Dec. 2, 1947. J. C. LANG 2,431,812

STAPLING METHOD AND APPARATUS

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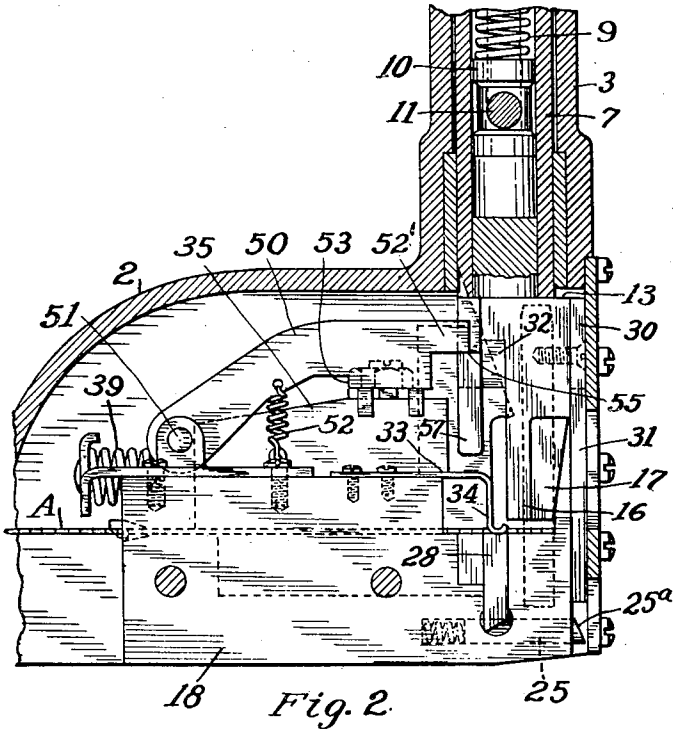


Fig. 2.

Fig. 1.

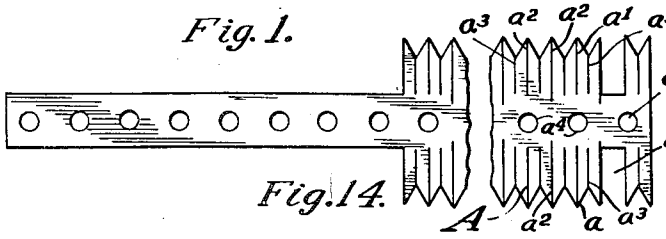


Fig. 14.

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STAPLING METHOD AND APPARATUS

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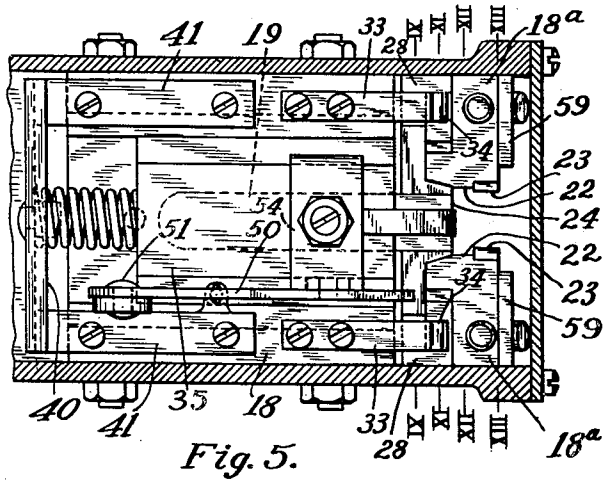


Fig. 5.

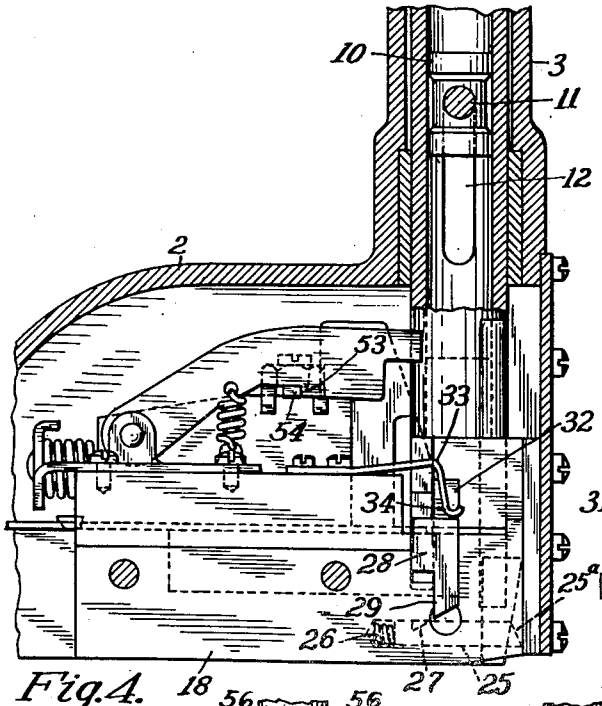


Fig. 4.

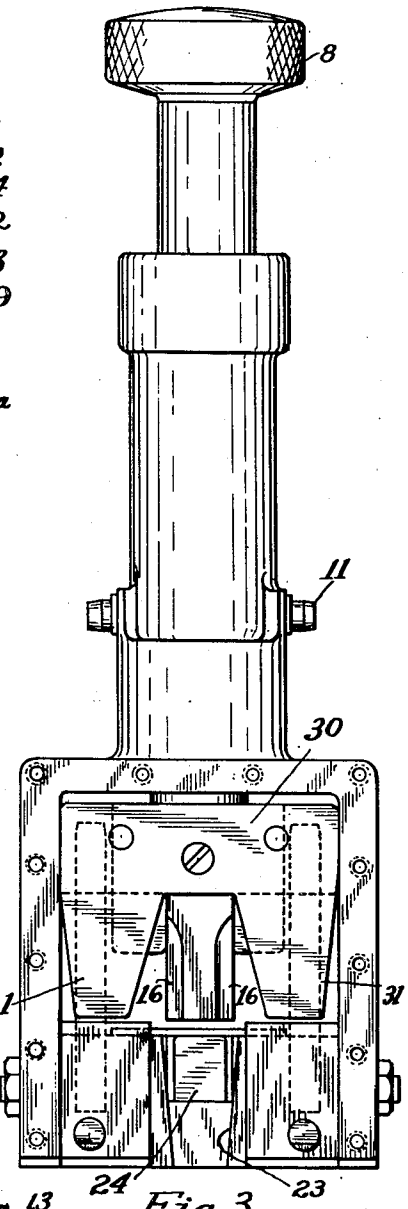


Fig. 3.

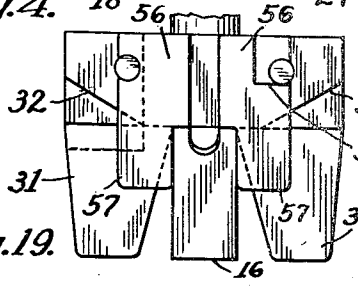


Fig. 19.

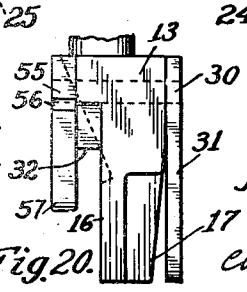


Fig. 20.

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STAPLING METHOD AND APPARATUS

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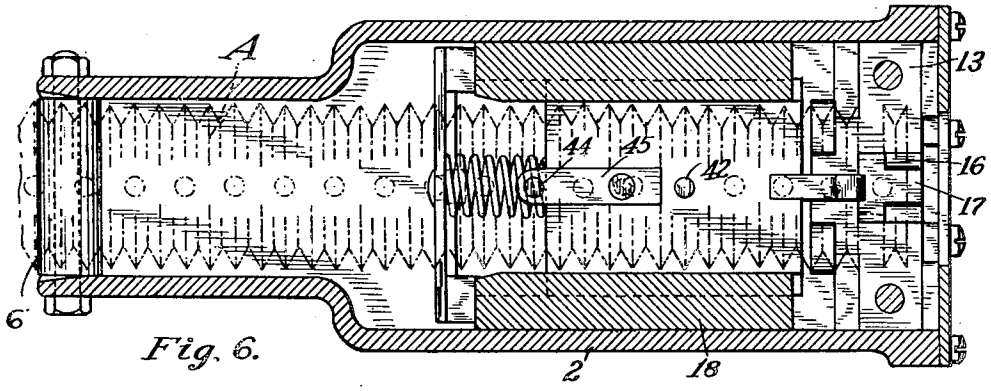


Fig. 6.

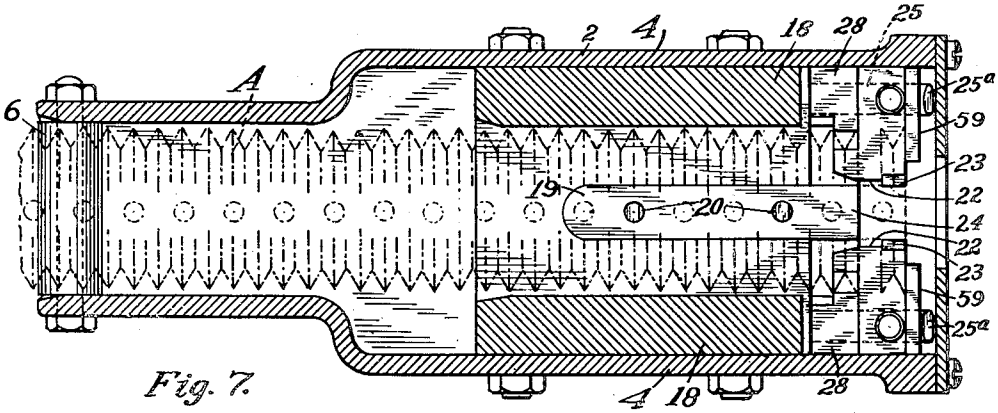


Fig. 7.

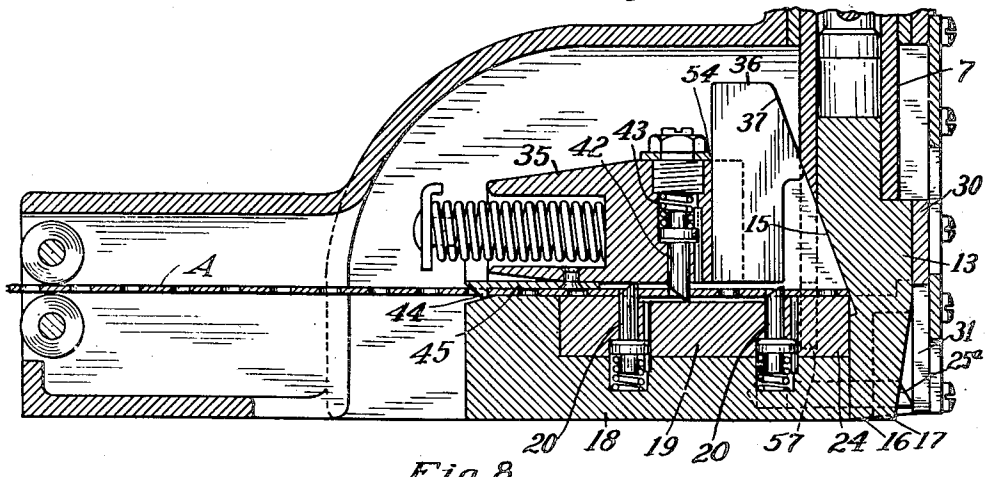


Fig. 8.

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STAPLING METHOD AND APPARATUS

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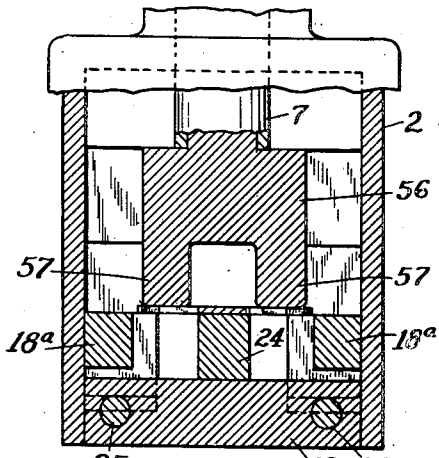


Fig. 9.

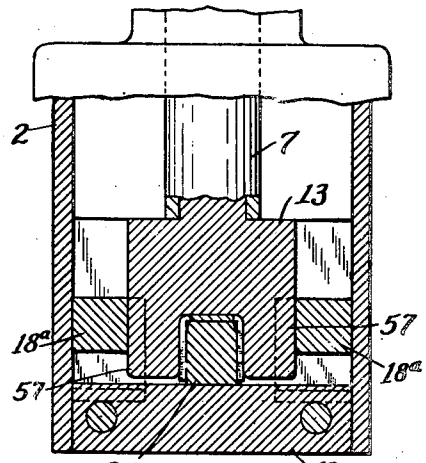


Fig. 10.

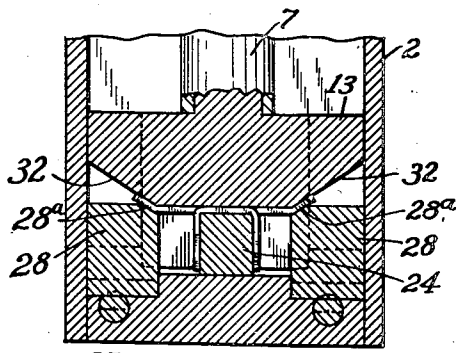


Fig. 11.

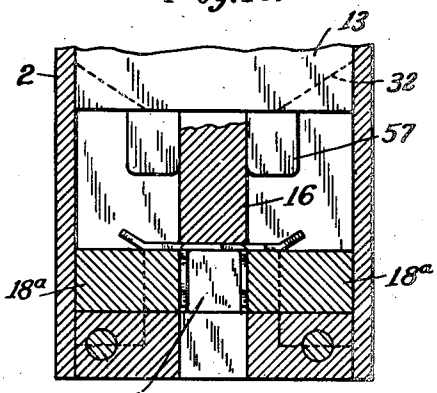


Fig. 12.

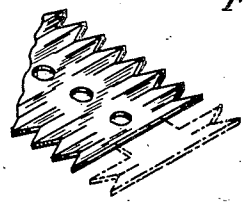


Fig. 15.

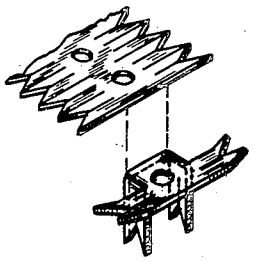


Fig. 17.

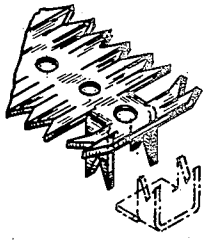


Fig. 16.

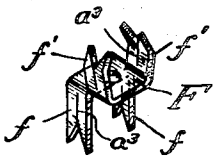


Fig. 18.

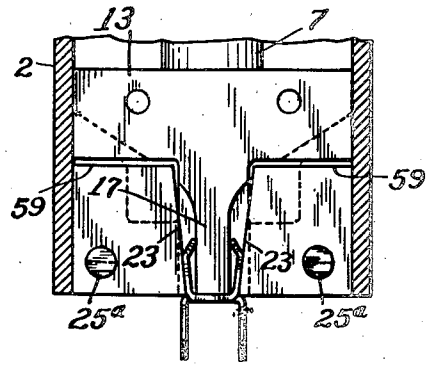


Fig. 13.

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UNITED STATES PATENT OFFICE

2,431,812

STAPLING METHOD AND APPARATUS

Joseph C. Lang, Pittsburgh, Pa., assignor to Bocjl Corporation, Pittsburgh, Pa., a corporation of Delaware

Application August 10, 1945, Serial No. 610,036

21 Claims. (Cl. 1—48)

1

This invention pertains to the art of stapling, and more particularly to the driving of staples having legs which extend in opposite directions from the bridge of the staple as disclosed, for example, in my co-pending application Serial No. 533,157, filed April 28, 1944.

In my application aforesaid, there is disclosed a staple-like fastener having a bridge portion or body portion with a pair of downwardly-extending legs along each of two opposite sides, and a pair of upwardly-extending legs on the same two sides, the upwardly-extending legs being separated slightly less than the downwardly-extending ones. Both pairs of legs are preferably fish-tailed, so that upon entering the material into which the staple is driven, the legs will tend to spread apart to increase the holding power of the fastener. It is explained in my said application that fasteners of this type are highly satisfactory for use in securing fiberboard or composition panels to wooden frames, the staple being driven first into the wooden frames, leaving the upwardly-extending pairs of legs projecting in a plane normal to the wood into which the downwardly-extending legs are driven. The panel of plywood, composition board, or the like, is then pressed against the protruding points which penetrate the panel without passing through it, thereby serving to firmly connect the panel to the wooden structure. The holding power of the staples in the panel is increased by having the upwardly-extending pairs of legs slope outwardly from the base at a very slight angle from the vertical with the extreme points of these legs turned inwardly toward each other. With this arrangement, when the legs of the fasteners enter the panel, the fish-tails cause the two legs of each pair to diverge while the turned-in ends cause the opposite legs on opposite sides to arch over toward one another to thus very firmly hold, particularly in soft composition panels, all as explained in my said co-pending application.

The present invention pertains to a driver and a method of driving, whereby a properly formed sheet metal blank in strip form is converted into fasteners of the type referred to during the operation of driving. As disclosed in my said application, a sheet metal strip has regular serrations formed in its side edges. The metal is slit from the edge toward the center from the peak of each serration, and from the valley of each serration. Every fourth slit extends inwardly toward the center further than the other three, to define the line along which the blank

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is separated in forming successive fasteners, and the central web of the strip is provided with regularly spaced holes for indexing and feeding the strip. The present invention provides an apparatus and method whereby a strip so prepared is delivered to the mechanism. There is a driver which reciprocates up and down. Every time the driver is forced downwardly, it cuts off one blank and drives it. According to the present invention, the various operations of forming downwardly-extending legs, upwardly-extending divergent legs, the toeing or cambering of the ends of the upwardly-extending legs inwardly, the cutting off and driving, occur progressively with the automatic feeding of the strip, all under the operation of the driver, as will be hereinafter more fully explained. The object of the invention is to provide a unique and novel driver and method wherein these various operations are accomplished upon a prepared blank strip. The driver, as shown in the present application, is primarily intended for use in a mechanism, not shown, where power is applied to the driver, but the driver may be operated by pressure in any number of ways, or even by hand.

The invention may be more fully understood by reference to the accompanying drawings, in which:

Fig. 1 is a longitudinal vertical section through a driver embodying my invention, with the driver in its elevated position;

Fig. 2 is a side elevation, partly in section, also showing the driver in its raised position, the view showing the mechanism with one of the side plates removed and the front plate and housing in section;

Fig. 3 is a front elevation of the machine;

Fig. 4 is a view similar to Fig. 2, but with the driver depressed to the full limit of its motion;

Fig. 5 is a detail top plan view of the strip feeding portion of the mechanism, the driver not being shown;

Fig. 6 is a horizontal section in the plane of line VI—VI of Fig. 1, looking upwardly;

Fig. 7 is a similar view in the same plane looking downwardly;

Fig. 8 is a section similar to Fig. 1, showing the driver in its lowermost position;

Fig. 9 is a transverse section in the plane of line IX—IX of Fig. 5, with the driver in its elevated position;

Fig. 10 is a view similar to Fig. 9, with the driver in its down position;

Fig. 11 is a transverse vertical section in the

plane of line XI—XI of Fig. 5, with the driver down;

Fig. 12 is a transverse vertical section in the plane of line XII—XII of Fig. 5, with the driver elevated;

Fig. 13 is a section in the plane of line XIII—XIII of Fig. 5 with the driver down;

Fig. 14 is a plan view of the beginning and end of a fastener strip or blank to be used in the machine, showing both the beginning and trailing ends, and a fragment only of the intermediate area of the strip;

Fig. 15 is a perspective view showing the entering end of the strip with the forwardmost portion of the strip in dotted lines, the dotted lines indicating a part which is discarded on the initial stroke of the machine;

Fig. 16 is a view similar to Fig. 15, showing the piece to be discarded cut-off and showing the development of the next succeeding blank;

Fig. 17 is a view similar to Fig. 16 showing the first complete, or any succeeding blank cut off, indicating the forming operations that take place on a single blank prior to the final step of driving;

Fig. 18 shows a single finished blank in the form which it takes when ejected from the driver without being driven into wood;

Fig. 19 is a rear elevation of the plunger removed from the rest of the machine; and

Fig. 20 is a side view of the part shown in Fig. 19.

Referring to the drawings, **2** designates generally a housing having an upwardly-extending barrel **3** at the forward end thereof, and having side plates **4** at each side thereof, the housing having a rearwardly-extending reduced portion **5**. The rear end of the extension **5** is open and is provided with guide rolls **6** through which the staple forming strip designated generally as A passes to the forming and driving mechanism.

The strip A, as best shown in Fig. 14, is in the form of a long ribbon of sheet metal. It may be many feet long, or many hundreds of feet long, its length being determined entirely by commercial expedience. Its edges are regularly serrated to provide a series of peaks and valleys or teeth, the teeth being designated *a*. The teeth on opposite edges are in exact transverse alignment and each tooth is slit from the point toward the longitudinal center of the strip as indicated at a^1 and a^2. The strip is also slit from the edges toward the center from each valley as indicated at a^3. The slits a^2, constituting every fourth slit in the blank, preferably extend in toward the center of the web further than the remaining slits, leaving a relatively narrow connecting portion of metal between successive blanks. The strip is provided with holes a^4 along the center line thereof, there being one hole in each blank, the holes being centered in their respective blanks. The slits a^1, if projected, would pass through the diameter of the holes a^4.

For reasons which will be more apparent in the subsequent description of the machine, at the leading end of the strip, which is the right-hand end in Fig. 14, the second pair of leg-forming elements of the first blank are cut away as indicated at a^5. At the trailing end of the blank, which is the left-hand end as viewed in Fig.14, the leg elements of a series of blanks are also entirely removed. The reason for this will be more fully apparent, but it is for the purpose of enabling the last fragment of the end of one strip to be pushed out of the machine and make way for

entering in of another strip when the fragment becomes so short that it cannot be properly handled in the feeding mechanism of the machine.

Referring to Fig. 18, which shows a complete fastener blank, there is a flat body portion designated F formed by the central web of the strip of Fig. 14. There is a pair of downwardly-extending legs *f* on each of the two longitudinal edges. The blank is formed by shearing transversely across the web in line of the slits a^2, and the legs *f* have their terminals formed by the valley which is immediately forward of the line shearing, and wherein slits a^3 form the dividing line between the two legs of each pair. The fastener also has a pair of upwardly-extending legs *f'* formed from the slit edges of the blank immediately forward of the slit portions which form the downwardly-extending legs, the slit a^1 of the blank forming a line of separation between the upwardly and downwardly-extending legs in the finished blank. As shown, the downwardly-extending legs are preferably parallel, while the upwardly-extending legs diverge outwardly at a very slight angle, and their terminal portions bend or arch inwardly toward each other. It will be seen that by reason of the construction, each pair of legs is fish-tailed at the outer end. It is the purpose of the present machine to receive the strips shown in Fig. 14 and convert them into fasteners as shown in Fig. 18 simultaneously with the driving of the fasteners, and with this preliminary explanation of the general operation, it is believed that the construction and the operation of the mechanism may be more readily understood.

In the upwardly-extending barrel **3** is a vertically reciprocable tube **7** having a knob or other operating abutment **8** at the upper end thereof. Inside this tube is a compression spring **9** and the lower end of the spring **9** rests on a fixed abutment **10** which is held in place by a transverse pin **11** passing through the abutment, through opposed slots **12** in the tube **7**, and through holes in diametrically opposite sides of the barrel. Thus when the knob **8** is pressed downwardly, carrying with it the tube **7**, the spring **9** will be compressed and when pressure is relieved from the knob, the spring will exert a pressure upwardly to return the parts to their normal position. Fixed in the lower end of the tube **7** is a driver block **13** having a shoulder **14** at the top thereof against which the lower end of the tube abuts, the driver block apart from the other machine being shown in Figs. 19 and 20. This block **13** has on its central rear face an inclined cam surface **15** that slopes upwardly and rearwardly. It has a downwardly-extending wide shearing and driving portion **16** (see Fig. 3) and a projecting narrow rib portion **17** (see Figs. 3 and 13). Rearwardly of the portion **16** it has oppositely inclined surfaces **32**, later described, and back of this, depending leg bending elements **57**, also hereinafter more fully described. There is a solid base block **18** in the lower portion of the housing **2** (see Figs. 1 and 2) having a recess formed therein to receive a second block **19**. The blocks **18** and **19**, together, serve to hold and retain a pair of indexing pins **20** in position, these indexing pins being resiliently supported and urged upwardly by springs **21**. They have their upper ends beveled to slope upwardly and forwardly, the arrangement being such that when the web of the strip A is pushed forwardly over these pins, they will push down and snap up into the holes a^4, which register with the pins. These

pins form ratchet-like indexing means to permit the strip to feed forward, but to prevent it from slipping back.

Forwardly of the indexing pins 20 the block 18 is bifurcated, providing two extensions 18a that pass out under the driver and on the faces of these extensions are formed vertical staple guides 22 down which the down-turned legs *f* of the fastener are guided during the driving of the staple. Forwardly of the guide channels 22 the opposed walls of the bifurcated portion of the base block 18 are sloped divergently upward as indicated at 23 (see Figs. 3, 5 and 13). It is these surfaces 23 that cause the upwardly-extending legs *f'* to be bent upwardly at a slightly divergent angle. The inset block 19 in the base block 18 projects forwardly between the bifurcated portions of the base block to provide an anvil 24 (see Figs. 3 and 9 to 12 inclusive), over which the downwardly-turned legs *f* of the finished blank are formed.

Each side of the base block 18 forwardly of the indexing pins 20 is drilled out horizontally to receive a reciprocating pin 25 (see Figs. 2, 3 and 4), the forward ends of these pins being beveled as indicated at 25a and they are resiliently urged forwardly by compression springs 26. These pins are at each side if the staple guide 23, and are in a plane close to the bottom of the tool. Each of them is provided with an inclined notch 27. Each of the two sides of the base block has a transverse vertical slot therein to receive a vertically-movable die member 28, the die member 28 having a downward projection 29 which is beveled and which as shown in Fig. 2 normally rests in the beveled notch 27 of the pin 25. These die blocks are best shown in Figs. 4 and 11 and have inwardly beveled edge portions 28a.

Secured to the forward face of the driver block is an inverted arc-shaped or converted U-shaped plate 30 (see Fig. 3) having downwardly-extending legs 31. These legs are positioned in their travel to ride past the beveled ends 25a of the pins 25 when the driver moves down, forcing the pins 25 inwardly toward the left as viewed in Fig. 2 to the position shown in Fig. 4. The inclined notch 27 in each of these pins serves to elevate the die member 28 from the position shown in Fig. 2 to the positon shown in Fig. 4. The purpose of this operation is to force the portions of the strip A, which at that instant overlie these dies, upwardly into contact with transversely sloping faces 32 (see Fig. 11) on the driver as the driver comes down. By this operation the terminals of the pairs of legs that bend upwardly are given an initial bend at their terminals, that is, they are bent from the flat condition shown in Fig. 15 to the upwardly sloped or cambered position shown in Fig. 16, so that when the staple is ultimately formed, the terminal portions of the upwardly-extending legs will be toed inwardly. It is, of course, apparent that the two upwardly movable dies 28 are so located with reference to the travel of the strip and to the edges of the strip as to engage and bend only the point portions of two legs on each blank.

It may be noted that on the upper edge of the base block 18 there are spring fingers 33 with downwardly-turned ends positioned over the die blocks 28 for exerting a slight pressure tending to restore the die blocks to the lowered position shown in Fig. 2 when the pins 25 move forwardly to their normal position. The terminals 34 of the springs 33 engage the surfaces of the blocks 28 outside the boundaries of the strip of stock A.

Rearwardly of the driver and above the base block 18, and in spaced relation thereto, is a slideable feed block 35 which moves back and forth in a horizontal plane over the strip of stock to progressively advance the stock with the operation of the driver. This feed block carries at its forward end a post 36 having an inclined cam surface 37 that rides against the sloping cam face 15 at the rear of the driver block 13. The operation is such that when the driver is forced downwardly, the inclined surface 15 of the driver will slide on the surface 37, exerting a thrust which moves the slide block to the left as viewed in Fig. 1, to the position shown in Fig. 8. At the opposite end of the slide block 35, remote from the end, is a well 38 to receive one end of a compression spring 39, and the opposite end of the spring 39 bears against a fixed abutment 40. The abutment 40 as best shown in Fig. 5, is in turn supported by brackets 41 secured to the top side edges of the base block 18. This spring operates to move the slide block 35 toward the right when the driver moves from the down position of Fig. 8 to the up position of Fig. 1.

The slide block 35 has a downwardly-projecting pin or pawl 42 thereon projecting below the lower face thereof, and backed up by a spring 43, the end of the pin 42 being beveled in a direction effectively opposite the bevel on the pins 20. Additionally, the under side of the block 35 may have a second pawl 44 thereon, this pawl being carried at the end of a leaf spring 45 secured to the under side of the block 35. The pawl 44 is sloped and shouldered in the same direction as the downwardly-projecting terminal of the pin 42, and the spacing between the pin or pawl 42 and the pawl 44 is a multiple of the distance between the holes a^4 and the blank A.

The operation of the feeder may now be followed. Assuming the parts to be in the position shown in Fig. 1, the driver is pushed down. This cams the block 35 to the left as viewed in Fig. 1, to the position shown in Fig. 8. During this movement of the slide block 35 to the left, the strip A is held against movement toward the left by the pins 20. When the driver raises, the block 35 is urged by the spring 39 toward the right from the position shown in Fig. 8 to the position shown in Fig. 1. During this operation, the pawls on the block 35, which ride out of the holes when the block moves to the left, catch in the holes a^4 of the strip when the block 35 moves toward the right, thus moving the strip along the slide block 35. During this movement of the strip A to the right under the action of the pawls 42 and 44, the holding pawls 20 in the base being of reverse slope permit the strip A to ride over them.

While the operation of the feeding mechanism in the manner described is normally satisfactory, I have found that the feeding operation is improved if the carriage 35 be locked in its retracted position, i. e., the position shown in Fig. 8, momentarily while the driver moves from the down position to the up position, and then quickly released so that instead of sliding forward slowly under the influence of the spring 39 with the cam surfaces 15 and 37 in contact, the block 35 can be snapped forward under the action of the spring after the driver has been raised. The latching of the feed slide followed by its quick release, enables a lighter spring to be used and gives a more positive feed. To ac-

complish this result, a latch bar 50 (see Figs. 2, 4 and 5) is pivotally supported at 51 on the top of the base block 18 at one side thereof. A tension spring 52 tends to pull this latch down while the latch itself has a tip 52' at its free end.

The latch 50 is provided with a shoulder 53 on its lower edge. A cross strip 54 is secured to the top of the slide block 35. The nose 52' of the latch is positioned to engage a shoulder 55 in a portion 56 on the rear face of the driver block 13. (See Figs. 2 and 19). When the driver block is in its normal elevated position, the shoulder 53 is above the top of the cross strip 54. When the driver is forced down, forcing the block 35 toward the left as viewed in Figs. 1 and 2, the strip 54 will move back until it is positioned rearwardly of the shoulder 53. At this time the lever 50 will be without support, and the spring 52 will pull it down so that the parts assume the position shown in Fig. 4, where the end portion of the bar 54 is caught behind the shoulder 53. This holds the block 35 to the left against the action of the spring 39 until the driver has returned to a position where it is entirely clear of the path of movement of the strip A. At this time the shoulder 55 catches the nose 52 of the latch bar, raises it up, and the spring 39 causes the slide block 35 to snap toward the right with considerable force, moving the strip A toward the right. Travel of the slide block 35 is just sufficient to advance the strip A the length of one staple unit with each operation of the driver.

As best shown in Figs. 19 and 20, the driver is provided rearwardly of the sloping faces 32 with spaced rearwardly bulging portions 56 in one of which the recess 55 above referred to is formed, and each of which has a downwardly-extending leg 57, the two legs 57 being spaced so as to straddle the central anvil member 24, these legs being rearwardly, or toward the left, of the vertically-movable die blocks 28.

The purpose of these legs 57 is to engage the proper parts of the blank at each side of the web, as shown in Fig. 9, and bend them down into an inverted U-shaped form as shown in Fig. 10. This downward bending of the pair of legs at each side of the strip occurs concurrently with the upward movement of the die blocks 28 toward the inclined surfaces 32 of the driver to form the camber on the side edges of the strip as shown in Figs. 11 and 12.

Briefly, and for the purpose of clarifying the construction of the driver, reference may be made to Figs. 19 and 20, wherein the block 13 has the inverted yoke or inverted U-shaped plate 30 with the depending legs 31 secured to the front of it. Spaced backwardly from the legs 31 is the driver portion having a rib 17 on the front face thereof, and having the wider portion 16 inwardly or back of the rib portion. The lower rear edge of portion 16 of the plunger travels past the end of the anvil 24 forming the shear for cutting the web portion of the blank in two. Rearwardly of the portion 16, and spaced upwardly from the end of the portion 16, are the inclined surfaces 32 which cooperate with the upwardly moving anvils 28 for forming the camber on the edges of the upwardly turned legs, and rearwardly of the inclined surfaces 32 are portions 56 having the legs 57 which form the downwardly turned legs of the staple, the legs 57 operating astraddle of the anvil 24.

The operation of the machine may now be clearly followed.

Assuming the parts to be in the position shown in Fig. 1, the strip shown in Fig. 14 is fed into the machine until it strikes the inner faces of the flanges 59 at the extreme forward end of the base block, and at each side of the base block (see Fig. 5). Because the machine is designed to bend one pair of legs downwardly on one section of the blank while it is driving another section, the lead end of the blank is formed as shown in Fig. 14 with the blank space a^5 corresponding to the position of the first downwardly turned pair of legs. If this were not done, the first blank sheared off would have no downwardly turned legs, and it could not move horizontally past the stop flanges 59 and it could not move down through the channel 22 for the downwardly turned legs.

When the blank is formed in the manner described, and is pushed into position, it occupies the position shown in Fig. 1. Pressure is then applied to the head 8 at the top of the plunger assembly, driving the plunger down. As the plunger moves down, the rear edge of the part 16 cuts off the first section of the blank. The first pair of legs at this time will be directly under the rib portion 17 of the plunger, and will be unsupported, except the laterally extending tips of the legs will rest on the two sides of the base block 18 as shown in Fig. 12. The part 17 of the driver, exerting pressure on the staple which is sheared off and carried down the staple guide, causes the leg forming elements beneath it, i. e., legs f', to fold inwardly as shown in Fig. 13. As the driver is operating on the first blank, the legs 57 on the rear face of the driver are forming the downwardly turned legs f of the next blank, and the dies 28 in conjunction with the sloping surfaces 32 of the driver are operated to camber the ends of the forward pair of legs of the next blank upwardly to the position shown in Fig. 16. At the same time the driver is being moved down, the slide block 35 is cammed to the left from the position shown in Fig. 1, the feeding pawls or pins of the block 35 riding out of the holes a^4 in the web of the stock, and the holding pins 20 keep the stock from moving backwards. When the block 35 has been pushed clear back, the latch 50 operates to hold it back. Then the driver is released and the spring 9 causes it to lift up. When its several die elements are above the path along which the strip is moving, the latch 50 is released and the block 35 snaps forward, advancing the stock a distance of four legs, or one unit. This brings the upwardly extending leg forming portions of the next blank under the narrow portion 17 of the driver, and the downwardly turned legs of the blank are between the surfaces 22 forming the staple guide. On the next operation the next blank is sheared off as shown in Fig. 17, the downwardly turned legs move out the bottom of the staple guide into the material into which the staple is driven, while the two pairs of legs which extend laterally and which have the points thereof cambered upwardly, are folded inwardly from the position shown in Fig. 12 to the position shown in Fig. 13. The narrow rib 17 at the front of the driver of course gives clearance for the cambered ends of the upwardly turned legs. As briefly stated, each time the driver moves down, the plate 30 with its legs 31 at the front of the driver also moves down and the legs 31, acting against the inclined ends 25a of the pins 25 cam these pins backwardly, in turn lifting the dies 28 to meet the inclined surfaces 32 of the driver to effect the cambering of the ends of the upwardly turned legs as previously described.

After the staple has been driven, the upwardly

extending legs will still be confined between the inclined surfaces 23 of the base block. To completely clear the staple of the machine, relative movement of the work piece and the machine is effected to clear the upwardly extending legs through the open front of the machine.

In a machine as thus constructed, an appropriately slitted ribbon of metal is converted into double-ended staples. With each operation of the driver, the forming of one staple is completed, and it is driven, and the partial forming of the next takes place.

The trailing end of the blank is reduced to only the width of the central web, as shown in Fig. 14, so that when the end becomes too short to feed properly, it may be pushed horizontally through the machine by the entering end of a new strip.

It will be noted that my invention provides not only a novel machine for forming and driving staples, but it also discloses a novel method in the art of stapling in that a flat ribbon of metal having closely spaced transverse slits extending from each edge toward a central web is converted from such strip form into a succession of fasteners, each of which has a downwardly turned pair of legs, the lower ends of which are fish-tailed, each fastener having upwardly turned legs which preferably slope outwardly somewhat, and the terminals of which are cambered inwardly, the terminals of the inwardly turned legs also being fish-tailed. While one form of apparatus for effecting the method has been specifically described, it will be understood that the same operations may be performed in other machines or in other ways within the scope of my invention.

While I have illustrated and described one preferred embodiment of staple forming and driving and machine, and one preferred method of effecting the movable steps of my invention, it will be understood that these are by way of illustration, and that various changes and modifications may be made therein.

I claim:

1. The steps in the method of stapling which comprise progressively operating upon a ribbon of metal having serrated edges with slits extending inwardly from the edges of the strip toward the center with the slits extending from both the peaks and valleys of the serrations, said slit edges thus constituting pointed leg forming portions which comprise alternately bending one pair of leg forming portions on each edge upwardly, and the next pair of leg forming portions downwardly to produce a succession of staple blanks each having a pair of upwardly extending leg-forming portions and a pair of downwardly extending leg-forming portions.

2. The method of operating upon a flat ribbon of metal having serrated edges with transverse slits extending from the peaks and valleys of the serrations toward, but not across the center of the strip whereby the strip has a continuous central web and leg forming portions extending from both sides of the web, which comprises alternately bending one pair of leg forming portions in one direction from the original plane of the web, and the next pair of leg forming portions in the opposite direction from the plane of the web.

3. The method of operating upon a flat ribbon of metal having serrated edges with transverse slits extending from the peaks and valleys of the serrations toward, but not across the center of the strip whereby the strip has a continuous central web and leg portion forming portions extending from both sides of the web, which comprises alternately bending one pair of leg forming portions in one direction from the original plane of the web, and the next pair of leg forming portions in the opposite direction from the plane of the web, and severing the strip with the two reversed pairs of leg forming portions.

4. The method of operating upon a flat ribbon of metal having serrated edges with transverse slits extending from the peaks and valleys of the serrations toward, but not across the center of the strip whereby the strip has a continuous central web and leg forming portions extending from both sides of the web, which comprises alternately bending one pair of leg forming portions in one direction from the original plane of the web, and the next pair of leg forming portions in the opposite direction from the plane of the web, and severing the strip with the two reversed pairs of leg forming portions, the line of severing being in transverse alignment with the peaks of the edges, whereby both pairs of legs in the section so severed have fish-tailed terminals.

5. The steps in the method of stapling which comprise operating upon the blank ribbon of metal having serrated edges which are slit transversely from the peaks and valleys of the serrations toward the center so that the ribbon has a succession of leg forming portions along each side of a central continuous web, severing the web transversely into sections having four leg forming portions along each edge, bending two opposite pairs of leg forming portions in one direction from the plane of the metal, and bending the other leg forming portions in the opposite direction from the plane of the metal.

6. The steps in the method of stapling which comprise operating upon the blank ribbon of metal having serrated edges which are slit transversely from the peaks and valleys of the serrations toward the center so that the ribbon has a succession of leg forming portions along each side of a central continuous web, severing the web transversely into sections having four leg forming portions along each edge, bending two opposite pairs of leg forming portions in one direction from the plane of the metal, and bending the other leg forming portions in the opposite direction from the plane of the metal, the line of severing occurring always on the line with slits that pass through the peaks of the serrated edges so that the pairs of leg forming portions will have fish-tailed terminals.

7. The process of operating upon a ribbon of metal having serrated edges and slits which extend from the peaks and valleys of the serration toward, but not across, the center so as to provide a continuous central web with leg forming portions extending transversely to each side thereof, which comprises bending every other pair of legs on each side of the staple downwardly and bending the intervening pairs of legs upwardly from the plane of the metal, and cambering the terminal portions of one pair of legs so as to turn it inwardly toward the terminal portions of the opposite pair of legs.

8. The steps in the method of stapling which comprises operating upon a substantially flat ribbon of metal having serrated edges which are slit from the peaks and valleys of the serration toward the center, the slits forming the edge portions of the metal into transversely extending leg forming portions which comprise bending alternate opposed pairs of leg forming elements downwardly from the plane of the ribbon, cam-

bering the terminals of the intervening opposed pairs of leg forming elements upwardly from the plane of the metal, thereafter bending the intervening opposed pairs of leg forming members upwardly from the plane of the metal and severing the metal along the lines which forms blanks with one pair of downwardly extending legs and one pair of upwardly extending legs on the side thereof on each successive blank.

9. A staple forming machine having a base block, a central anvil portion on the base block spaced from the sides of the base block, means for feeding a transversely slit ribbon of metal across the base block, and a driver cooperating with the base block having means thereon for engaging portions of the edges of the strip to bend them downwardly, the driver having other portions cooperating with the base block for bending other portions of the edges of the strip upwardly, and means on the driver for shearing the strip.

10. A staple forming machine having a base block, a central anvil portion on the base block spaced from the sides of the base block, means for feeding a transversely slit ribbon of metal across the base block, and a driver cooperating with the base block having means thereon for engaging portions of the edges of the strip to bend them downwardly, the driver having other portions cooperating with the base block for bending other portions of the edges of the strip upwardly, means on the driver for shearing the strip so that the sections so sheared each have downwardly extending portions and upwardly extending portions, means in the base block for providing guides for the portions of the sections which are turned downwardly, said driver having a surface thereon for applying pressure to the metal sections so severed and driving the downwardly extending portions into the material into which the fastener is to be driven.

11. In a stapling machine having a reciprocable driver block, said driver block having a driver portion with a narrow vertical rib on one face thereof, transversely inclined surfaces at the back of said driver portion and in a plane above the lower part of the driver portion, a pair of downwardly extending legs back of said transversely inclined surfaces and spaced from the center of the driver block, and a base block for cooperation with the driver having means thereon forming an anvil which terminates adjacent the path of travel of the rear edge of the driver to form a shear, the downwardly extending lugs at the rear of the driver moving to a position astraddle the anvil when the driver is operated, means forwardly of the anvil providing a driving guide for the fastener which is being driven, means forwardly of said guide parallel with the path of travel of the rib on the driver for causing portions of the blank to fold inwardly and upwardly as a blank is sheared off and pushed down the driving guide, and means for feeding a transversely slitted strip between the driver and the base block, the said downwardly extending lugs in the driver serving to bend the slitted edge portions of the blank downwardly over said anvil.

12. In a stapling machine having a reciprocable driver block, said driver block having a driver portion with a narrow vertical rib on one face thereof, transversely inclined surfaces at the back of said driver portion and in a plane above the lower part of the driver portion, a pair of downwardly extending legs back of said transversely inclined surfaces and spaced from the center of the driver block, and a base block for cooperation with the driver having means thereon forming an anvil which terminates adjacent the path of travel of the rear edge of the driver to form a shear, the downwardly extending lugs at the rear of the driver moving to a position astraddle the anvil when the driv r is operated, means forwardly of the anvil providing a driving guide for the fastener which is being driven, means forwardly of said guide parallel with the path of travel of the rib on the driver for causing portions of the blank to fold inwardly and upwardly as a blank is sheared off and pushed down the driving guide, and means for feeding a transversely slitted strip between the driver and the base block, the said downwardly extending lugs in the driver serving to bend the slitted edge portions of the blank downwardly over said anvil, the surfaces for bending the legs upwardly which are forwardly of the guide being sloped to converge downwardly.

13. In a stapling machine having a reciprocable driver block, said driver block having a driver portion with a narrow vertical rib on one face thereof, transversely inclined surfaces at the back of said driver portion and in a plane above the lower part of the driver portion, a pair of downwardly extending legs back of said transversely inclined surfaces and spaced from the center of the driver block, and a base block for cooperation with the driver having means thereon forming an anvil which terminates adjacent the path of travel of the rear edge of the driver to form a shear, the downwardly extending lugs at the rear of the driver moving to a position astraddle the anvil when the driver is operated, means forwardly of the anvil providing a driving guide for the fastener which is being driven, means forwardly of said guide parallel with the path of travel of the rib on the driver for causing portions of the blank to fold inwardly and upwardly as a blank is sheared off and pushed down the driving guide, and means for feeding a transversely slitted strip between the driver and the base block, the said downwardly extending lugs in the driver serving to bend the slitted edge portions of the blank downwardly over said anvil, means in the base block at each side of the anvil movable upwardly to meet the said inclined surfaces on the driver to engage the extreme edges of the portion of the blank which passes thereover to turn them upwardly, said means being positioned directly under the said transversely inclined surfaces of the driver.

14. In a stapling machine, a driver with an end portion for engaging and driving staples and having a forward portion for shearing off a blank from a strip, driving it and bending leg forming elements on the blank upwardly, the driver having a rear portion for operating on a succeeding blank to form downwardly extending legs at each side of the blank, means for feeding a blank in uniform increments under the driver and a base in said machine for cooperation with the driver.

15. In a stapling machine, a driver with an end portion for engaging and driving staples and having a forward portion for shearing off a blank from a strip, driving it and bending leg forming elements on the blank upwardly, the driver having a rear portion for operating on a succeeding blank to form downwardly extending legs at each side of the blank, means for feeding a blank in uniform increments under the driver and a base for cooperation with the driver, the base having an anvil which cooperates with the rear part of the driver for forming the downwardly turned legs, the base also having a vertical channel pro-

viding a staple guide for the downwardly turned legs, and another channel for cooperating with the driver to form the upwardly turned legs.

16. In a stapling machine, a driver with an end portion for engaging and driving staples and having a forward portion for shearing off a blank from a strip, driving it and bending leg forming elements on the blank upwardly, the driver having a rear portion for operating on a succeeding blank to form downwardly extending legs at each side of the blank, means for feeding a blank in uniform increments under the driver and a base for cooperation with the driver, the base having an anvil which cooperates with the rear part of the driver for forming the downwardly turned legs, the base also having a vertical channel providing a staple guide for the downwardly turned legs, and another channel for cooperating with the driver to form the upwardly turned legs, the rear portion of the driver also having means for cambering the portions of the blank which are to subsequently form upwardly extending legs, the base having means thereon for cooperating with the said last named means on the driver to effect such cambering operation.

17. In a stapling machine, a driver with an end portion for engaging and driving staples and having a forward portion for shearing off a blank from a strip, driving it and bending leg forming elements on the blank upwardly, the driver having a rear portion for operating on a succeeding blank to form downwardly extending legs at each side of the blank, means for feeding a blank in uniform increments under the driver and a base for cooperation with the driver, the base having an anvil which cooperates with the rear part of the driver for forming the downwardly turned legs, the base also having a vertical channel providing a staple guide for the downwardly turned legs, and another channel for cooperating with the driver to form the upwardly turned legs, the rear portion of the driver also having means for cambering the portions of the blank which are to subsequently form upwardly extending legs, the base having means thereon for cooperating with the said last named means on the driver to effect such cambering operation, said last named means in the base comprising vertically movable die elements at each side of the anvil.

18. In a stapling machine, a driver with an end portion for engaging and driving staples and having a forward portion for shearing off a blank from a strip, driving it and bending leg forming elements on the blank upwardly, the driver having a rear portion for operating on a succeeding blank to form downwardly extending legs at each side of the blank, means for feeding a blank in uniform increments under the driver and a base for cooperation with the driver, the base having an anvil which cooperates with the rear part of the driver for forming the downwardly turned legs, the base also having a vertical channel providing a staple guide for the downwardly turned legs, and another channel for cooperating with the driver to form the upwardly turned legs, the rear portion of the driver also having means for cambering the portions of the blank which are to subsequently form upwardly extending legs, the base having means thereon for cooperating with the said last named means on the driver to effect such cambering operation, said last named means in the base comprising vertically movable die elements at each side of the anvil, and means on the driver cooperating means in the base for effecting the vertical movement of the die elements.

19. A stapling machine for operating upon a transversely slitted strip of metal wherein the strip has a continuous web and transvsrsely slitted edges at each side thereof, the slit portions constituting leg forming elements, comprising a driver for driving the staples, driver-actuated means for feeding the blank, the driver having a portion for shearing the blank into sections having two pairs of leg forming elements at each side thereof, means on the driver for bending an opposite pair of leg forming elements of the blank downwardly and other means on the driver for bending an opposed pair of leg forming elements upwardly so that each blank has a downwardly extending pair of legs and an upwardly extending pair of legs, and a base block in the machine having elements complementary to the driver for cooperating and shearing the strip and effecting the aforesaid bending of the leg-forming elements.

20. In a stapling machine of the class described, a driver movable up and down, a base member cooperating with the driver, a horizontally movable feed block, space for a strip of staple-forming blanks being formed between the block and the base cooperating means on the feed block and driver for effecting motion of the feed block in one direction when the driver is pushed down, means for moving the feed block in the return direction when the driver comes up, driver released latch means for restraining the feed block against return movement until the driver has lifted clear of the plane of the strip in said space, pawls in the base below the strip for restraining the strip against reverse travel, and yieldable pawls on the feed block for cooperation with regularly spaced holes in a strip blank for feeding the strip forwardly on the return movement of the feed block.

21. In a stapling machine of the class described, a driver movable up and down, a base member cooperating with the driver, a horizontally movable feed block, cooperating means on the feed block and driver for effecting motion of the feed block in one direction when the driver is pushed down, means for moving the feed block in the return direction when the driver comes up, yieldable pawls on the feed block for cooperation with regularly spaced indexing means in a strip blank for feeding the strip forwardly on the return movement of the feed block, and driver-released latch means for restraining the feed block against return movement until the driver has been lifted clear of the plane of travel of the blank.

JOSEPH C. LANG.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,542,340	Crofoot	June 16, 1925

Certificate of Correction

Patent No. 2,431,812. December 2, 1947.

JOSEPH C. LANG

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows: Column 11, line 6, claim 8, for the word "forms" read *form*; line 24, claim 10, for "silt" read *slit*; column 14, line 4, claim 18, after "cooperating" insert *with*; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 2nd day of March, A. D. 1948.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.