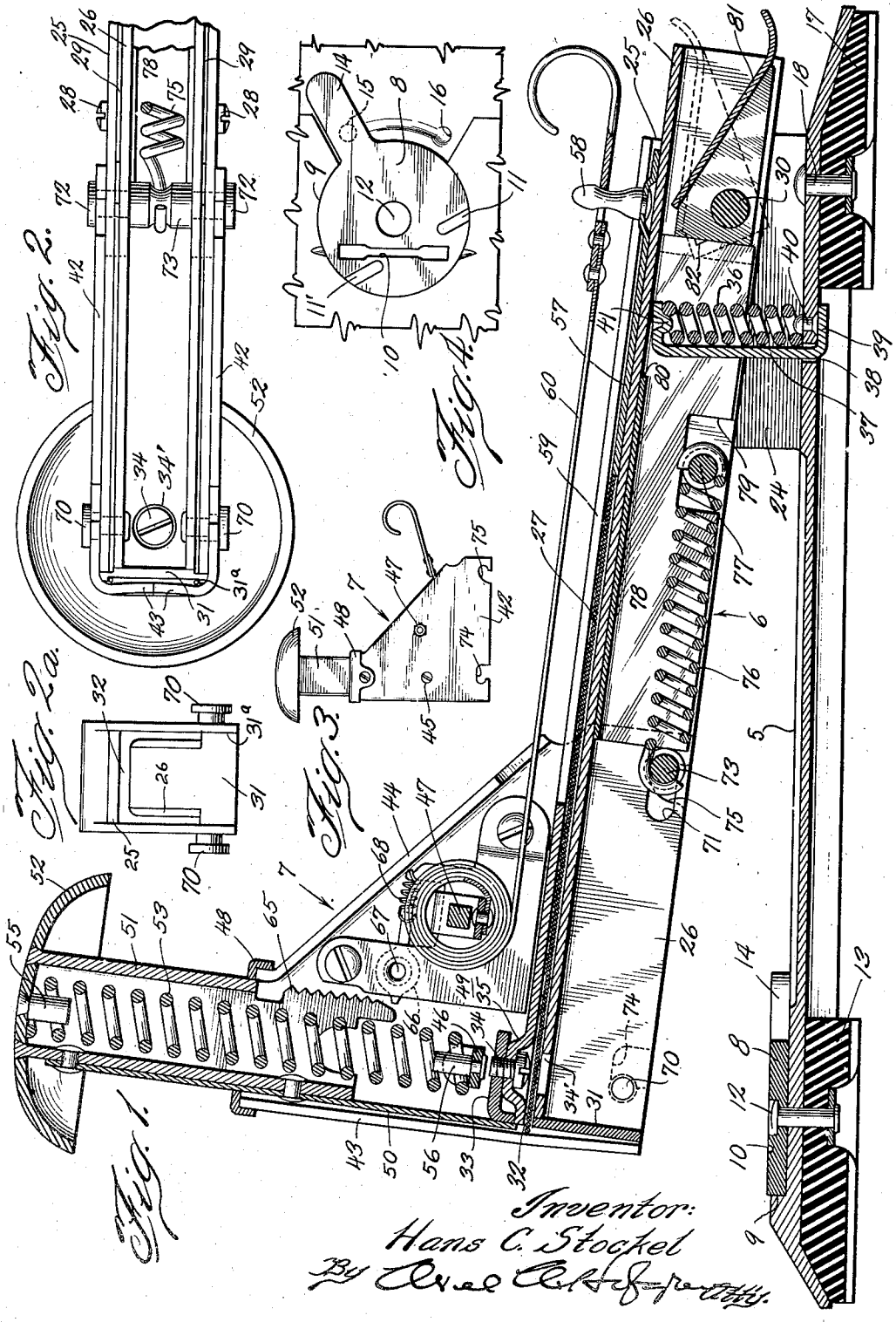


Fig. 1.

Fig. 2.

Fig. 2a.

Fig. 3.

Fig. 4.

Inventor:
Hans C. Stockel
By Owen Clark & Pretty

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STAPLING DEVICE

Hans C. Stockel, Chicago, Ill., assignor to Hercules Tool & Manufacturing Co., Chicago, Ill., a corporation of Illinois

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The invention relates generally to a stapling device for fastening together sheets of paper, cardboard and the like by means of wire staples, and particularly to an improved device of the character disclosed and claimed in my copending application Serial No. 745,493, filed September 26, 1934.

One object of the invention is to provide a stapling device of novel and improved construction, greatly facilitating the manufacture and particularly the assembly of such a device.

Another object is to provide a stapling device having a novel and improved construction forming a guide passage, through which the staples are ejected, supporting the intermediate portion of the staples during ejection to prevent buckling, but yieldable to prevent jamming and clogging of the passage.

A more particular object is to provide a stapling device having an arm and a housing for the staple driving mechanism mounted on the arm and forming therewith a passage, through which the staples are ejected, shaped to support the intermediate portion of a staple during its movement through the passage, the housing being mounted on the arm for yieldable movement longitudinally thereof and for bodily removal therefrom.

A further object is to provide a stapling device having a yieldably mounted and bodily removable housing for the staple driving mechanism and means for relieving the tension on the housing to facilitate removal thereof.

Yet a further object is to provide a stapling device having staple driving mechanism and an anvil, bearing means for bending the legs of the staples inwardly and separate means for bending the legs of the staples outwardly, rotatably mounted to position one or the other of said means in operative position with respect to the staple driving mechanism.

Other objects and advantages will become apparent from the following detailed description taken in connection with the accompanying drawing in which:

Fig. 1 is a vertical, longitudinal sectional view of a stapling device embodying the features of the invention.

Fig. 2 is a fragmentary plan view of the arm of the stapling device looking at the bottom thereof.

Fig. 2*a* is an end view of the arm with the housing removed.

Fig. 3 is a reduced side elevational view of the housing detached.

Fig. 4 is a fragmentary plan view of the anvil.

While the invention is susceptible of various modifications and alternative constructions, it is shown herein and will be described hereinafter in a preferred embodiment. However, it is not intended that the invention is to be limited thereby to the specific construction disclosed, but it is intended to cover all modifications and alternative constructions falling within the spirit and scope of the invention as defined by the appended claims.

In the exemplary embodiment of the invention illustrated in the drawing, the stapling device comprises generally an elongated base **5** having pivotally mounted thereon at its rear end a longitudinally extending arm **6**. At its forward end the arm **6** carries a casing generally designated **7** housing staple-driving mechanism, while mounted on the base for cooperation with the staple driving mechanism is an anvil **8**.

The base **5** preferably is a cast member and at its forward end is formed with a recess **9** in which is received the disk-like anvil **8** with which the staple-driving mechanism cooperates to clinch the staples. In the present instance, the anvil **8** is adapted to bend the legs of the staples inwardly toward one another or outwardly away from one another, and to that end is formed in its upper surface with an integral groove **10** and with divided grooves **11** and **11'** formed in well known manner to bend the legs of a staple inwardly and outwardly respectively. The anvil is rotatably secured in the recess by means of a single rivet **12** which projects through the base and also secures to the under side thereof a pad **13** of resilient material such as rubber. The anvil is formed with a finger **14** projecting from the recess by means of which the anvil is rotated from the position shown in Fig. 4, in which the integral groove **10** is in operative position for bending the legs of the staple inwardly, to the opposite extreme position in which the divided grooves **11** and **11'** are in operative position to bend the legs of a staple outwardly. The finger **14** carries a nub **15** adapted to engage in pockets **16** formed in the base to secure the anvil in its operative positions, the resilient pad **13** providing the yielding force holding the nub in the pockets **16**. A second pad **17** similar to the pad **13** is secured by a rivet **18** at the rear end of the base to cooperate with the pad **13** in preventing slipping of the stapling device and in preventing the surface of the piece of furniture on which the device is placed from being marred.

At its rear end the base **5** has cast integrally therewith a pair of upstanding flanges **24** be-

tween and on which the arm 6 is supported. Herein the arm 6 is composed of two channel shaped members 25 and 26 with the member 26 smaller than the member 25 and placed within the member 25 to provide an inverted U-shaped channel extending longitudinally of the arm for storing a supply of staples 27. A plurality of screws 28 spaced longitudinally of the arm secure the channel members together while shims 29 interposed between the channel members insure uniform spacing thereof. The arm is disposed between the flanges 24 and is pivotally mounted on a bolt 30 extending through the flanges and the channel members forming the arm. The forward end of the arm 6 is closed by a plate 31 slotted as at 32 (see Fig. 2*a*) to provide an opening for the U-shaped channel in the arm 6 and having a rearward extension 33 secured by a screw 34 to an offset 35 in the channel member 25 whereby the plate is retained in position. The screw 34 is accessible through an aperture 34' in the member 26. The front face of the plate 31, as best seen in Figs. 2 and 2*a*, has a groove 31ª extending from the extension outwardly to form in part a transverse guide pasage intersecting the supply channel and through which staples are ejected.

A compression spring 36 bearing at one end against the base 5 and at the other end against one leg of a restraining member 37, in turn bearing against the arm 6, urges the arm upwardly away from the forward end of the base. The restraining member 37 extends loosely through a slot 38 in the base 5 to permit downward movement of the arm and is formed with a second leg 39 adapted to engage the base to limit the extension of the spring 36. A rivet 40 provides a seat for the lower end of the spring 36 while the upper end seats on a bead 41 formed on the upper leg of the member 37.

The casing 7 housing the staple-driving or ejecting mechanism is, in the present instance, composed of two side plates 42 having laterally projecting flanges 43 and 44 forming front and rear end walls of the casing. The plates 42 are secured together by means of screws 45 threaded into a transverse brace 46, a bolt 47, and an annular cap 48. When the casing is in position on the arm 6, the side plates 42 extend downwardly to a point flush with the lower edges of the channel member 25 so that the flanges 43 cooperate with the plate 31 to complete the transverse passage, intersecting the channel formed in the arm, through which the staples are ejected. Secured to the interior of each side plate is a bracket 49.

Staples are ejected through the transverse passage by means of a plunger blade 50 riveted to a plunger 51 reciprocably mounted in the casing 7 and projecting therefrom through the cap 48. The plunger 51 is formed at its upper end with a knob 52 by means of which an operator may force the plunger into the casing against the action of a compression spring 53, bearing at its upper end against the knob 52 and at its lower end against the brace 46. Pins 55 and 56 secured respectively in the knob 52 and the brace 46 project into the end coils of the spring 53 to maintain the same properly seated. Staples in the arm 6 are urged outwardly of the forward end of the channel into the transverse passage for ejection by the plunger blade 50 by a slide 57 positioned in the arm rearwardly of the supply of staples 27. The slide is provided with a knob 58 projecting through a slot 59 formed in the upper surface of the channel member 25 and is detachably engaged with a resilient tape 60 coiled and mounted within the casing 7 on the bolt 47 squared for engagement with the brackets 49 to prevent rotation of the bolt.

Preferably a full stroke mechanism is associated with the staple driving mechanism to insure that each staple is completely ejected in order to prevent jamming or clogging by attempted ejection of a second staple before complete ejection of the previous staple. In the present instance, this mechanism is in the nature of a two-way pawl and ratchet comprising a ratchet segment 65 the teeth of which have a uniform slope on both sides and which is cut away at its ends to an extent greater than the depth of any tooth. Cooperating with the toothed segment 65 is a pawl 66 pivotally mounted at 67 on one of the brackets 49. A tension spring 68 tends to maintain the pawl 66 perpendicular to the path of movement of the segment 65 but the length of the pawl from its pivot 67 to its operative end is greater than the perpendicular distance from the segment 65 to the pivot point 67. Thus when the plunger 51 is forced downwardly the pawl 66 is rocked slightly in a counterclockwise direction by the teeth of the segment 65 and thus serves to prevent a return movement of the plunger until the plunger has been depressed far enough for the uppermost tooth to pass beyond the pawl 66, permitting return thereof to normal position perpendicular to the segment. Upon the return stroke of the plunger, the pawl 66 is rocked in a clockwise direction and thus prevents depression of the plunger until it has moved outwardly to an extent such that the lowermost tooth passes the pawl 66 and thus again permits its return to normal position. Thus the full stroke mechanism compels each downward stroke of the plunger blade to be a complete stroke ejecting the staple, and prevents a partial stroke followed by return of the blade to a position preparatory to ejection of a second staple which would jam the device.

In stapling devices of this character, difficulty is experienced in forcing the staples through tough, fibrous objects because of the tendency of the staples to crimp and particularly because of the tendency of the intermediate horizontal portion of the staples to buckle. It was found that, to avoid such crimping and buckling of the staples, not only must the legs of the staple be guided but that in addition the intermediate portion of the staple must be supported. To that end the lower ends of the flanges 43 opposite the plate 31 are bent inwardly so that the transverse passage tapers from its inner to its outer end as seen in Fig. 1, and so that the inner face of the wall formed by the flanges 43 is convex as seen in Fig. 2, resulting in a passage narrower along its center line than at its edges. The width of the passage at the center line, i. e., at the joint of the flanges, over the major portion of its length is less than the diameter of the wire forming the staples. Thus with this construction the legs of a staple moving through the passage are adequately guided and supported while in addition the intermediate portion of a staple is supported with increasing force to the very point of its ejection from the passage.

In order to facilitate manufacture and assembly of the stapling device, to provide a guide passage of the character above described which is yieldable to permit the passage of a staple therethrough and to prevent jamming and clog-

ging, and to provide for ready access to the passage for cleaning should it become obstructed, the casing 7 is herein mounted for yieldable movement longitudinally of the arm 6 and for bodily removal therefrom. To that end the arm 11 is provided with a pair of oppositely disposed stationary rivets 70 the heads of which are spaced from the channel member 25 a distance substantially equal to the thickness of the side plates 42. Extending through longitudinal slots 71 in the arm 6 for limited movement longitudinally thereof are a pair of oppositely disposed screws 72 threaded into a bar 73. The heads of the screws like the heads of the rivets 70, are spaced from the channel member 25 a distance approximately equal to the thickness of the side plates 42. Cooperating with the rivets 70 and screws 72 are oppositely directed bayonet slots 74 and 75 formed in the side plates 42 of the casing 7 by means of which the casing is detachably secured on the arm 6. The slots 74, as best seen in Fig. 3, have a more pronounced horizontal portion than do the slots 75 and thus permit of a limited movement of the casing longitudinally of the arm and relative to the rivets 70 to permit passage of a staple through the transverse passage. The casing, however, is urged onto the arm by means of a tension spring 76 at one end engaging the bar 73 and at the other end anchored to a cross bolt 77.

Means is provided herein for reducing the effective tension of the spring 76 on the casing 7 in order to facilitate removal of the casing. To that end there is longitudinally slidable within the channel member 26 a channel shaped member 78 cut away at 79 to accommodate the bolt 77 and at 80 to accommodate the retaining member 37. The forward end of the member 78 abuts the cross bar 73 while the rear end abuts the edge of a bracket-like lever 81 pivotally mounted on the bolt 30 supporting the arm 6. In the normal position of the lever 81 shown in Fig. 1, the spring 75 is free to move the casing 7 rearwardly to the extent permitted by the engagement of the casing with the forward end of the arm 6. However, when the lever 81 is pivoted to the position shown in dotted outline, the upper edge thereof cams the member 78 forwardly, as shown, which in turn shifts the cross bars 73 forwardly to relieve the tension of the spring 76 on the casing 7. At its rear end the member 78 preferably carries a notch 82 in which the edge of the lever engages to be retained in position camming the member 78 forwardly. With the bar 73 shifted forwardly, the casing is readily removed by sliding it forwardly until the vertical portions of the slots 74 register with the rivets 70. The forward end of the casing is then pivoted upwardly until the lower edge of the front end wall clears the top of the plate 31. A slight rearward movement then disengages the slots 75 from the screws 72. In replacing the casing the steps are reversed with the slots 75 engaged first.

It is believed apparent from the foregoing that because of the two-part construction of the casing 7 and the ready attachment of the casing to or removal from the arm 7, manufacture and particularly assembly of the stapling device is greatly facilitated. In addition the casing is constructed and mounted to provide with the arm a yieldable passage to prevent jamming and clogging which at the same time provides for the support of the intermediate portion of a staple.

I claim as my invention:

1. In a stapling device an arm providing a channel extending longitudinally thereof for storing a supply of staples, staple ejecting mechanism, and a casing housing the mechanism and forming with the arm a passage through which the staples are ejected, said casing being yieldably secured to said arm and bodily removable therefrom.

2. In a stapling device an arm providing a channel extending longitudinally thereof for storing a supply of staples, staple ejecting mechanism, and a casing housing the mechanism and forming with the arm a passage through which the staples are ejected mounted on said arm for yieldable movement longitudinally thereof and for bodily removal.

3. In a stapling device, an arm providing a channel extending longitudinally thereof for storing a supply of staples, a casing supported on the forward end of said arm and forming therewith a passage through which staples are ejected, means housed within the casing operable to eject a staple through the passage, downwardly opening oppositely extending bayonet slots formed in each side of said casing, means formed on the arm cooperating with said bayonet slots removably to secure said casing and to permit movement thereof longitudinally of the arm, and a tension spring urging said casing longitudinally in a direction rearwardly of the arm.

4. A stapling device comprising, in combination, an elongated base having staple clinching means mounted on the forward end thereof, a longitudinally extending arm pivotally mounted on the rear end of the base providing a channel extending longitudinally of the arm for storing a supply of staples, means for yieldably securing a casing on the forward end of said arm, said casing forming with said arm a transverse passage through which staples are ejected, a plunger reciprocable in said casing, a plunger blade carried by said plunger and operable to force a staple through the passage, and means for urging the supply of staples toward the passage, said casing and the operating mechanism housed therein being disengageable for removal therefrom by a sequence of longitudinal and upward movements.

5. In a stapling device, an arm providing a channel extending longitudinally thereof for storing a supply of staples, a casing supported on the forward end of said arm and forming therewith a transverse passage through which staples are ejected, a plunger reciprocable in said casing and projecting through the top thereof for actuation, a plunger blade carried by said plunger and operable to force a staple through said passage, a compression spring bearing at one end against said plunger and at the other end against said casing, and yieldable cooperating means on said arm and said casing having a resilient element for removably securing the casing on the arm, said cooperating means being separable by a succession of to-and-fro movements of the casing against the force of said resilient element.

6. A stapling device comprising, in combination, an elongated base having staple clinching means mounted on the forward end thereof, an arm pivotally mounted on the rear end of the base providing a channel extending longitudinally of the arm for storing a supply of staples, a casing supported on the forward end of said arm and forming therewith a transverse passage, intersecting the supply channel, through which

staples are ejected, staple ejecting mechanism housed in said casing, oppositely disposed rivets projecting laterally from said arm near the forward end thereof, oppositely disposed screws projecting laterally from the arm and mounted for limited movement longitudinally thereof, downwardly opening, forwardly extending bayonet slots formed in said casing for cooperation with said rivets and downwardly opening rearwardly extending bayonet slots for cooperating with said screws for mounting said casing on said arm for yieldable movement longitudinally thereof and for bodily removal, and a tension spring anchored at one end in said arm and at the other end operatively associated with said screws to resist movement of the casing longitudinally off of the end of said arm.

7. In a stapling device, an arm providing a channel extending longitudinally of the arm for storing a supply of staples, a casing mounted on the end of said arm for yieldable movement longitudinally thereof and for bodily removal therefrom, staple ejecting mechanism housed in said casing, and means for relieving the tension on said casing to facilitate removal thereof.

8. In a stapling device, an arm providing a channel extending longitudinally thereof for storing a supply of staples, a casing mounted on the forward end of said arm for yieldable movement longitudinally thereof and for bodily removal therefrom, said casing forming with the arm a transverse passage through which the staples are ejected, staple ejecting mechanism housed in said casing, a spring urging said casing longitudinally onto said arm, and a lever for relieving the tension of said spring on said casing to facilitate removal thereof.

9. In a stapling device, an arm providing a channel extending longitudinally thereof for storing a supply of staples, a casing mounted on the forward end of said arm and forming therewith a transverse passage through which the staples are ejected, staple ejecting mechanism housed in said casing, oppositely disposed laterally projecting rivets fixed in said arm near the forward end thereof, a longitudinally movable member projecting laterally from opposite sides of said arm, bayonet slots formed in said casing for cooperation with said rivets and said member removably and longitudinally movably to secure said casing, a tension spring anchored at one end in said arm and at the other end engaging said member to urge said casing longitudinally onto the arm, a channel member slidable in said arm and at one end abutting said movable member, and a lever carried by said arm and operable to cam said channel member forwardly of the arm to shift said longitudinally movable member and thereby relieve the tension of the spring on said casing to facilitate removal thereof.

10. In a stapling device an arm providing a channel extending longitudinally thereof for storing a supply of staples, staple ejecting mechanism, and a casing housing the mechanism and forming with the arm an outwardly tapering transverse passage narrower along its longitudinal center line than along its edges to support the intermediate portion of the staple against buckling, said casing being mounted on said arm for yieldable movement longitudinally thereof and for bodily removal.

11. In a stapling device an arm providing a channel extending longitudinally thereof for storing a supply of staples, staple ejecting mechanism, a casing mounted on the arm housing said ejecting mechanism, the lower end of the front end wall of said casing being bent inwardly toward said arm to form therewith an outwardly tapering passage for supporting the intermediate portion of a staple ejected through the passage, and cooperating means on said arm and said casing removably securing said casing for yieldable movement longitudinally thereof.

12. In a stapling device an arm providing a channel extending longitudinally thereof for storing a supply of staples, a casing adapted to be mounted on the forward end of said arm comprising a pair of side plates having inwardly projecting flanges forming the front and rear walls of said casing, the front flanges forming with the end of said arm a transverse passage through which staples are ejected and being bent inwardly to make the passage outwardly tapering and with a convex wall to support the intermediate portion of a staple, staple ejecting mechanism housed in said casing, cooperating means on said arm and said housing securing said housing for limited movement longitudinally of said arm and for bodily removal therefrom, and a spring urging said housing longitudinally onto said arm.

13. A stapling device comprising, in combination, an elongated base, pads of resilient material disposed below said base at the opposite ends thereof, a single rivet securing each of said pads, an arm pivotally mounted on said base at the rear end thereof and providing a channel for storing a supply of staples, a casing mounted on said arm, mechanism housed in said casing for ejecting the staples, a passage through which the staples are ejected extending transversely of said arm and intersecting said supply channel, and a disk-like anvil rotatably mounted on said base below said casing and having separate means formed therein for bending the legs of a staple toward or away from one another, said means being selectively positionable in operative relation with respect to the ejecting mechanism by rotation of said anvil, and said anvil being secured by and rotatable about the rivet securing the pad at the forward end of the base.

14. A stapling device comprising, in combination, a base, supporting pads disposed beneath the ends of said base, a rivet securing the pad at the anvil end of said base, an arm pivotally mounted on said base at the rear end thereof and providing a channel for storing a supply of staples, a casing mounted on said arm, mechanism housed in said casing for ejecting the staples, a passage through which staples are ejected extending transversely of said arm and intersecting said supply channel, and a disk-like anvil rotatably mounted on said base below said casing and having separate means formed therein for bending the legs of a staple in different directions, said means being selectively positionable in operative relation with respect to the ejecting mechanism by rotation of said anvil, and said anvil being secured by and rotatable about the rivet at the anvil end of said base.

HANS C. STOCKEL.