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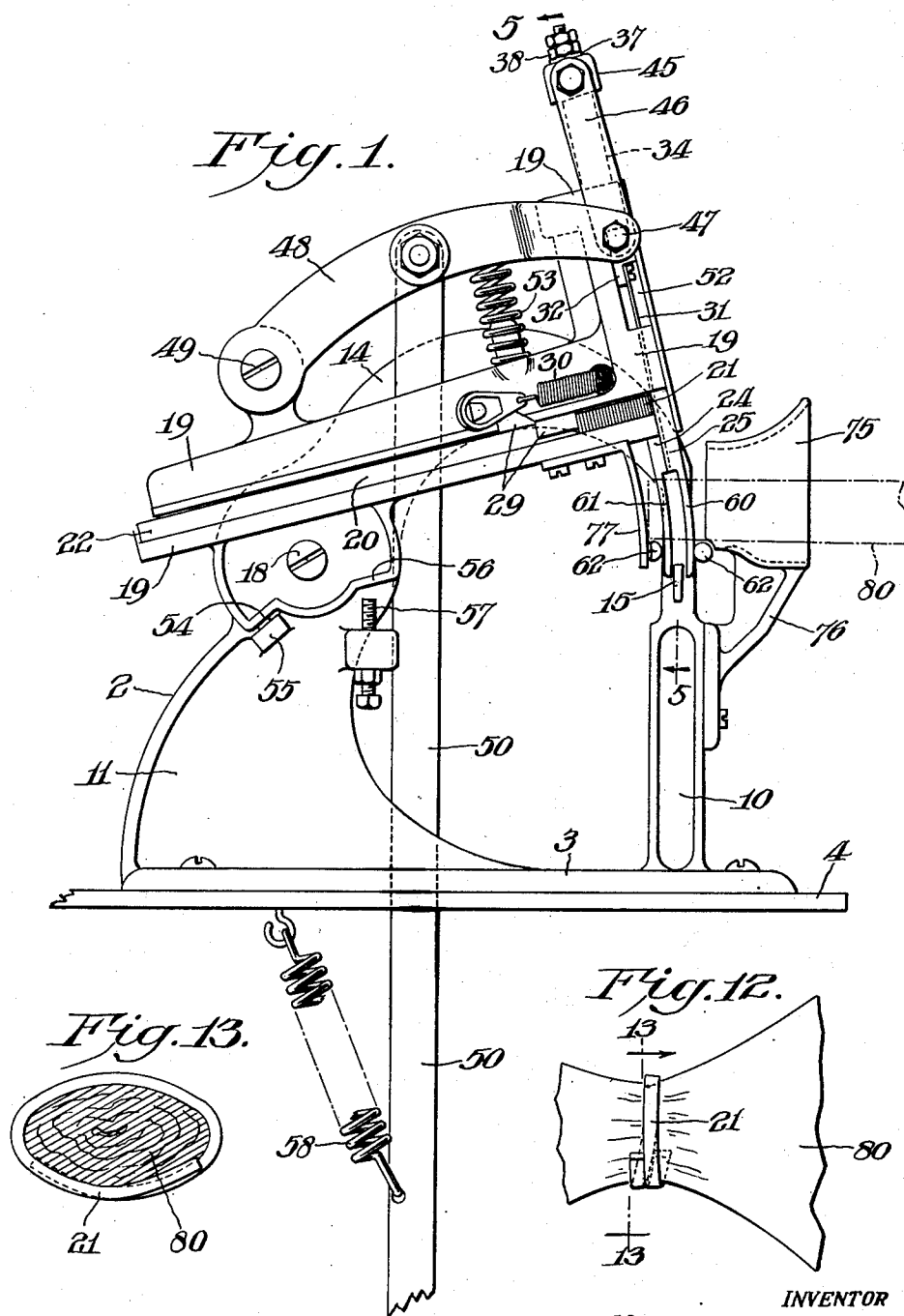
H. J. GERKE, JR

2,265,277

STAPLING MACHINE

Filed May 31, 1940

4 Sheets-Sheet 1



INVENTOR

Henry J. Gerke, Jr.,

BY

A. V. Grouse

ATTORNEY

Dec. 9, 1941.

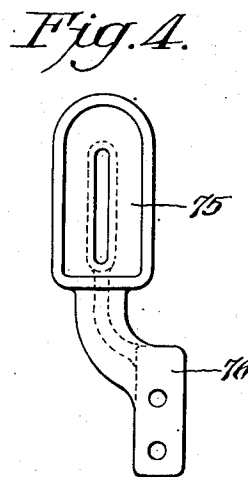
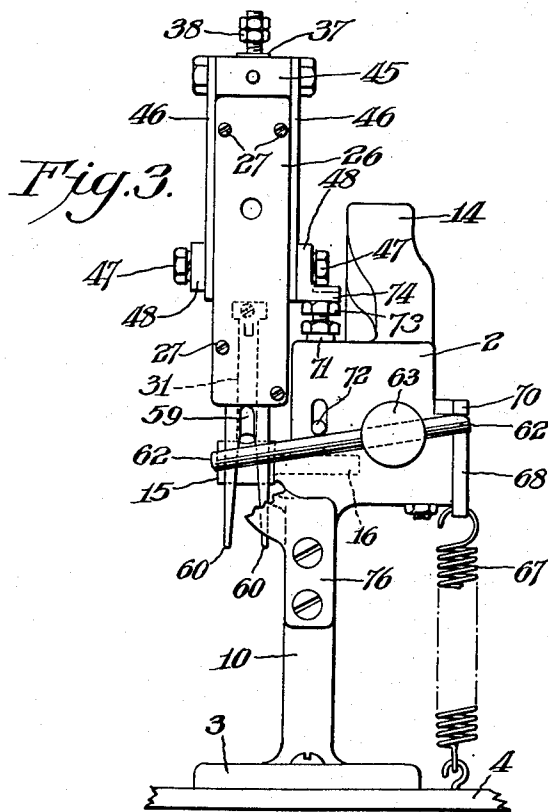
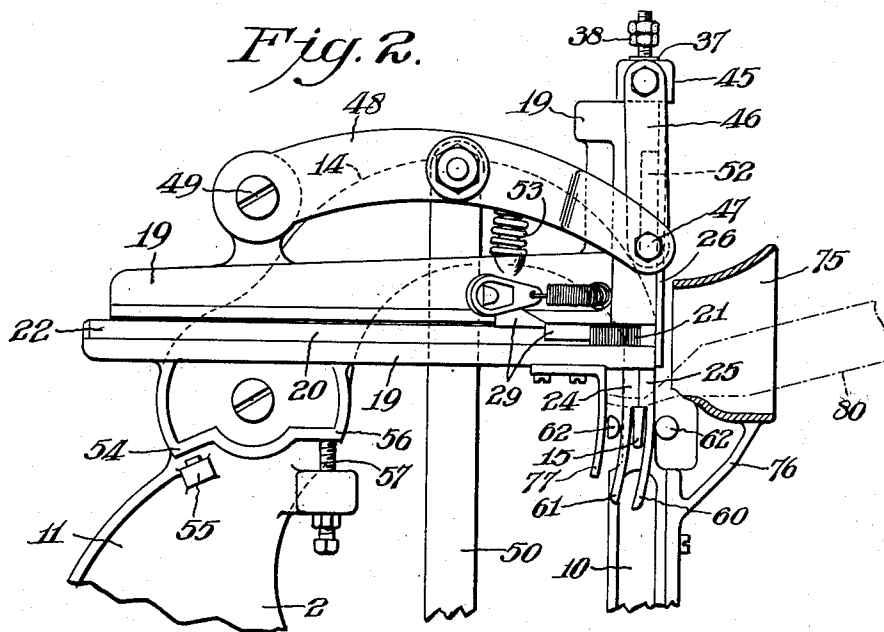
H. J. GERKE, JR

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STAPLING MACHINE

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4 Sheets-Sheet 2



INVENTOR.
Henry J. Gerke, Jr.,

BY *A. V. Groupe*
ATTORNEY

Dec. 9, 1941.

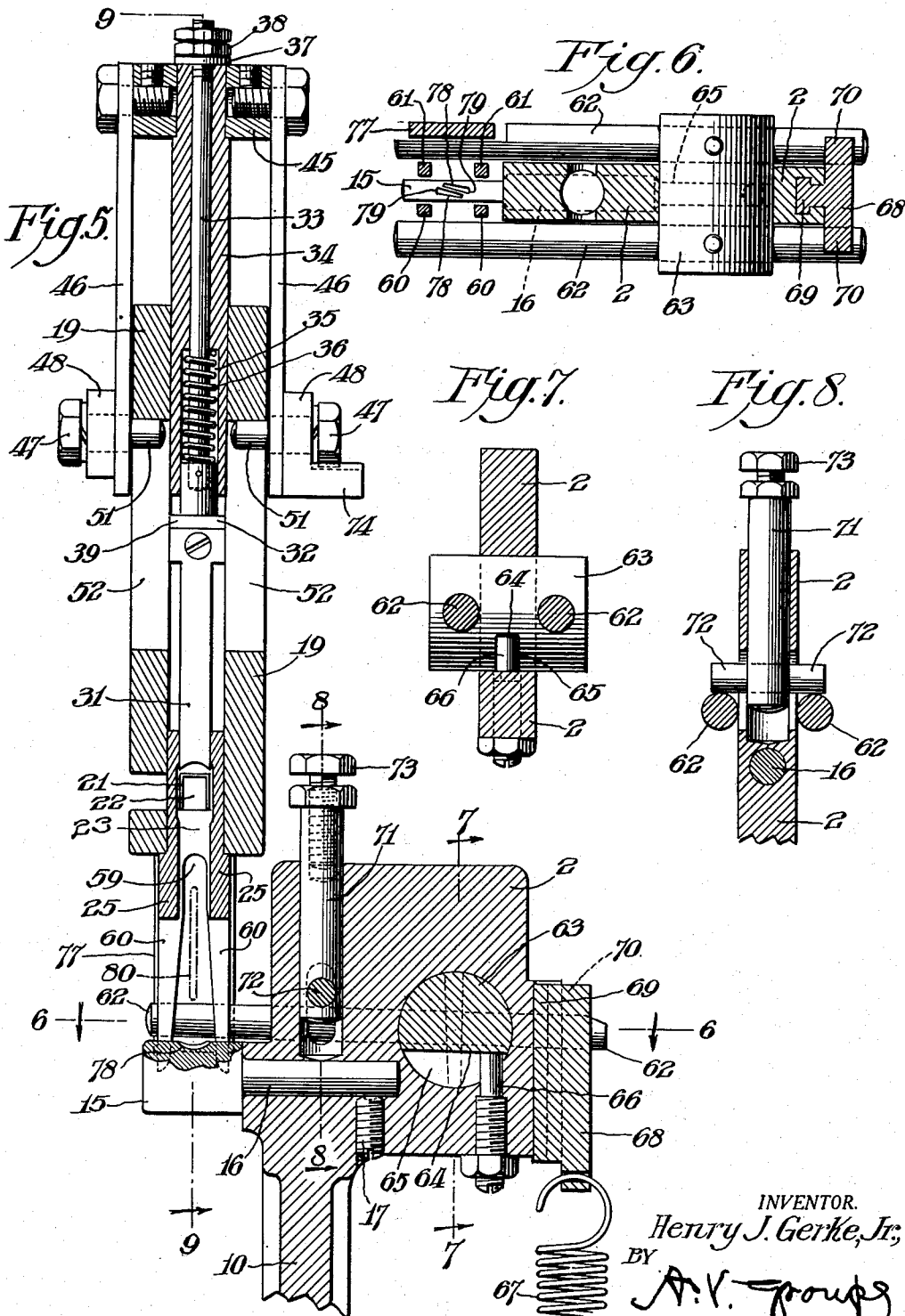
H. J. GERKE, JR

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STAPLING MACHINE

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4 Sheets-Sheet 3



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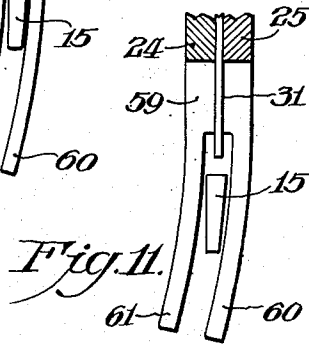
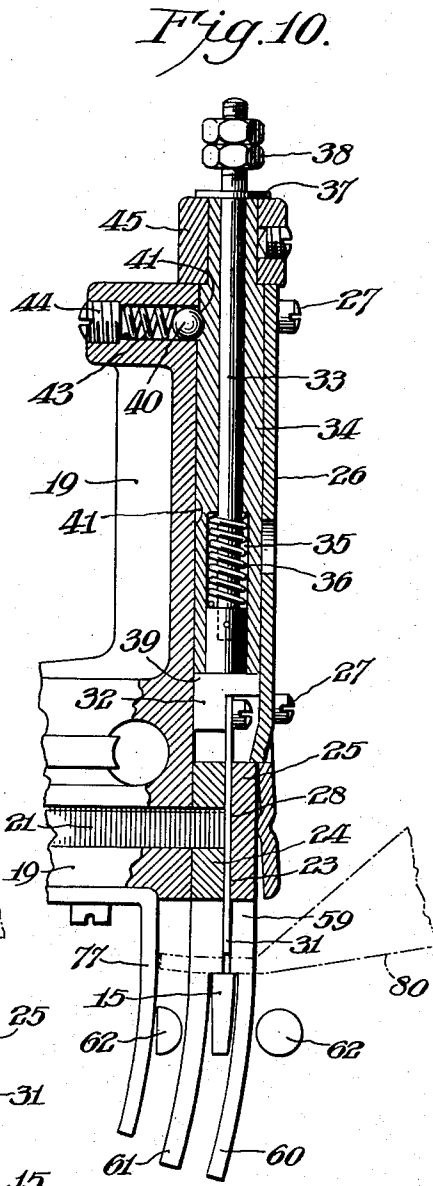
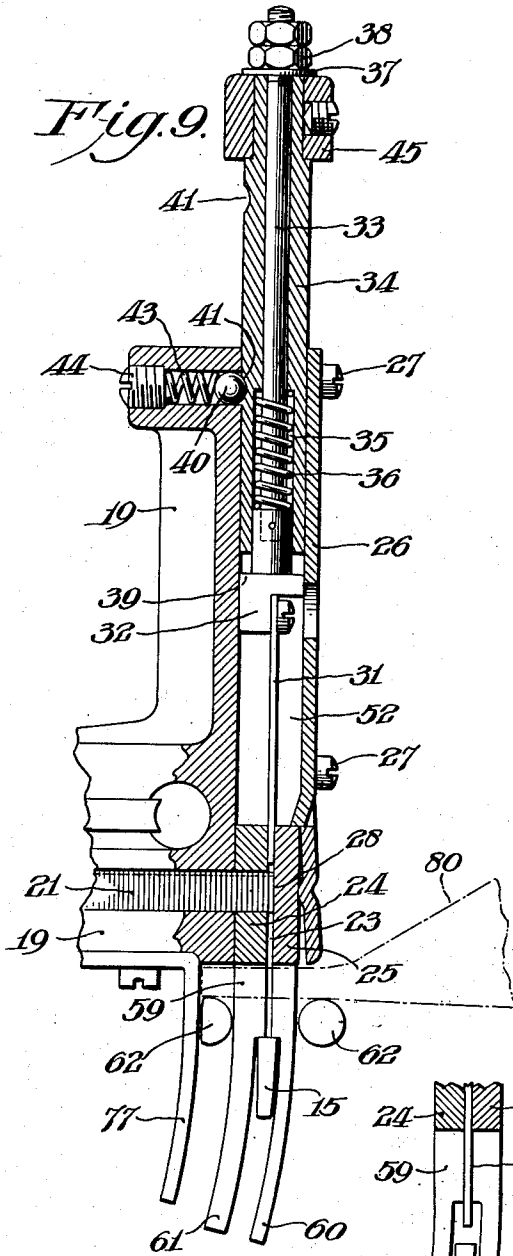
H. J. GERKE, JR

2,265,277

STAPLING MACHINE

Filed May 31, 1940

4 Sheets-Sheet 4



INVENTOR
Henry J. Gerke, Jr.
BY
A. V. Young
ATTORNEY

UNITED STATES PATENT OFFICE

2,265,277

STAPLING MACHINE

Henry J. Gerke, Jr., West Collingswood, N. J.,
 assignor to Acme Staple Company, Camden,
 N. J., a corporation of New Jersey

Application May 31, 1940, Serial No. 338,195

6 Claims. (Cl. 153—1)

This invention relates to improvements in stapling machines wherein are employed a staple clinching anvil, a member movable on the machine frame toward and from the anvil, and having a work receiving opening and staple guiding means extending from above the opening to and through the side walls thereof, a staple driver operating within said member, and means operable to move said member and the staple driver relatively to each other and to the anvil to effect the staple driving and clinching operation.

An object of the present invention is to provide a stapling machine of the aforesaid general character with a novel and advantageous means whereby relatively wide, flat work of thin material, such, for example, as a flattened tube formed of thin material, may be crumpled upon itself and banded or surrounded by the staple to close a part of the tube.

Another object of the invention is to improve the construction and operation of the machine whereby, after the staple clinching operation, the staple guiding member will be raised from the anvil and moved upwardly with relation to the staple driver before the driver is moved upwardly with relation to the member, for the purpose of loosening the work within or ejecting it from the work embracing part of the member, to permit the easy removal of the stapled work from the machine.

The invention resides in the elements and the combinations of them hereinafter described and claimed.

In the accompanying drawings, illustrating the invention,

Figure 1 is a side view, partly broken away, of a stapling machine embodying the invention, showing the parts thereof in the raised or normal position.

Figure 2 is a side view of the upper portion of the machine, showing the movable or operating parts thereof in the lowered or down position at the completion of a staple driving and clinching operation, and showing the work guiding funnel in section.

Figure 3 is a front view of the machine, with the parts thereof in the position shown in Fig. 2, and showing the work guiding funnel broken away from its supporting bracket.

Figure 4 is a front view of the work guiding funnel and its supporting bracket.

Figure 5 is a vertical section through the forward portion of the machine, on line 5—5 of Fig. 1.

Figure 6 is a horizontal section, on line 6—6 of Fig. 5.

Figures 7 and 8 are vertical sections, on lines 7—7 and 8—8, respectively of Fig. 5.

Figure 9 is a vertical section on line 9—9 of Fig. 5, showing the movable member carrying the staples, and the staple driver moved down to the position it occupies with relation to the staple clinching anvil during the staple driving and clinching operation.

Figure 10 is a view similar to Fig. 9, showing the parts in the lowered position at the completion of a staple driving and clinching operation.

Figure 11 is a sectional detail, showing the staple driver, the anvil and adjacent parts in the relation thereof to one another, after the initial upward movement of the member carrying the driver, and showing the relation of the driver to the member after the driver has loosened the stapled work within or ejected it from the work receiving opening of the member.

Figure 12 is a side view of a portion of work having a staple applied thereto by the machine, enlarged.

Figure 13 is a section through the work, on line 13—13 of Fig. 12.

Referring to the drawings, 2 designates the frame of the machine comprising a base 3, secured upon a suitable support 4, forward and rearward standards 10 and 11, respectively, rising from the base 3, and an arch-like upper structure 14 connecting the standards 10 and 11.

The forward standard 10 supports a staple clinching anvil 15 formed integral with a stem 16 which is set in a bore in the standard 10 and secured therein by a set screw 17, Fig. 5.

Pivoted, at 18, on the rearward standard 11 is the rearward end portion of a member 19 whose forward position is movable toward and from the anvil 15.

One side of the member 19 is grooved and forms a magazine 20 for a row of staples 21. The staples 21 slidably embrace a guiding rib 22 which extends longitudinally in the magazine 20 and is secured to the bottom thereof. The staples 21 are guided by the rib 22 and they are moved forwardly thereon and into a staple guiding channel 23 which extends up and down transversely of the rib 22, and which is formed by the forward end wall of the rib and by and between two blocks 24 and 25 which are suitably secured within an opening in the member 19 back of a front plate 26 which is secured to the member 19 by screws 27.

The staples 21 are fed forwardly on the guid-

ing rib 22 toward and into contact with the front wall 28 of the channel 23 by a suitable follower 29 which embraces and is slidably fitted to the rib 22, and which is urged forwardly by a spring 30 which is connected thereto and to the member 19 in the usual manner. The space between the front end of the rib 22 and the wall 28 is equal to or slightly in excess of the thickness of a staple.

The lower portion of a staple driving plate 31 is fitted to slide in the channel 23 toward and from the anvil 15, and the lower end of the driving plate 31 is made concave in form, as shown, for a purpose hereinafter described. The upper end of the staple driver 31 is secured to a block 32 which is fitted to slide within an upwardly extending limb of the forward end portion of the member 19.

The block 32 is secured to the lower end of a stem 33 which extends upwardly from the block 32 through a sleeve 34 which is fitted to slide within the member 19. The upper portion of the block 32 extends into an opening or bore 35 in the lower end portion of the sleeve 34. A spring 36 encircles the stem 33 within the bore 36, between the block 32 and the upper end of the bore, and urges the block and staple driver 31 downwardly with relation to the sleeve 34. The upper end portion of the stem 33 extends above the top of the sleeve 34 and carries a washer 37 and a nut 38, which engage the top of the sleeve 34 and limits the extent of the downward movement of the stem 33 and staple driver 31 with relation to the sleeve 34. The extent of the upward movement of the stem 33 and staple driver 31 with relation to the sleeve 34 is limited by a shouldered portion 39 of the block 32 which is adapted to engage the bottom of the sleeve 34.

The staple driver 31, block 32, stem 33 and sleeve 34 are adapted to be moved up and down as a unit within the member 19, and they are also adapted to be connected to and disconnected from the member by releasable means which causes them to be moved by and with the member, under certain conditions, and which permits the member to be moved independently of them, under certain other conditions, presently described. This releasable means comprises a spring pressed ball 40 which is adapted to enter either of the two spaced sockets 41, 41 in the sleeve 34, when either of the sockets is moved into registry with the ball. The ball 40 moves within the inner end portion of an opening or bore 42 in the member 19, and it is urged toward the sleeve by a spring 43 within the bore and acting between the ball 40 and a plug 44 screwed into the outer threaded end portion of the bore.

The upper end portion of the sleeve 34 has a block or collar 45 surrounding the same and secured thereto. This collar 45 is connected to the upper ends of two links 46, 46 on the respective sides of the member 19. The links 46, 46 extend downwardly from the collar 45, and the lower ends of the links are connected by pivot screws 47, 47 to the forward, bifurcated end of a lever 48 which is fulcrumed at 49, on the member 19, and which is pivotally connected to the upper end of an operating bar 50 which extends downwardly from the lever 48 and through suitable openings in the base 3 and table 4. The pivot screws 47, 47 terminate at their inner ends in stop pins 51, 51 which extend into vertical slots 52, 52 in the side walls of the member 19, the pins 51, 51 being provided to move down and

up within the slots 52, 52 and to engage the upper end walls thereof, Fig. 5.

A spring 53 is interposed between the member 19 and lever 48 which tends to raise the forward end portion of the lever with relation to the member, and which permits the lever to be moved downwardly with relation to the member from the position shown in Fig. 1 to the position shown in Fig. 2.

Upward movement of the member 19 with relation to the machine frame is stopped by the engagement of a projection 54 on the member with a lug 55 on the frame 2, and downward movement of the member 19 is stopped by the engagement of a projection 56 on the member with an adjustable stop screw 57 carried by a boss on the machine frame 2.

Upward movement of the lever 48 with relation to the member 19 is stopped by the engagement of the stop pins 51, 51 with the upper end walls of the slots 52, 52 and downward movement of the lever 48 with relation to the member 19 is stopped by the engagement of the collar 45 with the top of the upwardly extending limb of the member 19.

The machine is operated by lowering and raising the operating bar 50, and this may be accomplished by any suitable means. When the bar 50 is operated by a pedal connected thereto, the bar is held normally in the raised position, with the projection 54 in engagement with the lug 55, as shown in Fig. 1, by a spring 58, one end of which is attached to the operating bar 50 and the other end of which is attached to the table 4, whereby the bar 50 may be lowered by the operation of the pedal and raised by the spring.

The staple driver 31 is operated, as hereinafter described, to drive the staples down through the staple guiding means or channel 23 which extends downwardly from the staple guiding rib 22 and between the blocks 24 and 25. These blocks and the channel 23 formed between them extend downwardly from the forward end of the member 19, and the blocks 24 and 25 have a work receiving opening 59 therein which extends completely through the blocks transversely of the anvil 15, as shown in the drawings.

The opening 59 crosses and extends through the staple guiding channel 23, and the width of the opening 59 is equal to or slightly less than the space between the legs of a staple, and the sides of the channel 23 which guide the staple legs extend through the side walls of the opening 59 to the bottom thereof, as shown in Fig. 5.

The forward portion of the block 25 is provided with two laterally spaced arms 60, 60 which extend downwardly from the block forwardly of the anvil 15 on the respective sides of the forward portion of the work receiving opening 59; and the rearward portion of the block 24 is provided with two laterally spaced arms 61, 61 which are located directly back of the arms 60, 60 and extend downwardly from the block 24 rearwardly of the anvil 15 on the respective sides of the rearward portion of the work receiving opening 59.

These arms 60, 60 and 61, 61 extend to and below the top of the anvil 15, when the member 19 is in the raised or normal position, as shown in Fig. 1, and the arms are curved, as shown, to permit them to move in close relation to the anvil when the member 19 is lowered and raised on its pivot 18.

The opposing inner walls of the two pairs of arms 60, 60 and 61, 61 are tapered or flared

downwardly and outwardly from the lower ends of the sides of the work receiving opening 59 and constitute continuations of the forward and rearward portions of the side walls of the opening to receive work placed upon the anvil between the arms of the two pairs thereof and direct such work into the opening 59 when the member 19 is moved downwardly with relation to the anvil 15.

Two work supporting and opposing pins or parts 62, 62 are carried by a cylinder 63 which extends through and is fitted to turn in an opening in a part of the forward frame standard 10. The left hand end or work supporting portions of these pins extend from the cylinder 63, and they embrace the two pairs of arms 60, 60 and 61, 61 and cross the space between the arms of each pair, one pin 62 being located forwardly of the arms and the other pin being located rearwardly of the arms. The top surfaces of the work supporting portions of the pins 62, 62 are above the top of the staple clinching anvil 15 in the normal position of the pins, as shown in Figs. 1 and 5, and the pins are adapted to be depressed to move the work supporting and opposing portions thereof down to a position below the top of the anvil 15, as shown in Figs. 2 and 10. When the pins 62, 62 are thus depressed, their supporting cylinder 63 is turned in its bearing in the frame. The upward movement of the right hand end portions of the pins 62, 62 is stopped by the engagement of the top wall 64 of a slot 65 in the cylinder 63 with the upper end of a stop screw 66 which is screwed into a part of the machine frame and extends into the slot 65. The pins 62, 62 are held yieldably in the normal position shown in Fig. 5 by the pull of a spring 67 having its lower end attached to the table 4 and its upper end attached to a block 68. The block 68 has a vertical rib 69, T-shaped in cross section, slidably fitted to a similarly shaped groove in a part of the machine frame, and it has two projections 70, 70 which extend outwardly over the free right hand end portions of the pins 62, 62 and engage and urge the same downwardly.

Extending upwardly from the space between the right hand portions of the pins 62, 62 is a plunger 71 fitted to slide vertically in a bore in a part of the machine frame. This plunger 71 has a transverse pin 72 extending through the same and outwardly through vertical slots in the machine frame to positions above the pins 62, 62. This transverse pin 72 rests upon the pins 62, 62, and, when the plunger 71 is depressed, the pin 72 will depress the pins 62, 62. The upper end of the plunger 71 is provided with an adjustable impact screw 73 which is arranged to be engaged by a lug 74 on the forward end of the lever 48 to depress the plunger and therewith the pins 62, 62 when the lever 48 is moved downwardly, as will be hereinafter described.

The forward portion of the machine is provided with an appropriately shaped funnel 75 for receiving the work to be acted on by the machine and directing the work into the opening 59 and into the spaces between arms of the two pairs thereof 60, 60 and 61, 61 above the anvil 15 and above the work supporting pins 62, 62. This funnel 75 is formed on and supported by a bracket 76 which is secured to the forward standard 10 of the machine frame.

Secured to the member 19, and located rearwardly of the work supporting pins 62, 62, is a suitable stop plate or bracket 77 for limiting the

extent of the insertion of the work into the machine.

The anvil 15 is provided with two adjacent grooves 78, 78 which extend side by side, as shown in Fig. 6, for receiving and guiding the legs of a staple during the driving and clinching of the staple. These grooves have entrance openings 79, 79 in registry with the legs of a staple, as the staple descends through the channel 23. The grooves 78, 78 are so relatively disposed that they will deflect the staple legs into lateral lapping relation during the staple driving and clinching operation, such lateral lapping relationship being clearly illustrated in the stapled work as shown in Figs. 12 and 13.

In Figs. 1, 2, 5, 9 and 10, I have shown by dot-and-dash lines, indicated at 80, work in the form of a flattened tube of thin material, as acted upon by the machine.

The operation of the machine is as follows:

When the machine is in the raised or normal position, as shown in Figs. 1 and 5, the upward movement of the member 19 under the urge of the spring 58 is stopped by the engagement of the projection 54 with the frame lug 55, the upward movement of the lever 48 with relation to the member 19 is stopped by the engagement of the pins 51, 51 (Fig. 5) with the upper ends of the slots 52, 52, and the ball 40 is resting in the upper socket 41 in the sleeve 34, releasably holding the sleeve and the staple driver 31 in the raised position with relation to the member 19.

In this normal position of the parts, the work 80 to be acted upon by the machine is inserted into the machine through the funnel 75, as shown in Figs. 1 and 5. The operating bar 50 of the machine is then moved downwardly. During the initial downward movement of the bar 50, the bar moves the lever 48 and member 19 as a unit on the pivot 18 until the further downward movement of the member is stopped by the engagement of the projection 56 with the stop screw 57, with the bottom of the blocks 24 and 25 and the bottom of the staple guiding channel 23 and the bottom of the work receiving opening 59 in close relation to the top of the staple clinching anvil 15, as shown in Figs. 2, 3, 9 and 10.

During the downward movement of the member 19, the work 80 is crumpled between the arms of the two pairs thereof 60, 60 and 61, 61 and between the top of the work supporting and opposing pins 62, 62 and the top wall of the work receiving opening 59, and, at the same time, the work 80 is directed by the arms 60, 60 and 61, 61 into the opening 59 and between the guides for the staple legs in the side walls of the opening 59, as shown in Fig. 9, the pins 62, 62 opposing the downward movement of the bottom of the work 80, during the crumpling of the work between the top wall of the opening 59 and the pins.

During the continued downward movement of the operating bar 50, after the engagement of the projection 56 with the stop screw 57, and the crumpling of the work 80, as shown in Fig. 9, the bar 50 moves the lever 48 downwardly on its fulcrum 49 with relation to the member 19. During this downward movement of the lever 48, it causes the links 46, 46 to move the sleeve 34 and staple driver 31 downwardly, and, during the initial downward movement of the sleeve 34, the ball 40 is forced back against the action of the spring 43 and out of the lower socket 41 in the sleeve, releasing the sleeve from the member 19 and permitting the sleeve and staple driver 31 to be moved downwardly within the member.

During the continued downward movement of the sleeve 34, the sleeve moves the staple driver 31 downwardly within the channel 23, and the bottom of the driver engages the top of the foremost staple 21 of the row thereof and drives it downwardly through the guiding channel 23, and drives the legs of the staple into the clinching grooves 78, 78 of the anvil 15 until the further downward movement of the staple is stopped by the staple crown engaging the work 80 upon the anvil, after the staple clinching operation, as shown in Fig. 10, or until the collar 45 on the sleeve 34 engages the member 19, after the clinching operation. As the sleeve 34 and driver 31 complete the downward movement thereof, as just described, the ball 40 enters the upper socket 41 in the sleeve 34, as shown in Fig. 10.

During the staple driving and clinching operation, just described, the pins 62, 62 support and oppose the crumpled work 80 in the upper portion of the opening 59, as shown in Fig. 9, while the staple driver 31 moves the staple 21 downwardly and the staple legs straddle the work and extend below the same, and the staple crown contacts the work 80. At or about this stage of the operation, the lug 74 on the lever 48 engages the screw 73 and moves it and the plunger 71 downwardly, causing the plunger pin 72 to depress the work supporting and opposing pins 62, 62, and thereby lower the work 80 with the downwardly moving staple and staple driver 31 and deposit the work 80 upon the anvil 15, while the driver is effecting the clinching of the staple legs beneath the work, and the encirclement or banding of the work by the staple. The final clinching of the staple legs compresses the encircled work further and effectively closes the tubular work acted upon; and the concave lower end of the staple driver 31 permits the crown portion of the staple to be curved upwardly to conform to the encircled work.

During the downward movement of the sleeve 34 in driving the staple, as above described, the bottom of the sleeve moves down into engagement with the shoulder 39 of the block 32 when the resistance of the staple to the action of the staple driver 31 is sufficient to overcome the pressure of the spring 36, and, thereafter, the staple is driven and clinched by the positive action of the sleeve 34 upon the driver.

Now, after the staple has been driven and clinched, the operating bar 50 is raised by the spring 58 or other suitable means to return the parts of the machine to the raised or normal position, as shown in Figs. 1 and 5; and, during the initial upward movement of the bar 50, the bar raises the lever 48 and member 19 as a unit, thereby moving the member and sleeve 34 therein as a unit with relation to the staple driver 31 until the top of the washer 37 on the top of the sleeve 34 engages the nut 38 on the stem 33. This upward movement of the member 19 and sleeve 34 with relation to the staple driver 31 causes the work receiving opening 59 of the member 19 to move upwardly from the anvil 15 and also upwardly with relation to the staple driver 31 until the parts reach the position shown in Fig. 11. This upward movement of the opening 59 with relation to the driver 31 causes the latter to loosen the stapled work within or eject it from the opening 59 for the easy removal of the finished work from the machine.

After the stapled work has been thus ejected from the opening 59, the movement of the lever 48 and member 19 as a unit is continued until

the upward movement of the member is stopped by the engagement of the projection 54 with the frame lug 55, as shown in Fig. 1. This done the bar 50 moves the lever 48 upwardly with relation to the member 19 to the position shown in Fig. 1; and, at the beginning of such movement, the links 46, 46 raise the sleeve 34 within the member 19 and force the ball 40 out of the upper socket 41 of the sleeve. As the upward movement of the lever 48 continues, the links 46, 46 raise the sleeve 34 within the member 19 until the stop pins 51, 51 engage the upper ends of the slots 52, 52 in the member 19 and the ball 40 enters the lower socket 41 in the sleeve, leaving the parts of the machine in the raised or normal position, shown in Figs. 1 and 5, for a succeeding staple driving and clinching operation.

As the bar 50 raises the lever 48 to the normal position, the lug 74 is moved upwardly from the impact screw 73 and permits the spring 67 to return the work supporting and opposing pins 62, 62 and plunger 71 to the normal position shown in Fig. 5.

I claim:

1. In a stapling machine, the combination of a frame, a staple clinching anvil, a member movable on the frame toward and from the anvil and having a work receiving opening and staple guiding means extending from above the opening to and through the side walls thereof, two laterally spaced arms carried by said member and extending downwardly from said guiding means and from the respective side walls of said opening and forming continuations thereof for receiving work between them and directing it into said opening, a staple driver movable in the member, an operating part yieldably mounted on the member and operatively connected to the staple driver, means operable to move said part and said member as a unit toward the anvil, and thereafter operable to move said part and said staple driver toward the anvil independently of said member to drive and clinch a staple, a work supporting and opposing part yieldably mounted on the frame adjacent to and above the level of the anvil, and means actuated by said operating part for depressing said supporting and opposing part during the staple driving and clinching operation.

2. In a stapling machine, the combination of a frame, a staple clinching anvil, a member movable on the frame toward and from the anvil and having a work receiving opening and staple guiding means extending from above the opening to and through the side walls thereof, a staple driver movable in the member, an operating part yieldably mounted on the member and operatively connected to the staple driver, means operable to move said part and said member as a unit toward the anvil, and thereafter operable to move said part and said staple driver toward the anvil independently of said member to drive and clinch a staple, a work supporting and opposing part yieldably mounted on the frame adjacent to and above the level of the anvil, means actuated by said operating part for depressing said supporting and opposing part during the staple driving and clinching operation, and two laterally spaced arms carried by said member and extending downwardly from said guiding means and from the respective side walls of said opening and between said anvil and said work supporting part and forming continuations of said side walls for receiving work between them and directing it into said opening.

3. In a stapling machine, the combination of a frame, a staple clinching anvil, a member movable on the frame toward and from the anvil and having a work receiving opening and staple guiding means extending from above the opening to and through the side walls thereof, a sleeve movable in said member toward and from the anvil, said member and said sleeve having co-operating parts limiting the extent of movement between them, releasable means for moving said member and said sleeve by and with each other, means to limit the extent of movement of said member away from the anvil, a stem extending through said sleeve and being movable relatively thereto toward and from the anvil, said sleeve and said stem having cooperating parts limiting the extent of movement between them, a staple driver movable in said member and connected to said stem, yieldable means acting between said sleeve and said driver and urging the driver toward the anvil, and means operable to move said sleeve toward and from the anvil and thereby move said member and said driver toward and from the anvil, whereby the initial movement of said member away from said anvil will take place before the initial movement of said driver away from said anvil takes place.

4. In a stapling machine, the combination of a frame, a staple clinching anvil, a member movable on the frame toward and from the anvil and having a work receiving opening and staple guiding means extending from above the opening to and through the side walls thereof, a sleeve movable in said member toward and from the anvil and having ball receiving sockets therein, said member and said sleeve having cooperating parts limiting the extent of movement between them, a ball movable in said member and engaged with said sleeve and yieldably urged toward the sleeve for entering said sockets for releasably moving said member and said sleeve by and with each other, means to limit the extent of movement of said member away from the anvil, a stem extending through said sleeve and being movable relatively thereto toward and from the anvil, said sleeve and said stem having co-operating parts limiting the extent of movement between them, a staple driver movable in said member and connected to said stem, yieldable means acting between said sleeve and said driver and urging the driver toward the anvil, and means operable to move said sleeve toward and from the anvil and thereby move said member and said driver toward and from the anvil, whereby the initial movement of said member away from said anvil will take place before the

initial movement of said driver away from said anvil takes place.

5. In a stapling machine, the combination of a frame, a staple clinching anvil, a member movable on the frame toward and from the anvil and having a work receiving opening and staple guiding means extending from above the opening to and through the side walls thereof, a sleeve movable in said member toward and from the anvil, said member and said sleeve having co-operating parts limiting the extent of movement between them, releasable means for moving said member and said sleeve by and with each other, means to limit the extent of movement of said member away from the anvil, a stem extending through said sleeve and being movable relatively thereto toward and from the anvil and having a stop part on the upper end thereof for engagement with the top of the sleeve to limit the downward movement of the stem relatively to the sleeve, a block secured to the lower end of the stem and having a stop part for engagement with the bottom of the sleeve to limit the upward movement of the stem relatively to the sleeve, a staple driver movable in said member and secured to said block, yielding means acting between said sleeve and said block and urging the driver toward the anvil, and means operable to move said sleeve toward and from the anvil and thereby move said member and said driver toward and from the anvil, whereby the initial movement of said member away from said anvil will take place before the initial movement of said driver away from said anvil takes place.

6. In a stapling machine, the combination of a frame, a staple clinching anvil, a member movable on the frame toward and from the anvil and having a work receiving opening and staple guiding means extending from above the opening to and through the side walls thereof, a part movably carried by said member, a staple driver yieldably carried by said part, means operable to move said part toward and from the anvil, and means connecting said member and said part and limiting the relative movement thereof in such a manner that when said part is moved toward the anvil, the member will be first moved with said part toward the anvil, and, thereafter said part will be moved toward the anvil relatively to the member, and, when said part is moved from the anvil, the member will be first moved with said part from the anvil, and, thereafter said part will be moved from the anvil relatively to the member.

HENRY J. GERKE, Jr.