

Dec. 28, 1937.

W. G. PANKONIN

2,103,551

STAPLING DEVICE

Filed Oct. 18, 1934

3 Sheets-Sheet 1

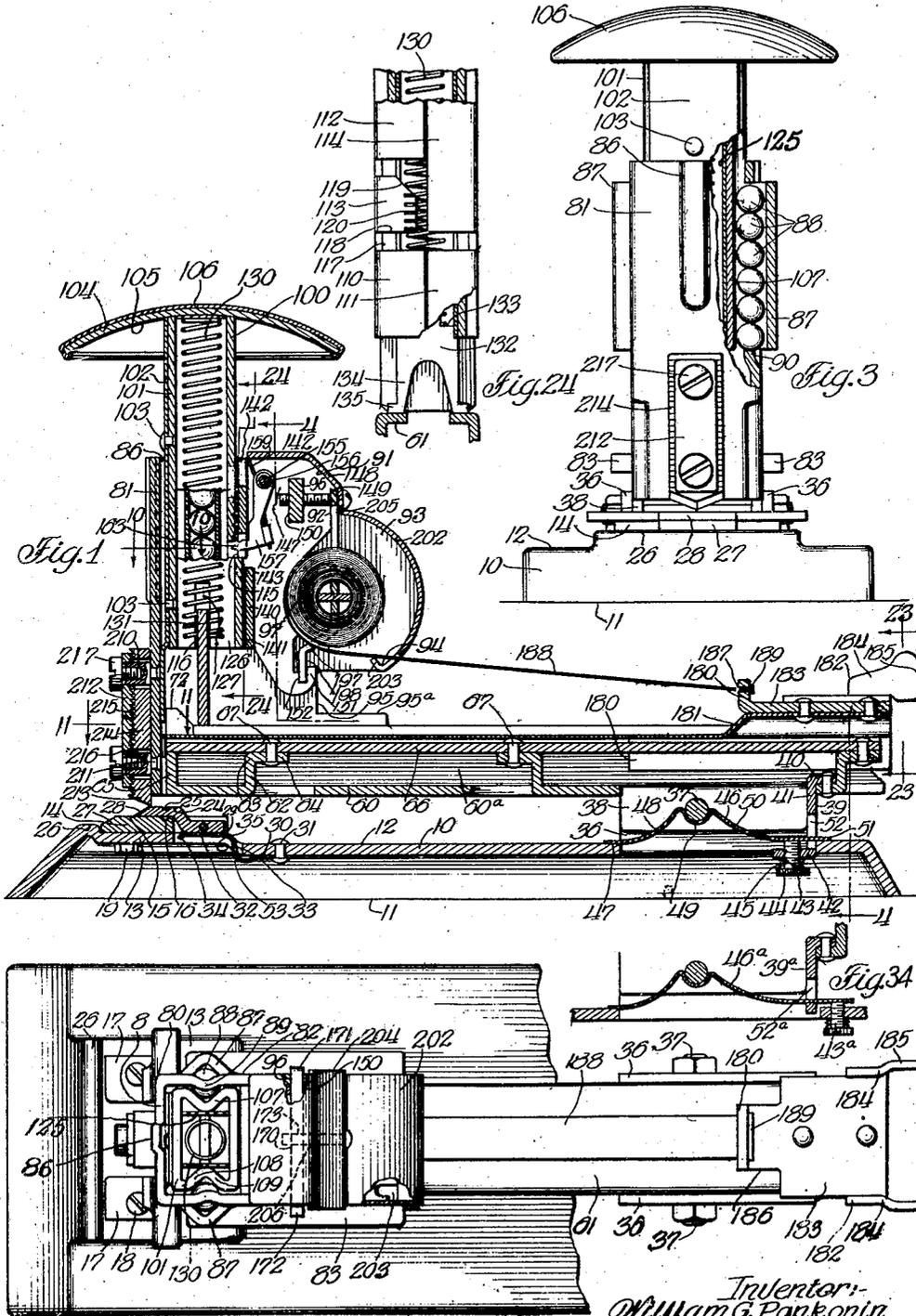


Fig. 2

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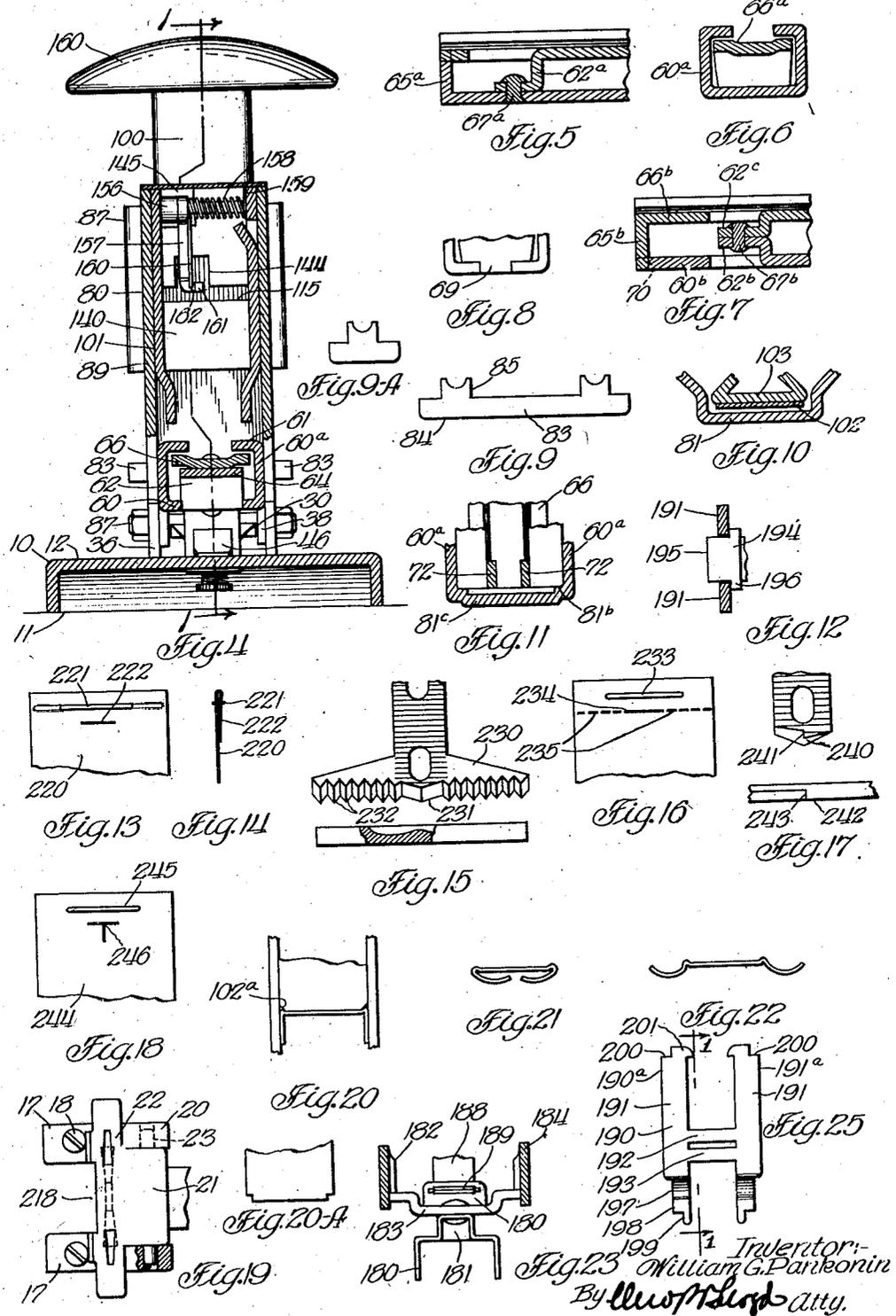
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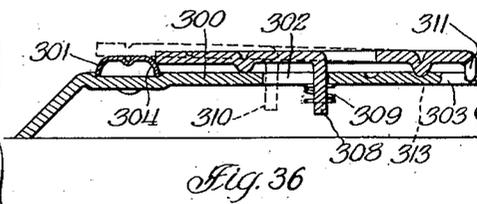
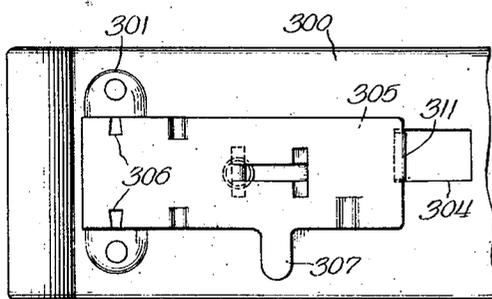
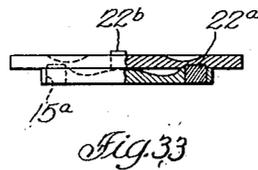
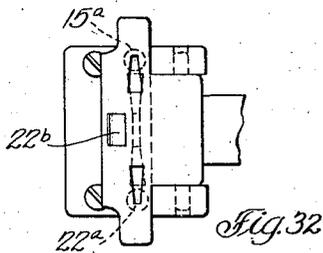
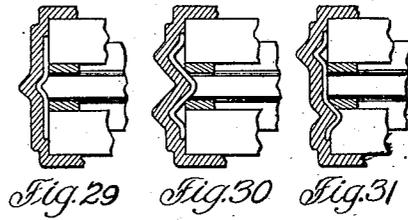
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Filed Oct. 18, 1934

3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

2,103,551

STAPLING DEVICE

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Application October 18, 1934, Serial No. 748,803

33 Claims. (Cl. 1—3)

One of the objects of this invention is to provide a stapling machine having an improved construction of the housing for the staple driving mechanism and an improved construction of the parts included within said housing for providing the support for the staple driving plunger, full stroke mechanism, and follower spring, whereby the plunger and the support members may be readily disassembled from said housing for replacement or repair.

Another object of the invention is to provide a stapling machine having an improved construction of the guiding means for the staple driving plunger whereby the same is accurately and movably supported with a minimum amount of frictional resistance to its operation.

Another object of the invention is to provide a stapling machine having an improved construction of the staple driving plunger and staple driving blade whereby the blade has relative movement with respect to the plunger to lessen the possibilities of fracture of said blade during operation of said machine.

Another object of the invention is to provide a stapling machine having an improved construction of the staple driving blade whereby it aids in preventing the buckling of the bridge portion of a staple during driving thereof.

Another object of the invention is to provide a stapling machine having an improved type of ejection chute wherein rearward support and guiding means is provided for the staple driving blade while in position raised above staples projected into the ejection chute from the staple magazine.

Another object of the invention is to provide a stapling machine having improved means for providing a guide and support for the plunger raising spring.

Another object of the invention is to provide a stapling machine having improved means for securing the housing for the staple driving mechanism to the staple magazine.

Another object of the invention is to provide a stapling machine having an improved construction of the magazine for staples whereby the same can be inexpensively manufactured with a minimum number of parts.

Another object of the invention is to provide a stapling machine having an improved means for supporting the coiled follower spring within the housing for the staple driving mechanism whereby the spring may be readily removed and whereby the tension of the coil spring tends to

maintain the means for supporting the same in position within the housing.

Another object of the invention is to provide a stapling machine having an improved staple deforming anvil providing means for deforming the legs of a staple in a plurality of different forms at the selection of the operator.

Another object of the invention is to provide a stapling machine in which the means for maintaining the staple carrying mechanism and associated driving mechanism spaced from the staple deforming anvil is of improved construction to provide simplicity and adjustability thereof.

A still further object of the invention is to provide a stapling machine having combined therewith an adjustable slitting tool whereby objects are simultaneously stapled and provided with cuts or slits therein adjacent the clinched staple.

These objects and such other objects as may hereinafter appear, are obtained by the novel construction, unique arrangement and improved combination of elements comprising the invention, several forms of which are illustrated in the accompanying drawings, hereby made a part of this application, and in which:

Figure 1 is a view of one form of a stapling machine embodying the subject matter of the present invention, taken on a longitudinal section line with the exception that said line is offset from the center as generally indicated by line 1-1 of Figure 4 and Figure 25 to include a showing of the full stroke mechanism;

Figure 2 is a plan view of the device shown in Figure 1, the handle being removed and a part of the cover sectioned;

Figure 3 is an end elevation partly in section of the same machine;

Figure 4 is an irregular section taken on the line 4-4 of Figure 1;

Figures 5 and 6 are longitudinal and transverse details, partly in section, of a second form of skeleton beam magazine suitable for use in the device shown in Figure 1.

Figures 7 and 8 comprise a longitudinal sectional detail and a fragmentary front elevation of a third form of skeleton magazine which may be used;

Figure 9 is a plan view of a double rivet used for assembling the magazine and the housing;

Figure 9A is a plan view of a single rivet, a pair of which may be used on each side of the housing.

Figure 10 is a fragmentary section on the line 10-10 of Figure 1;

Figure 11 is a fragmentary transverse section on the line 11—11 of Figure 1 the slitting members being omitted for sake of clarity;

Figure 12 is a detail partly in section of the spring magazine follower spring core;

Figure 13 is a plan view of a top end or a bag stapled and slit by the apparatus shown in Figure 1;

Figure 14 is a longitudinal section of a fragment of the bag shown in Figure 13;

Figure 15 is a front elevation of a second form of bag slitter and of the anvil used in connection therewith, the anvil being partly in section;

Figure 16 is a plan view of a bag which has been treated in a stapling device having a slitter and anvil like that shown in Figure 15;

Figure 17 is a fragmentary detail of a third form of slitter and of an anvil for use therewith;

Figure 18 is a plan view of a bag after treatment in a device having a slitter and anvil similar to those shown in Figure 17;

Figure 19 is a transverse plan detail of an anvil having a cutting edge suitable for use with the slitter shown in Figure 1;

Figure 20 is a fragmentary view of a staple driving tool having its corners beveled;

Figure 20A is a similar view of a staple driving tool having each of its corners cut back;

Figures 21 and 22 are side elevations of staples deformed in an apparatus like that shown in Figure 1 and in which the staple driving tool is of the character illustrated in Figure 20;

Figure 23 is a transverse section on the line 23—23 of Figure 1 and illustrating the magazine follower;

Figure 24 is a transverse fragmentary section taken on the line 24—24 of Figure 1; and

Figure 25 is a rear elevation of the magazine follower spring anchor.

Figure 26 is a perspective view of a group of staples cemented together each having a single projection in the bridge thereof;

Figure 27 is a similar view of another group of staples similarly secured together and each having a series of projections in the bridge thereof;

Figure 28 is a similar view of a third group of staples cemented together, each having a forwardly and rearwardly projecting projection thereon;

Figures 29, 30, and 31 are fragmentary transverse sections of staple housings suited for use with the staples illustrated in Figures 26, 27, and 28;

Figure 32 is a fragmentary plan view illustrating a compound anvil in which each anvil has a spacer limiting movement of the staple driver head, and the movable anvil locks with the stationary anvil to prevent lateral movement;

Figure 33 is an end elevation, partly in section, of the movable anvil seated upon the stationary anvil;

Figure 34 is a detail in vertical section of a modified form of base and beam adjustment;

Figure 35 is a fragmentary plan view of a base having thereon a rigidly mounted anvil and an auxiliary anvil slidable thereover longitudinally of the base, the auxiliary anvil being at one side of the rigid anvil;

Figure 36 is a fragmentary elevation of the parts shown in Figure 35, the full lines being with the slidable anvil removed from and below the top of the rigid anvil, and the dotted lines with the slidable anvil above the rigid anvil.

Like reference characters are used to designate similar parts in the drawings and in the following description of the several illustrated embodiments of the invention.

For convenience the various parts of the device as illustrated will be described independently of one another as far as possible and their interrelation pointed out as each new part is considered or in the statement of the operation of the device.

The base

The stapling mechanism is disposed upon a base or platform. The base provides a mounting for an anvil, whether single or compound, and a support for a beam magazine. Between the base and the beam magazine is a spring for retracting the beam magazine after use of the device. Between the base and the beam magazine is an adjusting means which may operate in conjunction with the spring just mentioned. The anvil is at the front of the base and the remainder of the parts mentioned are at the rear end thereof.

The base 10 comprises a rectangular inverted dished member having a lower edge 11 which normally rests upon a desk or other flat supporting surface when used as a stapling device. With the base 10 removed, the device may be used as a tacker. The base 10 has a top flat transverse surface 12 which is generally in the same plane throughout its length but which, (as shown) is upwardly offset at the front of the base as shown at 13 in Figure 1. In the offset section 13 is a permanent anvil 14 which comprises a transverse body 15 in which clenching seats 16 are formed.

At the front of the anvil are sections 17 which extend forwardly and which may be in the form of legs or which may comprise a section as wide as the body of the anvil. Screw holes are drilled through the legs or extensions 17 and bolts 18, or other suitable fastening members are inserted through the apertures into the elevated section 13 of the base 10. The bolts are secured therein in any suitable manner as, for example, by nuts 19 threaded into the shanks of the bolts and engaging the under side of the base 10. Other fastening means, such as rivets, may be substituted for the bolts and nuts.

At the back of the anvil 14 are extensions or legs 20 between which a wing 21 forming a part of a movable anvil 22 may be pivotally connected. When preferred, the movable anvil 22 may be mounted directly upon the raised platform 13 of the base 10. Any other suitable mounting may be substituted so long as the movable anvil 22 may be moved about a pivot to a position over the permanent anvil or to a position removed therefrom to clear the permanent anvil for the reception of staples driven thereagainst by a staple driving head, later to be described. The movable anvil when in usable position registers with the same driving head as the permanent anvil.

In addition to the wing 21 which is pivotally connected at 23 to the permanent anvil 14 (or to the platform 13 of the base 10), the movable anvil comprises an offset section 24 in which staple deforming or clenching seats 25 are formed. That part of the anvil in which the seats 25 are formed is adapted, when in use, to lie flatly upon the body of the permanent anvil 14 in alignment with the staple discharge path in the staple driving head as previously indicated.

Pressed out portions 15a which may be of round, square, or any desired shape, may extend upwardly from the permanent anvil and fit into cavities 22a upon the under face of the movable anvil.

Such fit assists in aligning the two anvils, when the movable anvil is in use (see Figures 32 and 33). The anvils, however, may be aligned by the pivot connection and slotted means shown in Figure 19. The movable anvil member also has a raised portion 22b extending above the face of the anvil. The raised portions or lugs may be pressed from the anvil itself, or they may be formed of added studs or pins. In the clinching action, the sloping portion of the anvil clinching seats causes the staple legs to bend about a point immediately where the staple leg, as it projects through the material being stapled, leaves such material. Since the portions or lugs 15a and 22b project above the upper surfaces of the respective anvils thereby increasing the distance between the material and the sloping portion of the clinching seats, the moment of force required to bend the legs of the staple is increased and the relative pressure required to clinch the staple reduced.

It will also be seen that by spacing the material from the top surface of the anvil, the driving head will also be spaced therefrom. Given a constant thickness of material to be stapled, the proportioning of the portions 15a and 22b will directly affect the shape of the clinched legs of the staple. For example, if it is desired to deform a staple as shown in Figure 22, but with less curve at the ends, it is only necessary to raise the portions 15a and 22b on the anvils and provide a greater clearance space between the driving head and the surface of the anvil. If the curved ends of the staples are to be increased as shown in Figure 22, the clearance space should be reduced. Thus, by varying the height of the pressed out portions 15a and 22b on the anvils, the shape of the ends of the staples may be varied.

At the front of the base 10 and in front of the platform 13 is a more elevated transverse part 26 which rises to a height equaling at least a fraction of the height of the legs 17 of the permanent anvil 14. The front edge 27 of the permanent anvil 14 is beveled and the entire front edge 28 of the movable anvil is beveled in a complementary manner. The part 26 and the several beveled edges just described facilitate the insertion of paper into the throat of the machine when open, the parts described and illustrated comprising no pronounced obstruction in the path of the articles to be disposed on either anvil whichever one is in use.

The movable anvil is maintained in either of its positions, that for operation, or that out of range of the staple driving tool, by a flat spring 29. Other means could be supplied for this same purpose. The spring 29 has a body 30 which extends to the rear of the elevated section 13 of the base 10. Such extension is anchored in the base by a rivet 31, as shown, or by other suitable means.

The forward end 32 of the spring 29 is formed by turning the body upwardly at 33 and then forwardly. The extreme front section 34 of end 32 is turned down. The front section 32 of the spring projects through an aperture 35 in the base 10 provided therefor. One side or the other of the wing 21 of the movable anvil 22 rests upon the section 32 to maintain such anvil in either of its two positions.

The material adjacent the pivoted end of the movable anvil 22 cams the flat upper face 32 of the spring 29 to flex or distort the spring from

out of the path of the anvil as the anvil is moved, the spring 29 urging the anvil 22 in the direction of either of its two positions from either side of a position of dead center. The latter position exists only when the movable anvil is in a vertical unstable position. The turned down edge 34 facilitates the camming movement just described.

At the rear end of the base 10, the top portion thereof is divided longitudinally and the material turned upwardly to provide guides 36 for a beam magazine. Between the guides 36 thus formed is a pivot member 37 which may be a bolt secured in position by a nut. Intermediate the guides 36 and parallel thereto are complementary wings 38 upon a beam magazine.

At the rear of the beam magazine (later to be more fully described) is a Z-shaped member 39 having its upper horizontal section 40 riveted to or otherwise secured to the beam magazine, a vertical section 41 depending downwardly and into the opening in the base between the guides 36 of the base 10, and a lower section 42, such lower section of its member 39 being horizontal and normally parallel with the top section of the base and slightly lower than the top horizontal plane 12 of said base 10.

Extending upwardly through an aperture in said lower section 42 is a thumb screw 43 having a knurled head 44. Between the knurled head 44 and the horizontal section 42 there is disposed about the shank of the thumb screw 43 a coil spring 45. Spring 45 acts as a lock for maintaining the thumb screw 43 in any adjustable position to which screw 43 may be moved with respect to the wing 42 through which its shank projects.

The upper end of the shank of the thumb screw 43 extends above the top face section 42 of the Z-shaped member 39 and engages one section of a flat spring 46 which is employed for retracting the beam magazine after a staple clinching stroke. The spring 46 comprises a front flat section 47 which rests upon the horizontal section 12 of the base 10 beyond the aperture obtained by the formation of wings 36, a curved rising section 48 which extends upwardly to and slightly above the middle line of the pivoting bolt 37, a section 49 curved about the pivot screw 37 at least one hundred eighty degrees and preferably slightly more, a rearwardly sloping section 50 and a rear flat end 51, said rear end 51 extending beyond the aperture made by the folding upwardly of the guides 36 and resting upon the rear flat surface 12 of the base 10.

The flat spring 46 projects rearwardly through an aperture 52 arranged longitudinally in section 41 of the Z-shaped member 39. The aperture 52 extends from the lower extremity of the vertical section 41 thereof upwardly sufficiently to provide clearance for the spring 46 whether the adjusting screw 43 is at one extreme position or at its other extreme position.

The aperture 52 has such height that it allows an extra clearance space, so when the screw 43 has been turned in the Z member its full limit of adjustment, such extra clearance will allow the beam magazine to be elevated by hand a distance greater than its highest mechanical adjustment.

If and when desired, the adjusting screw 43 may be omitted. When the adjusting screw is omitted, the face 42 of the Z member would contact the underneath surface of the flat spring and hold the beam in an elevated position at a fixed distance from the base. A modified adjustment

means is illustrated in Figure 34. The member 39a has no lower step and has the shape of an inverted L. The aperture 52a in the member 39a is the same as in member 39. The screw 43a is threaded into the base instead of the member 39a. The member 39a through which the spring 46a is threaded seats itself against the bottom of said spring. Adjustment of the screw 43a will raise or lower the spring 46a from the base. The member 39a pulling against the spring will thus raise or lower the beam magazine relatively to the anvil.

The aperture 52 in the Z-shaped member 39 combined with the crimping of the spring 46 about the under side of the pivot bolt 37 maintains the spring 46 in longitudinal alinement between the guides 36 during operation of the device.

The beam

The beam for the staple driving head may comprise any suitable core and any suitable staple guide member. In the machine illustrated, three different magazine beams are shown. Each is of what may be called a skeleton structure. The staple guide member in each instance comprises a channel member 60 having inturned flanges 61 at its top edges. The channel member 60, by its flanges 61, extends partly over the bridge of staples in the magazine and completely about the legs of such staples exposing a middle section of the bridge part of the staple between the inturned edges of the flanges 61.

In the form of the invention shown in Figure 1, there may be struck up from the bottom of the channel member 60 at spaced intervals supports 62 comprising first a vertical section 63 and then a horizontal section 64. Supports 62 may be all struck up in one direction or the direction of different supports may be reversed as is shown in Figure 1, in which figure the front and rear tongues 62 project toward the rear of the channel while the intermediate tongue 62 projects forwardly. The number of supports 62 is a matter of choice.

In the form of the device shown in Figure 1, there is a tongue 65 at the front of the channel member which is turned upwardly at a right angle. Such member provides a part of the staple discharge chute or channel, guiding the bridge of the staple at the back edge thereof from its position at entry into the discharge chute to the bottom of the magazine. The bottom of the beam magazine or channel member 60 also comprises the bottom of the discharge chute.

Disposed upon and riveted or otherwise securely fastened to the upstanding tongues 62 is a strip 66 upon which staples ride. The strip 66 is counter-sunk either for its entire length by the formation of a groove therein or at spaced intervals to receive the heads of rivets 67 or other fastening means inserted therethrough and through the horizontal section 64 of each of the tongue members 62. In this manner, the fastening means 67 are positioned out of the path of the staples as they are propelled along the magazine from the loading or rear end thereof to the discharge or front end thereof.

Reversing the direction of one or more of the tongues 62 lends resistance to collapse of the members by a longitudinal relative movement thereof and substantially prevents any such movement under normal strains.

The front end of the member 66 is seated upon

the upwardly turned tongue 65 of the channel member 60 which latter has a central groove for the reception of the grooved portion of the staple supporting member 66.

In the form of the invention shown in Figures 5 and 6 the channel member 60a possesses no upstanding tongues but has an upstanding front end 65a forming a part of the wall of the staple discharge chute. The staple supporting member 66a at spaced intervals therealong has downwardly projecting tangs or tongues 62a, the tongues 62a being of a width less than the width of the channel member 60a and resting upon the inner surface of the closed section of the channel member 60a. Rivets 67a are inserted through the tongues and channel members, 62a, the outer end of the rivet being flush with or countersunk upon the under side of the channel member 60a.

In the form of the invention shown in Figures 7 and 8, both the channel member 60b and the staple supporting strip 66b have tangs 62b and 62c struck therefrom. Tongues 62b and 62c are struck in a complementary direction and a rivet 67b is inserted through the paired and complementary tongues 62b and 62c, such rivet being away from the top surface of the staple supporting member 66b and away from the outer surface of the channel member 60b.

In the form of the invention last referred to the staple supporting member 66b has a downwardly turned tongue 65b forming a part of the rear wall of the staple discharge chute, such turned down portion 65b is substantially as wide as the space between the legs of a staple and terminates in a narrow section 69 inserted in a slot or complementary groove 70 in the front end of the channel member 60b.

The structure shown in Figure 8 may be employed in the structure illustrated in Figure 5. Member 66a may have a slot or other means to receive the upper end of section 65a and fit therewith in a manner to prevent the part 65a from being bent away from the discharge chute. If bent away, this would enlarge the chute and cause the device to jam.

There is thus provided in any one of the three forms of beam which have been described and illustrated, a skeleton beam comprising two members, one member guiding the staples, the other member supporting the staples, and one or the other of the members supplying a section of the rear wall of the staple discharge chute.

At the rear end of the beam in any of the forms of the invention shown, two wings 38 parallel with the side walls of the channel member 60 are struck downwardly from the material of the channel member 60 and through these extend a transversely disposed bolt 37 secured in position by a nut, the bolt 37 also extending through the upwardly disposed wings 36 upon the base member 10. The bolt 37 is a pivot for the movement of the beam magazine. Parallelism of the beam and base is maintained by the contacting of the adjacent faces of the upwardly struck wings 36 of the base 10 and the downwardly struck wings 38 of the channel member 60. This beam and the housing which is secured thereto is guided over the anvil for registering a staple in the course of discharge from the staple driving section of the device with the clenching seats in the anvil, whether the fixed anvil 15 or the movable anvil 22.

In connection with the description of the base member, a means for adjusting the angular position of the beam relatively to the base 10 and

comprising a flat spring 46 has been described. There has been a description of the means for changing such angular position, such means including a Z-shaped member 39 extending downwardly from the channel member 60, the upper horizontal section 40 of such Z-shaped member resting upon the interior surface of the channel member 60 adjacent to the aperture formed in the channel member 60 by the downwardly striking of the material thereof to produce the wing members 38 which serve as beam guides.

In the form of the invention illustrated, the flanges 61 upon the channel member 60 have at their front end upwardly turned ears 72. Ears 72 are in vertical parallelism and the front edge thereof provides guide means for a staple driver member which is of the usual flat spring type. The ears 72 at the front end of the channel 60 act as the rear guide for the driver when said driver is above the staple strip, and said ears align the driver with the ejection chute as the foremost staple is discharged. Thus the ears 72 at the front end of the channel 60 and the tongue 65 also disposed at the front end thereof provide guide means for the staple driver member both above and below the strip 66.

The staple driver housing

At the front end or free end of the beam magazine is a U-shaped housing. The housing 80, as shown, has a straight bottom edge, a straight top edge, similarly shaped rear edges between the top and bottom edges, pushed in and pushed out sections providing guide and supporting means for ball bearings and for other purposes, opposed slots to receive an assembly bar, and notches for the reception of tongues upon a housing cover later to be described.

The housing 80 generally is of a blank of sheet metal folded to provide a front section 81 and identical side sections 82. Through the side sections 82 and through the side walls of the channel member 60 there is inserted an elongated double shanked rivet 83, the exterior portion 84 of which comprises a bridge of almost the length of the side 82 of the housing. At each end of the bridge there are tongues 85 which, as indicated above, project through the housing walls 82 and channel member 60 and are flattened upon the interior wall of channel 60 to avoid interference with the movement of staples within the channel 60. Thus a firm joinder between the channel 60 and the housing 80 is obtained in which four transverse areas of support are obtained. The cross sectional dimension of tongues 85 is an appreciable portion of the side of the housing 80 whereby strength of union is assured. The rivets may be made individual (see Figure 9A) of rectangular or square shape, or they may be round-shaped, or the housing may be spot-welded to the beam. Any suitable fastening means may be employed so long as there is no interference with the free sliding of the staples along the beam magazine. The externally exposed bridge 84 of the connecting member 83 provides a convenient means for gripping the housing 80 when it is desired to manipulate the device independently of the staple driver handle as when used as a tacker.

In the lower section of the front 81 of the housing 80, that is, the portion into which the magazine projects, the front 81 may be forced outwardly to provide the staple path 81c. The path 81c is of the width of a staple and provides

a staple track to the front of the magazine. The front of the magazine at its sides (see Figure 11) may rest upon a narrow section 81b at each side of the housing, the shoulders 81b being of the width of the material of the side members of the channel member 60 which side members in the assembly of the device are forced against sections 81b.

A section 86 of the front wall of the housing may be punched outwardly from the top edge downwardly to provide clearance for a rivet used in securing the staple driver upon the staple plunger body.

The present device has in the sides 82 thereof a punched out section 87, V-shaped in cross section, and providing a seat for steel balls. The balls 88 contact and guide the plunger in its downward and upward movements and reduce the area of the contacting bearing surfaces between the plunger and the housing. The top of the housing above the punched-out section 87 may comprise a substantially straight wall section, or it may be inwardly bent slightly as at 89. The bottom edge of the inwardly punched section 89 is the top extremity of the ball seat and prevents upward escape of the balls 88.

At the lower end of the ball seat, the material of the sides 82 is slit vertically and transversely to provide tongues 90, the tongues 90 being bent inwardly to present a flat end surface diametrically of the spherical surface of the lowermost ball to prevent downward displacement of the balls. Sufficient play is had by the spacing of the balls 88 loosely between the sections 89 at the top of the race and the inwardly directed tongues 90 at the bottom of the seat to permit the balls to freely rotate in their respective positions within the ball seat as the plunger is reciprocated.

The rear edges of the side walls 82 of the housing comprise an oblique section 91, a short vertical section 92, a substantially arcuate section 93 with a notch 94 therein, and a slotted section 95 having its lower edge parallel to and in substantial alignment with the top of the flanges 61. Slots 96 are formed in the material adjacent the tops of the sides and therebeneath are two indented or pushed in parts 97 parallel with the slots 96 but not in alignment therewith.

The staple driver plunger

In the form of the invention illustrated, the plunger 100 comprises a front wall 101 upon which a staple driving tool 102 is fastened. Member 102 may be riveted at spaced intervals therealong by rivets 103 which ride in slot 86. The upper end of the tool 102 rests under a handle section 104 of the plunger. The handle section 104 is attached to the plunger 100 in any suitable manner. The handle is rounded for the purpose of providing a smooth and properly shaped grip means and may comprise an internal member 105 secured to the plunger 100 and a cover piece 106 extending over member 105 and crimped to the under side thereof as shown.

When desired, the staple driving tool may be fastened at the top and loosely suspended upon the lowermost rivet, that is, the rivet may be secured to the plunger but has no head to engage the material of the tool, thus permitting of a slight relative movement of the tool in respect to the adjacent wall 101 of the plunger while the tool is being supported against longitudinal movement along the plunger by the body of the

rivet on the shank of which it is laterally movable.

As shown in Figure 1, the plunger driving tool 102 may be slightly offset to provide clearance, the upper section thereof being more to the rear of the device than the driving section. The housing may be offset or pressed out to provide a clearance space between the driving blade and the housing, so that friction is eliminated and the ball bearings act as the guiding means.

It will be noted in Figure 20 that the corners of the staple driving tool 102 are beveled at 102a. The bevel extends inwardly to a point removed from the ends of the bridge approximately equal to the diameter of the legs of the staple. By removing the corner sections 102a of the staple driving tool, the body thereof is brought to bear upon the bridge of the staple intermediate the legs thereof so that when considerable resistance is offered to the passage of the staple legs through material within the throat of the machine there will be a slight deformation of the staple bridge, such deformation being illustrated in Figures 21 and 22 which show staples driven therefrom. The staple in Figure 21 has closed ends and that in Figure 22 has spread-apart ends. The deformation is somewhat exaggerated in the figures but shows the shoulders or humps which are produced in the bridge of the staple adjacent the legs when resistance is had to the passage of the staple through thick or tough material. Figure 20A illustrates a second way of producing the same result. This is done by notching out the corners of the blade.

In Figures 20 and 20A, the driver has its corners removed. This allows that portion of the bridge of the staple just over its legs to become forced into or seated into the cut away sections of the driver, as shown in Figure 20. This prevents the legs of the staple from backing up. It prevents the material of the legs from flowing into the bridge portion to buckle the bridge under the driving strain of the legs as they are forced into and through material. This method of supporting the bridge from buckling or collapse eliminates the use of the commonly employed spring means or mechanically controlled means for the same purpose.

Integral with the front wall 101 of the plunger are side walls 107. Walls 107 comprise two sections 108 and 109 which sections are complementary to and opposed to the punched out sections 87 of the housing 80. The angular sections 108 and 109 of the plunger project inwardly to provide the opposite walls of the ball race heretofore described.

The rear wall of the plunger at its bottom comprises parallel flanges 110 and 111 depending from the side members 107. The flanges 110 and 111 come into close proximity at their contiguous edges and may actually contact. At the top, the rear wall of the plunger comprises flanges 112, 113, and 114, the flanges 112, 113, and 114 being in a vertical plane forward of the vertical plane of flanges 110 and 111. Because the side walls of the plunger project rearwardly at their bottoms a distance greater than they do thereabove, the flanges 110 and 111 provide a transverse step 115 extending completely across the rear wall of the plunger. Step 115 is a stop means cooperating with an insert member hereinafter to be described. The bottom edge of the plunger is notched at 116 in each side 107 to receive the lowermost section of a spring guide, also later to be described.

Flange 113 is separated from flange 110 by slot 117 and has a horizontal bottom edge 118 and an oblique top edge 119, the material between the top edge and the bottom edge having teeth 120 therein. Above the top edge 119 of flange 113 is a triangular space which extends into a substantially rectangular space between flange 113 and flange 114. Flange 112 defines the top of the triangular space and flanges 112 and 114 may contact at their contiguous edges.

Within the plunger 100 is a spring housing 125. This may comprise a strip of relatively thin material folded into a U-shape. The closed section of the U is at the top of the plunger and may rest upon the under side of the driving handle. It may be riveted or otherwise fastened if desired.

Each leg 126 of the member extends downwardly of the plunger at the side thereof, fitting snugly upon the interior face of the side walls of the plunger. At the bottom of each leg is a slot 127 in alinement with the notches 116 at the bottom of the plunger, each slot 127 extending upwardly of the leg 126 a distance equal to the height of the bifurcated end of a spring guide member shortly to be described. In the form of the spring housing illustrated, the width of the legs 126 at the bottom is greater than at the top to compensate for the difference in plunger depth at the top and bottom of the device.

Within the plunger 100 is a coil spring 130. The upper end of spring 130 engages the closed section of the spring guide housing 125 while the lower end thereof extends over the leg 131 of an inverted Y-shaped member 132 comprising the spring guide member. The spring 130 rests upon shoulders 133 formed adjacent the bifurcations of the spring guide member 132, the bifurcations 134 terminating at the bottom of the device in projecting lugs 135 and which are of a width equal to the width of the plunger 100, the lugs 135 resting upon top of the flanges 61 of the magazine guide member 60. Shallow slots to receive the ends of the spring guide member may be formed in flanges 61 but these are unnecessary.

The main body of the bifurcated section of the spring guide member has parallel edges which engage the interior side walls of the plunger extending upwardly in the slots 127 in the spring guide housing member. In this manner, the spring 130 is maintained against collapse or buckling and made to exert its full force in a unidirectional manner at all times.

The spring guide member 125 prevents the Y-shaped member 132 from turning and dropping between the flanges of the magazine guides. It thus prevents interference with the staples. The spring about the stem of the Y-member and the slots of the guide member maintain the Y-member from displacement within the plunger. When desired, the spring guide member 125 may be eliminated and the notches 116 in each side 107 of the plunger may be carried upward. The Y-shaped member 132 may thus be guided from turning and displacement by the plunger slots 116 and the housing walls. In such a structure, the spring would be guided by the inside walls of the plunger and by the stem of the Y-member.

The full stroke mechanism

In the present device, the full stroke mechanism in its entirety is disposed upon a removable rear wall 140 of the housing. The wall 140 may provide a bearing surface for the rear wall of the plunger. When the member 140 is used as such, the ball bearings are removed and the plunger

possesses a sliding fit within the housing walls.

The member 140 supporting the full stroke mechanism comprises two flat vertical walls 141 and 142 parallel one to another and separated by a transverse slot 143 which extends into the flanges of the member. The lower wall 141 is rearwardly offset from the upper wall 142. The upper wall 142 at its top edge and at its lower edge has rectangular slots 144 and 145 therein, the lower notch 144 providing a space for the movement of a pawl into and out of engagement with the teeth 120 upon the rear wall of the plunger 100. The upper notch 145 provides clearance for the pawl mounting means.

Integral with the walls of the plunger guide insert member 140 are side members 147 which project to the rear of the housing. The upper extremity of the side members 147 is parallel with the top of the wall 142. The side walls at the top are of greatest width and at 148 slope obliquely rearwardly in a complementary parallel relationship to the wall 91 of the housing member 80.

There is a shouldered section 149 upon the rear edge of side members 147 which cooperates with a magazine follower spring anchor member later to be described.

Through the wider section of the side walls 147 are slots 150 which are complementary to the slots 96 in the side walls of the housing.

The back edges of the side members 147 extend downwardly beyond the lower edge of the transverse bearing wall 141 and terminate in two opposed inwardly offset hook like sections 151, the rear upper face of which are horizontal and notched, the notches 152 being open from above. The straight edge upon the rear of the side members 147 between the wide section and the hook sections 151 engages the inwardly projecting parts 97 in the housing side walls to determine the position of the insert member 140, the indentations 97 providing anchoring means for the insert member 140 and preventing any rearward motion thereof so that the member 140 accurately guides the plunger.

Between the sides of the insert member and transversely of the member 140 is a shaft 155. At one side thereof and in registry with the upper notch 145 in the wall 142 is a spacing washer 156. Immediately adjacent thereto is the pawl 157 which is loose upon the shaft 155.

Between the pawl 157 and the opposite wall 147 and surrounding the shaft 155 is a coil spring 158 one end 159 of which is anchored upon the wall 142. The other end 160 is parallel to the body of the pawl 157 and engages the side of a laterally projecting stirrup 161 on said pawl 157 there being a groove 162 across stirrup 161 to maintain the end of the spring against displacement.

Normal to the stirrup 161 the pawl 157 has a tooth 163 the end of which is adapted to engage in the teeth 120 in the rear wall of the plunger. One side of the lower rectangular slot 144 arrests the lateral movement of the pawl 157 in one direction, such member being freely displaceable in the opposite direction within the confines of slot 144 while being concurrently movable about the shaft 155 on which it fits loosely.

When the plunger is in its uppermost position, the lower offset section of the plunger wall at step 115 engages the upper offset wall 142 of the insert member, the contact of the two walls at their offset sections limiting the upward movement of the plunger. Whether the insert mem-

ber 140 is closely fitted to the plunger to act as a rear guide for the plunger, or there is a clearance space between the members and the ball bearings act as the guiding means for the plunger, the offset section 142 acts as a stop for the plunger.

When in such position, the pawl 157 is out of engagement with the teeth 120 on the plunger wall. Immediately a downward movement of the plunger is made, the pawl 157 is moved by a camming action first to the rear, and then along the back surface of the plunger wall and into and over the teeth 120 one by one. If the downward movement of the plunger is arrested, the pawl 157 will engage one of the teeth 120 upon the plunger wall to arrest a retractile movement. The plunger will remain locked against upward movement until a full down stroke is completed.

As the plunger proceeds downwardly, the pawl 157 travels over the entire rack of teeth 120. At the completion of the stroke, the pawl 157 drops into the horizontal slot between flanges 112 and 113 in the plunger rear wall. As the stroke of the plunger is completed, there is only one direction in which the plunger may be moved and that is upwardly. Because of the coil spring 130 within the plunger 100, the plunger 130 will retract the instant pressure is released therefrom. As it retracts, the pawl 157 is removed angularly by the oblique edge 119 away from the teeth 120 and guided into the vertical slot between flanges 113 and 114 and into the slot just above step 115 where it remains until the close of the upward movement of the plunger.

It then moves into alignment with the teeth by lateral projection in the slot between flanges 110 and 113. The pawl 157 during these movements rotates about its axis, the shaft 155, and angularly thereto. The mounting of the pawl 157 is such that it is freely movable in the cycle just described to make each downstroke complete and with complete freedom on the upstroke after the downstroke is complete. The pawl cannot again aline itself after a full down stroke has been made with the teeth 120 until a complete upstroke is completed so that once a full down stroke is completed, the device will remain inoperative until a full upstroke is had at which time a staple is discharged from the magazine into the magazine discharge chute.

The shaft 155 upon which the pawl 157 is mounted is held into place in the member 140 by the housing walls 81 as the member 140 is inserted therebetween. The shaft 155, however, including the full stroke mechanism, may be assembled directly upon the housing walls 81 and an opening cut into the side walls of the insert member 140 to clear the shaft 155. The former construction is preferred because the full stroke mechanism may be assembled upon the insert member 140, and the follower spring and its mounting, later to be described, may also be assembled upon such insert member. The unit including the insert member, the full stroke mechanism, and the follower spring may then be inserted between the side walls of the housing.

The insert member 140 acts as a spacing member for the housing walls. As previously stated, it may or may not form the rear bearing for the plunger. It does form a stop for the plunger in its upward movement, a mounting for a full stroke mechanism, and also a mounting for holding a member having a spring coiled thereabout to operate a staple follower.

In the assembly of the device, the plunger is first positioned with the spring 130 therein and the spring guide 132 is disposed upon the flanges 61 of the magazine. The spring guide is then made to enter the slots within the spring housing 125 to prevent it from turning. Insert 140, including the full stroke mechanism, and which may or may not include the follower spring and its mounting, is next positioned by moving it inwardly of the device at the upper section of the housing so that the vertical rear edges thereof seat to the front of the lugs 97 with the top edges of the insert member and the top edges of the housing registering.

The inwardly offset portions of the side walls of the insert member 140 facilitate the insertion of said member 140, the offset portions clearing the indented lugs 97 of the housing walls 82.

When in this position, an assembly bar or bolt 170 is inserted through the registered apertures 96 and 150, the member 170 having a beveled front end 171 to facilitate insertion. At the other end 172, the member 170 is enlarged to limit inward movement and to provide a handle. At the center of the body of the assembly bolt 170 there is a threaded hole 173, the purpose of which will later appear.

Magazine follower and spring

The magazine follower and magazine spring may be conveniently assembled one with the other and sold as a separate and replaceable unit. The follower itself comprises a channeled member 180 having an offset section 181 at its rear. The flanges and cross section of member 180 ride on member 66 and are held in position by member 60 and flanges 61. To the offset section 181 a handle 182 is riveted. The handle comprises a front transverse body part 183, side members 184 that extend rearwardly to provide grip pieces 185, and a forwardly extending narrow section 186 having a transverse horizontal slot 187 in which the end of a magazine spring 188 is anchored by a staple or other suitable means after being folded upon itself and inserted through the slot 187. A staple 189 similar to that employed in the device with its ends clenched provides a satisfactory anchor.

The other end of the spring 188 is coiled about an anchor member 190 which comprises side members 191 having two parallel cross bars 192 and 193. The end of the spring 188 may be inserted between the two cross bars 192 and 193 and fastened in any suitable manner customarily used by those skilled in the art. The spring is then coiled about the outer surfaces and edges of the cross members 192 and 193.

In place of the annular member, a T-shaped member 194 may be inserted through the slot between the two cross members 192 and 193 in conjunction with the end of the spring 188 as shown. The stem 195 of the T-shaped member forms a rest for the inner lamination of the spring and the cross bar 196 of the T-shaped member forms a core about which the spring 188 is coiled.

The spring anchor 190, in its assembled position, has a substantially vertical body comprising the side members 191 and a forwardly disposed lower end divided into three sections 197, 198, and 199. Section 199 is narrower than sections 197 and 198. The forwardly projecting oblique section 197 is of reduced breadth and terminates in the downwardly projecting sub-

stantially vertical section 198 at the end of which are the tongues 199. Tongues 199 are inserted between the material of the hook-shaped part 151 of the insert member 140, a section of the part 198 being disposed in the vertically extending notches 152 in the hook-shaped part 151.

The top edge of the spring anchor 190 at its corners has shoulders 200 adapted to be inserted under the shoulders 149 of the insert member. At the top of the spring magazine anchor 190, there are two inwardly directed tongues 201 which are spaced apart a distance less than the width of the spring 188. The tongues 201 present barriers against the escape of the spring 188, and thus the spring 188 may not unwind once it has been coiled. The space between the lugs or tongues 201 is such that the convolutions of the spring may be inserted therebetween one or more at a time when slightly twisted. The outer surface of the lugs 201 is beveled to facilitate the insertion of the spring from either direction.

The upper portion of the spring support 190 is adapted to rest upon the edges in the insert member 140, the upper outer edge of the spring holding member 190 being adapted to be seated under the shoulders 149 when the lower end of the spring support member is disposed in the hook-shaped sections 151 of the insert member, the shoulders maintaining the spring support member 190 against vertical displacement.

The support member 190 may be guided laterally by its shoulder parts 199—200 interfitting with the insert member 140, or by its outer edges 190a, 191a fitting between the housing walls 82. Under the influence of the coiled spring 188 the member 190 tends to rotate in a counter-clockwise direction about the shoulder parts 199 and with a force greater than the resulting rearward lateral pull placed on the cross bars 192—193 when the free end of the spring is pulled rearwardly. Thus, by hooking the shoulders 199 within the hooks 151, the upper shoulders 200 will snap forwardly into place and nest within the shoulders 149 on the member 140 to maintain the member 190 in its proper place without other fastening means. To remove the member 190, the top portion is tilted rearwardly until it has cleared the shoulder 149, and then the member may be lifted upwardly and out of the hook portions of member 140.

The side members 184 of the staple follower are in parallelism with the side walls of the housing and are adapted to be drawn along the beam magazine as it is emptied until in contact with the material comprising the slotted part 95, such engagement arresting the advancing movement of the follower 180 with the front end of the staple follower 180 at the end of the magazine beam but not depending into the staple discharge path or chute.

The housing walls 82 extend upwardly and above the guide member 60 of the magazine at 95a. In loading staples into the magazine, the follower is withdrawn from the magazine and placed between the housing walls at 95a. This prevents the follower from slipping from the top surface of the flanges 61, and also prevents the edge of the follower entering the space between the flanges 61 and interfering with the staple track as the staples are being loaded on said track.

To complete the assembly of the device, a cover plate 202 is secured upon the housing. The cover plate 202 comprises a body shaped at its

edges to be complementary to the edges of the side of the housing upon which it rests. At its lower end it has two inwardly projecting tongues 203, one at each side. The tongues 203 comprise a wide and short section which is adapted to be inserted into the notches 94 in the housing and a narrow and long section which projects therebeyond and engage at one edge the interior of the housing to prevent lateral displacement of the cover at its bottom.

Adjacent the top of the cover and upon the oblique section thereof are ears 204 which are folded inwardly to fit snugly over the oblique section 91 in the side walls of the housing. The ears 204 facilitate positioning of cover upon the housing member and prevent lateral movement thereof at the top. For assembly purposes, the ears 204 aid in positioning the cover and prevent the side walls of the housing from spreading.

An aperture 205 in the vertical section of the cover is in registry with the threaded hole 173 in the assembly bar 170. A screw 206 may be inserted through aperture 205 and into threaded hole 173. When so inserted and run home, the screw 206 firmly secures the cover plate in position and prevents disassembly of the device.

The cover plate, when locked into position, maintains the member 190 against accidental displacement. The holding means for the cover locks the entire mechanism and the parts within the housing 81 (except the magazine) in assembly. The assembly bar 170 may be round or square shaped and it may be made of tubing or other material shaped to hold the insert member 140 into position.

The slitter

As shown in Figure 1, the stapling machine may be supplied with a slitting member. Such member comprises two spaced laterally projecting and vertically aligned bosses 210 riveted to the outside of the front wall 81 of the housing by rivets 211 countersunk to prevent interference with the staple driving tool. Slidably secured for lateral movement only along the bosses 210 is a positioning rack 212. A slitter member 214, having its lower end provided with a cutting edge or blade 213, is carried by and vertically adjustable along the bosses 210 between the positioning rack 212 and the wall 81 by means of elongated slots 216 contained therein. As indicated at 215, the rear face of the positioning rack 212 and the forward face of the slitter member 214 are provided with complementary racks or interlocking teeth. It will be seen that with the positioning rack 212 pressed inwardly against member 214, the interlocking teeth 215 will prevent vertical movement of the member 214 with respect to the wall 82, but upon moving the positioning rack 212 laterally away from the wall 82 vertical adjustment of the member 214 is permitted. The lateral movement of positioning rack 212 is controlled by screws 217 threaded in the bosses 210. Upon operation of the plunger to drive a staple against the anvil, the beam will be depressed so that cutting edge or device carried by the slitter member 214 will then be forced into engagement with an appropriate shearing edge carried by the anvil or base thereby causing slits to be cut in the same material through which the staple is being driven.

As shown in Figure 19, a shearing edge 218 is provided upon the front body section of whatever anvil is used in the device. The edge 218 normally is transverse of the base of the ma-

chine and in registry with the complementary straight back edge of the slitter blade 213.

A plurality of slitting members are shown. That in Figure 1 provides a slit parallel to the inserted bridge of a staple, the relative position of the staple and of the slit being shown in Figure 13. In that figure, there is a bag 220 the end of which has been folded over as is shown in Figure 14, the folded-over section being held in position by the staple 221, and the slit 222 extending through the body of the bag and through the folded-over section to provide means for readily hanging the bag.

In Figure 15, another form of slitter is illustrated. The slitter 230 comprises a main slitting member 231 and a plurality of smaller slitting members 232 spaced apart one from another. Such member produces upon a bag with a folded-over end the effect illustrated in Figure 16, in which 233 is the clinching staple, 234 is the long slit and 235 are the short slits. The end of such a bag may be readily torn from the body thereof for the purpose of opening, the long slit 234 providing means for hanging the bag.

In Figure 17, another form of slitter and a complementary anvil are illustrated. In such form of slitter, there are two penetrating sections 240 and 241, one at substantially a right angle to the other. In the anvil complementary thereto there are two slitting edges 242 and 243, one transverse of the base and the other longitudinally thereof. When such slitter and anvil are employed, a result such as is illustrated in Figure 18 is obtained. In said figure 244 indicates a bag having in back thereof a turned under section, 245 is a staple securing the turned-over section against the body of the bag, and 246 is the T-shaped slit which is obtained by the use of the slitter and anvil shown in Figure 17.

Figures 26, 27 and 28 illustrate new types of staples and Figures 29, 30 and 31 show in cross-section discharge chutes suited for use therewith with a staple of each of the types mentioned. The staples disclosed in Figs. 26, 27, and 28, form a part of a divisional application Serial No. 39,247, filed September 5, 1935, by William G. Pankonin, for Staple and staple strips. Each staple has its bridge portion formed laterally to correspond with the shape of the discharge chute. There may be a slight difference between the shape of the staples and the shape of the discharge chute at the lower portion of the latter to cause a slight friction upon the staple and hold it from accidental displacement from the chute. Only a staple shaped to correspond with the discharge chute may be used. If a straight sided staple or any other shape used other than the shape of the chute, it will be cut into pieces by the driving tool which corresponds in shape to the chute. The staple thus would be made useless. The staples A, B, and C shown in Figures 26, 27, and 28 are cemented together in the usual manner. It will be noted that by forming the bridge portion as above described the effective width, i. e. total space contained between two parallel planes touching the outermost side surfaces of the bridge portion, is increased without materially increasing the amount of material in the staple. This provides for a more stable engagement between the driving tool and the bridge of the staple aiding in maintaining the legs in vertical alignment with the driving tool during the driving operation. Further, the lateral interfitting of the staples aids in preventing

misalignment when assembled into strip formation.

To form the modification of the ejection chutes as shown in Figs. 29 to 31, inclusive, the slitting mechanism illustrated at 212, 214 in Fig. 1 is omitted from the front wall 81 of the U-shaped housing 80. The front section 81 of the housing (Figs. 1, 2, and 3) is then formed with a centrally located, vertically extending, V-shaped forwardly faced indentation (see Fig. 29) extending from the bottom of the section 81 to a point opposite the bottom of the plunger 100 when the latter is in its raised position. The front edge of the strip 66 is provided with a V-shaped projection (see Fig. 29) complementary to and spaced from the indentation formed in section 81, the spacing being substantially equal to the thickness of the bridge of staples for which the machine is designed. A similar complementary projection in vertical alignment with the projection in the strip 66 is formed and extensive of the tongue 65 at the front of the channel member 60. The staple driving tool 102 is provided with a vertically extending centrally located V-shaped indentation and projection complementary to the projections and indentation above referred to. This extends from the driving edge to the point on the driver adjacent the bottom of the plunger 100. To form the structure shown in Fig. 30 substantially the same modification of the structure described with respect to Fig. 29 and applied to the parts shown in Figs. 1, 2, and 3 is followed. In place of a single V-shaped indentation there are three indentations, the central indentation facing rearwardly and the symmetrically positioned side indentation facing forwardly. It should be noted that in addition to the changes noted above, it is necessary to extend the centrally positioned and rearwardly facing indentation in the driving tool 102 upwardly from the bottom edge of the plunger to a point distant therefrom equal to the distance of travel of the plunger during a complete down stroke. In connection with the above, the forward wall 101 of the plunger 100 is likewise formed with a centrally positioned and rearwardly facing indentation coextensive and complementary with that formed in the driving tool 102 above the bottom of the plunger. This is necessary to provide clearances between plunger tool and housing. In forming the modification shown in Fig. 31, the front wall section 81 has to one side of its vertical center line a forwardly faced indentation and symmetrically positioned on the other side of the vertical center line a rearwardly faced indentation. The indentations are formed to the same extent as that described in relation to Figs. 29 and 30. Likewise the front end of the strip 66 and the tongue 65 are provided with a projection and an indentation in proper spaced alignment and complementary with the respective indentations in the wall 81. In addition, the forward end of the flange 81 is provided with an indentation in alignment with the indentation in tongue 65 and strip 66. As described with respect to the structure of Fig. 30, the forward wall of the plunger 101 has an indentation coextensive and complementary with the rearwardly facing indentation formed in the driving tool 102, it being remembered that with respect to the rearwardly facing indentation it must extend vertically from the driving edge of the tool to a point above the bottom edge of the plunger equal to the length of the down stroke of the plunger.

When a staple having its bridge formed lat-

erally to conform with the indentations and projections of any of the modifications shown in Figs. 29 to 31 inclusive is being driven, any tendency of the metal comprising the legs to flow into the metal comprising the bridge will be prevented without buckling the bridge. This is because the compressive forces set up in the bridge will occur, due to the lateral deformations, at points more closely spaced than in the case of a straight bridge of a staple having its legs similarly spaced. Hence the tendency to buckle is lessened. Moreover, the interfitting of the lateral deformations on the bridge of the staple with the indentations of the discharge chute will effectively, by reason of friction therebetween, prevent the central portion of the bridge from bending downwardly in advance of the driving tool during the driving action.

Staple A comprises a bridge having an offset projection which extends forwardly (see Figure 29). Such projection may be at the center or at one side of the center. The staple may be of bent wire or it may be stamped from sheet material.

In staple B the bridge has a number of projections thereon and it is designed for use in a chute like that shown in Figure 30.

Staple C has two projections, one forwardly extending and the other rearwardly extending. Such staple is reversible in the machine (Figure 31); that is, strips may be fed in with either end of the strip first.

Figures 35 and 36 illustrate a new combination of anvils. Base 300 has thereon a permanent anvil 301. The clenching seats in anvil 301 may be for bending the legs of the staple inwardly. The base 300 has slots 302 and 303 therein. The rear wall 304 of anvil 301 preferably is sloping as shown.

A sliding member or anvil 305 is mounted on base 300. Member 305 at its front end has clenching seats 306. These are disposed at the edges of the member 305 and are adapted to spread the legs of a staple. The seats 306 are short and the ends of the legs of a staple ride out of the seats as they are deformed to make room for the upper portions of the staple legs which rest in such seats at the termination of the clenching operation. The bottoms of seats 306 are offset from the adjacent material of rigid anvil 301 so as not to interfere with the clenching operation and to control the shape of the staple. A clenched staple in seats 306 has its legs projecting well beyond the lateral edges of member 305.

Member 305 has at one side (or both, if preferred), a finger piece 307 which facilitates movement of the member longitudinally of the base 300. Finger piece 307 also assists in lifting the member or anvil 305 from its inoperative position shown in full lines in Figure 36 to its operative position shown in dotted lines in the same figure.

A T-shaped section 308 of material of the member 305 is cut from the body thereof and bent downwardly into the slot 302. Beneath the base 300, a spring 309 encircles the upper part of section 308, engaging the under surface of base 300 and being held in position by the enlarged end 310 of section 308.

At the rear end of member 305 is an extension 311 which projects downwardly into slot 304 to limit forward and backward movement of member 305. Forward movement of member 305 positions clenching seats 306 in registry with the staple discharge chute of a staple driving head mounted on base 300, but not shown in Figures

35 and 36. As generally indicated at 313, the member 305 may be provided with a projection selectively fitable into a plurality of recesses formed in the top of base 300 for the purpose of maintaining the member 305 in either its operative or inoperative positions. The spring 309 holds the member 305 resiliently upon base 300 permitting the member 305 to ride away from the recesses and upwardly upon and over the rear wall 304 of anvil 301 to render anvil 301 inoperative while making movable anvil 305 effective.

What I claim is new and desire to secure by Letters Patent of the United States is:

1. In a stapling machine, a base, a fixed anvil in said base, a second anvil pivoted transversely of said base for movement into and out of operative position, and a spring disposed longitudinally of the base and engaging the second anvil to maintain it in and out of operative position.

2. A stapling machine comprising a base, a beam magazine, a transverse member for pivoting said magazine to said base, and a flat spring intermediate said base and beam, said spring intermediate its ends being biased by said transverse member and having its ends normally resting against said base, and means providing a lost motion connection between one end of said spring and said beam magazine.

3. In a stapling machine, a base, an anvil, a beam magazine, a flat spring between said base and magazine and disposed longitudinally of the base, a member depending from said beam and engaging said spring, and means on said depending member for adjusting the engagement between said spring and said depending member to vary the distance between said anvil and said beam magazine.

4. A staple magazine for use in a staple machine having a beam magazine, and comprising a channel member, and a strip, the end of said magazine comprising an angularly disposed section of one of said members, and there being between said members spacing and supporting tongues struck from the material thereof.

5. A staple deforming tool comprising a deforming member having a width approximating that of a staple and a thickness approximating the thickness of the staple, said tool having a driving end of the width of the staple between the legs thereof, the corners of said tool being removed to allow the end portions of the bridge portion to seat therein to prevent said bridge portion from buckling or bending as the legs of the staple are driven into material or clinched.

6. In a staple driving machine, a hollow plunger housing, a spring in said housing, and a spring basket between the plunger walls and said spring, said basket being coextensive with the plunger walls and movable therewith.

7. A plunger for driving staples and comprising a member having spaced-apart walls forming a hollow shank, a U-shaped housing in said shank, a spring within said housing, and a spring guide extending upwardly into said plunger and forming an interior guide for said spring, said housing and said guide having interfitting and relatively movable parts.

8. A stapling machine comprising a housing having a front wall and side walls, a plunger in said housing, a removable insert member fitted between said side walls and forming a rear wall for said housing, and a pawl resiliently carried

by said insert member and forming an element of a full stroke mechanism.

9. A stapling machine comprising a housing, a plunger in said housing and having teeth thereon, and a rear insert member arranged transversely of said housing and having a pawl pivoted therein for engaging said teeth said pawl being movable laterally of said teeth to cause disengagement therefrom.

10. A stapling machine comprising a housing, a plunger in said housing, an insert member in said housing, and a full stroke mechanism mounted on said insert member, said plunger and said insert member having opposed complementary offset sections providing a plunger stop device.

11. A stapling machine comprising a housing, a magazine spring, a support for said spring comprising an H-shaped member, said spring being coiled about the cross bar in said member, means in said housing for holding the lower end of said H-shaped member, and a shoulder in said means to receive the other end of said H-shaped member to prevent its rotation in a direction uncoiling said spring.

12. A stapling machine comprising a U-shaped housing, a plunger in said housing, an insert member arranged transversely of said housing, a locking bar extending through said insert member and the side members of said U-shaped housing, and a cover for the open side of said housing and having fastening means extending into said cross bar.

13. In a stapling machine, a base, an anvil, a beam magazine movably mounted upon said base, a flat spring intermediate said base and beam to elevate said beam magazine to a predetermined angular spaced relation to said anvil, and adjustment means cooperating with said spring to vary the predetermined angle between said anvil and said beam magazine.

14. In a stapling device, a housing having front and side walls, a plunger fixedly positioned between said walls and having an offset section, and an insert member mounted between said side walls to the rear of said plunger and forming a rear wall for said housing, said member having a complementary offset section and co-operating with the offset section of the plunger to form a stop arresting upward movement of said plunger.

15. In a stapling machine, a beam magazine, a housing, a spring for moving staples along said magazine, and a mounting member for said spring in said housing and comprising a core about which said spring is coiled and side members acting as side guides for the spring, said side members being provided with inward projections preventing said spring from uncoiling while permitting one end of said spring to pass freely out of said mounting member.

16. In a stapling machine of the type specified, a magazine for staples consisting of a channel member having an upturned end and a strip supported within said channel member and spaced from the sides thereof, a housing on one end of said magazine and defining with said upturned end an ejection chute for staples, said strip and said channel member providing a guiding and supporting means for staples in said magazine.

17. In a stapling machine of the type specified, a channel member of U-shaped cross section, means within said channel member comprising a track upon which staples ride in straddle fashion, the depending legs of said staples being only slightly spaced from the bottom of said

- channel member, staple driving mechanism, a housing for said mechanism positioned on said channel member, said housing extending to the bottom of said channel member, and means securing said housing to said magazine at a point above the bottom level of staples therein, said means consisting of double shanked rivets having their shanked ends flattened flush with the inner surface of said channel member.
18. In a stapling machine, staple driving mechanism including a hollow plunger having sides, a housing for said plunger having walls adjacent said sides, said walls intermediate the top and bottom thereof having outwardly formed portions of V-shaped cross section providing a seat for steel balls, said sides having inwardly formed portions of V-shaped cross section providing a guide, and steel balls in said seat, said guide slidably contacting said balls whereby said plunger is guided for vertical movement within said housing.
19. In a stapling machine, means for driving staples comprising a housing, an ejection chute for staples, a plunger reciprocal in said housing and slidably supported at the sides thereof and a staple driving blade having a portion adjacent the front of said plunger and spaced from the forward wall of said housing and an extended portion operable in said ejection chute, means for securing said blade to said plunger to allow slight lateral movement therebetween, said means comprising rigid fastening means between the upper end of said blade and said plunger and a slidably interfitting stud and recess connection between the intermediate portion of said blade and said plunger, said interfitting stud and recess means permitting relative lateral movement between said blade and plunger while preventing relative vertical movement therebetween.
20. In a stapling machine, staple driving mechanism including a plunger, a housing for said mechanism comprising a front wall and side walls, said plunger being operable between said walls, an insert member positioned between said side walls and providing a rear wall for said housing, and a transverse locking bar extending through said side walls and insert member to hold the latter in rigid position within said housing.
21. In a stapling machine, staple driving mechanism including a plunger, a housing for said mechanism comprising a front wall and side walls, said plunger being operable between said walls, said side walls having inward projections formed thereon, an insert member positioned between said side walls forward of said projections and resting thereagainst, said member providing a rear wall for said housing, and a transverse locking bar extending through said side walls and said insert member, said bar and said projections maintaining said insert in accurate and fixed position within said housing.
22. In a stapling machine, staple driving mechanism including a plunger, a housing for said mechanism comprising a front wall and side walls, said plunger being operable between said walls, spring means for feeding staples to said driving mechanism, and an insert member positioned between said side walls to the rear of said plunger, said member being provided with a rearwardly opening notched structure for holding said spring means within said side walls.
23. In a stapling machine, staple driving mechanism including a plunger, a housing for said mechanism comprising a front wall and side walls, said plunger being operable between said side walls, an insert member positioned between said side walls to the rear of said plunger, spring means for feeding staples to said driving mechanism positioned between said side walls to the rear of said insert member, a transverse locking bar extending through said side walls and said insert member to rigidly secure said member in position, a cover plate resting on the rear edge of said side walls, and fastening means for said cover plate acting upon said bar to hold it from transverse displacement.
24. In a stapling machine, staple driving mechanism, a housing for said mechanism, a staple magazine, means for advancing staples through said magazine to said driving mechanism comprising a member having elongated side portions and an intermediate connecting portion, a spring coiled about said connecting portion and having one end extending out from the coiled portion, a staple follower attached to the free end of said spring, and interconnecting means between said side portions and said housing for releasably securing said member within said housing, the tension in the coiled portion of said spring cooperating with said interconnecting means to hold said member in position.
25. In a stapling machine, staple driving mechanism, a housing for said mechanism, a staple magazine, means for advancing staples through said magazine to said driving mechanism comprising a member having elongated side portions and an intermediate connecting portion, a spring coiled about said connecting portion and having one end extending out from the coiled portion, a staple follower attached to the free end of said spring, interconnecting means between said side portions and said housing for releasably securing said member within said housing, said side portions having projections on the inner edges thereof positioned to engage the outer coil of said spring to prevent said spring from uncoiling beyond a predetermined limit when tension is removed from said free end.
26. In a stapling machine, staple driving mechanism, a housing for said mechanism, a staple magazine, means for advancing staples through said magazine to said driving mechanism comprising a member having elongated side portions and an intermediate connecting portion, a spring coiled about said connecting portion and having one end extending out from the coiled portion, a staple follower attached to the free end of said spring, interconnecting means between said side portions and said housing for releasably securing said member within said housing, said connecting portion having a slot therein, the inner end of said spring fitting in said slot, and a spreader member within said slot to anchor said inner end of said spring, said spreader member having vanes normal to said connection portion and forming therewith a coiling bar for said spring.
27. In a combined stapling machine and slitting device, a base, an anvil on said base having staple deforming means, a staple carrying arm pivoted to said base, staple driving mechanism carried by said arm, said arm being movable toward said base during a staple driving operation, a slitting tool adjustably carried by said arm, said tool having a V-shaped cutting edge, said anvil having a cutting edge in alignment with the cutting edge of said tool and cooperable therewith as said arm is moved toward said base as the staple driving mechanism is operated, and adjustment means between said tool and said arm

to regulate the length of the cut produced by said tool when cooperating with the cutting edge of said anvil.

28. In a stapling machine, a base having an upper surface, staple driving mechanism associated with said base, a fixed anvil positioned on said surface and having staple deforming cavities in alinement with said mechanism, a shiftable anvil mounted on said base having staple deforming cavities of different characteristics than those of said fixed anvil, and means for mounting said shiftable anvil to permit it to be shifted to a position overlying and supported on said fixed anvil to render the fixed anvil inoperative and the shiftable anvil operative, said means permitting said shiftable anvil to be moved rearwardly and downwardly of said fixed anvil to a position resting upon said surface to render said fixed anvil operative and said shiftable anvil inoperative.

29. In a stapling machine, a base having an upper surface, staple driving mechanism associated with said base, a fixed anvil positioned on said surface and having staple deforming cavities in alinement with said mechanism, spaced extensions on said fixed anvil, a shiftable anvil having staple deforming cavities of different characteristics than those of said fixed anvil, and means pivotally mounting said shiftable anvil between said extensions to permit it to be shifted to position overlying and supported on said fixed anvil to render the fixed anvil inoperative and the shiftable anvil operative, said means permitting said shiftable anvil to be moved rearwardly and downwardly of said fixed anvil to a position resting upon said surface to render said fixed anvil operative and said shiftable anvil inoperative.

30. In a stapling device of the type specified, an ejection chute for staples, a staple driving tool operable in said chute to drive staples therefrom and having a driving edge co-extensive with the bridge of the staples, said tool having the corners of its driving edge removed whereby as said tool contacts the bridge of a staple during the driving action the portion of said bridge immediately overlying the legs of the staple will be wedged in said removed portions of said tool to prevent buckling of said bridge.

31. In a stapling machine, a magazine for staples comprising a channel guide member having

inturned flanges on the side portion thereof, an elongated strip of metal forming a track upon which staples ride, said strip being positioned within said member in spaced relation to its bottom, sides, and flanges, and supporting tongues between said strip and the bottom of said member to maintain said strip in proper spaced relationship to said member.

32. In a stapling machine, a base having an upper surface, staple driving mechanism associated with said base, a fixed anvil positioned on said surface and having staple deforming cavities in alinement with said mechanism, a shiftable anvil mounted on said base having staple deforming cavities of different characteristics than those of said fixed anvil, and means for mounting said shiftable anvil to permit it to be shifted longitudinally to a position overlying and supported on said fixed anvil to render the fixed anvil inoperative and the shiftable anvil operative, said means permitting said shiftable anvil to be moved longitudinally rearwardly and vertically downwardly of said fixed anvil to a position resting upon said surface to render said fixed anvil operative and said shiftable anvil inoperative.

33. In a stapling machine, a base having an upper surface, staple driving mechanism associated with said base, a fixed anvil positioned on said surface and having staple deforming cavities in alinement with said mechanism, a shiftable anvil mounted on said base having staple deforming cavities of different characteristics than those of said fixed anvil, and means for mounting said shiftable anvil to permit it to be shifted to a position overlying and supported on said fixed anvil to render the fixed anvil inoperative and the shiftable anvil operative, said means permitting said shiftable anvil to be moved rearwardly and downwardly of said fixed anvil to a position resting upon said surface to render said fixed anvil operative and said shiftable anvil inoperative, said fixed and shiftable anvils each having a raised portion thereon above their normal face to increase the distance between material resting thereon to be stapled and said staple deforming cavities whereby legs of the staples are permitted to be more readily deformed.

CERTIFICATE OF CORRECTION.

Patent No. 2,103,551.

December 28, 1937.

WILLIAM G. PANKONIN.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, before line 1, insert the following paragraph:

The present invention has to do with a staple driving and clinching machine and its combination with a slitter. Novelties reside in the construction and in the combination of a member of the parts of the stapling device and of the slitter.;

and that the said Letters Patent should be read with this correction therein so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 22nd day of February, A. D. 1938.

(Seal)

Henry Van Arsdale,
Acting Commissioner of Patents