Nov. 1, 1955 H. G. ALLEN 2,722,002

STAPLING MACHINE

Filed Feb. 10, 1954 5 Sheets-Sheet 1

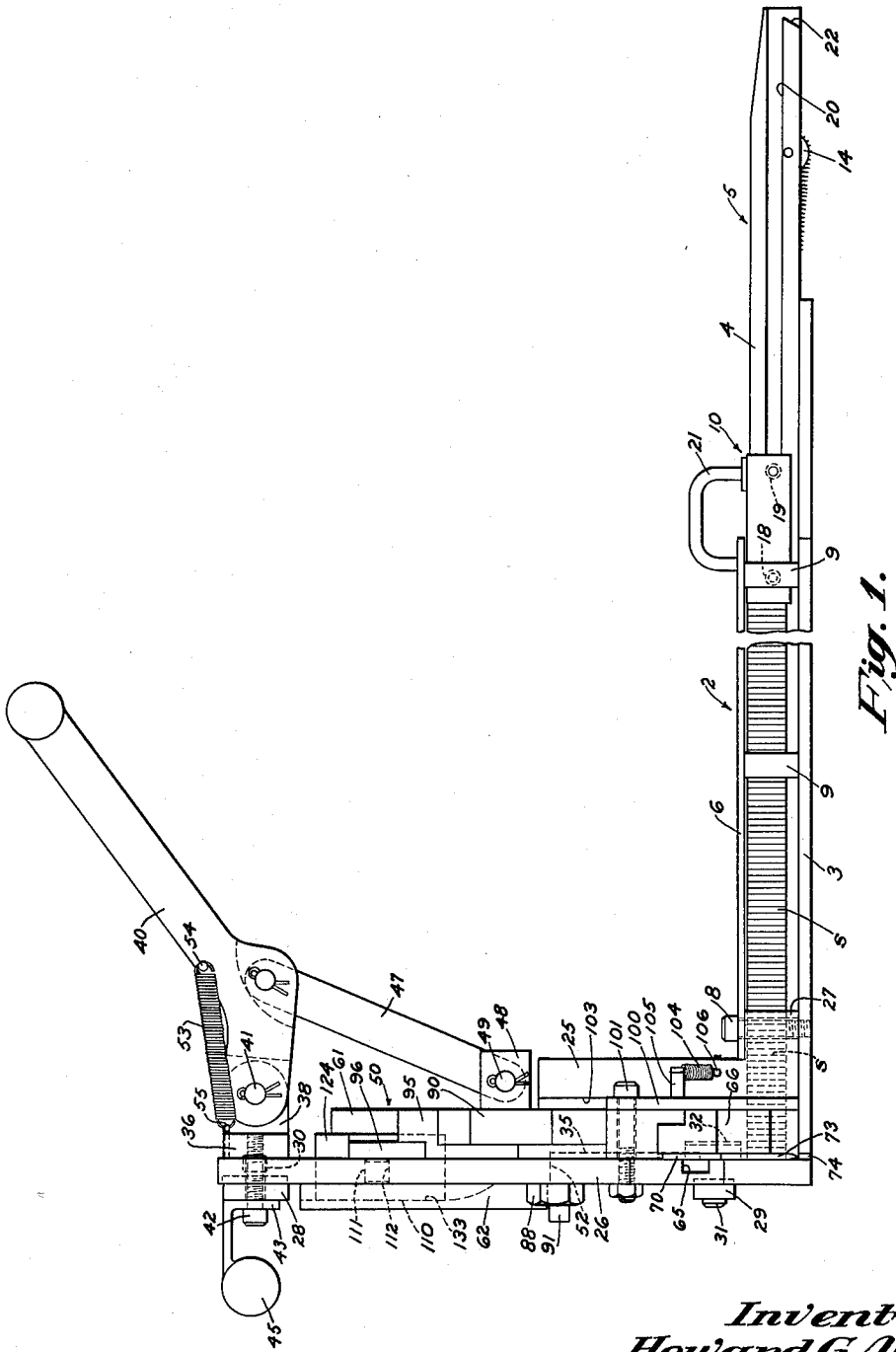


Fig. 1.

Inventor:
Howard G. Allen
By Pennington & Hobbs
Attorneys.

Nov. 1, 1955 H. G. ALLEN 2,722,002

STAPLING MACHINE

Filed Feb. 10, 1954 5 Sheets-Sheet 2

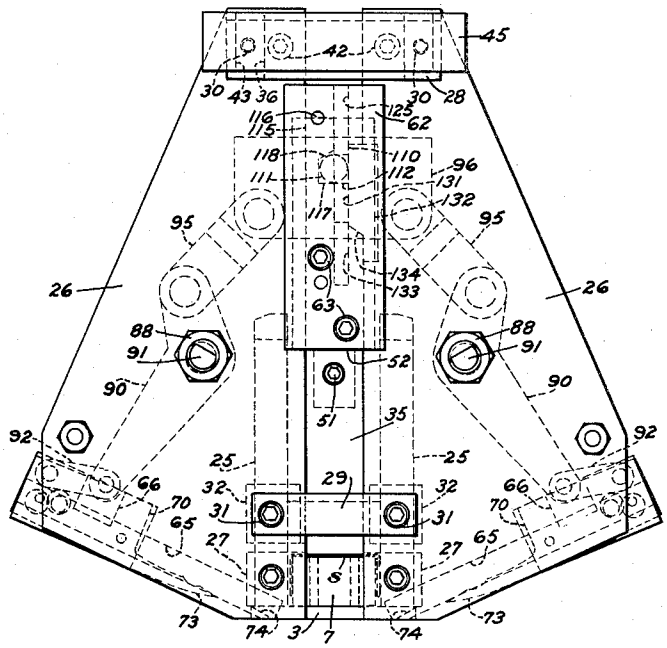


Fig. 5.

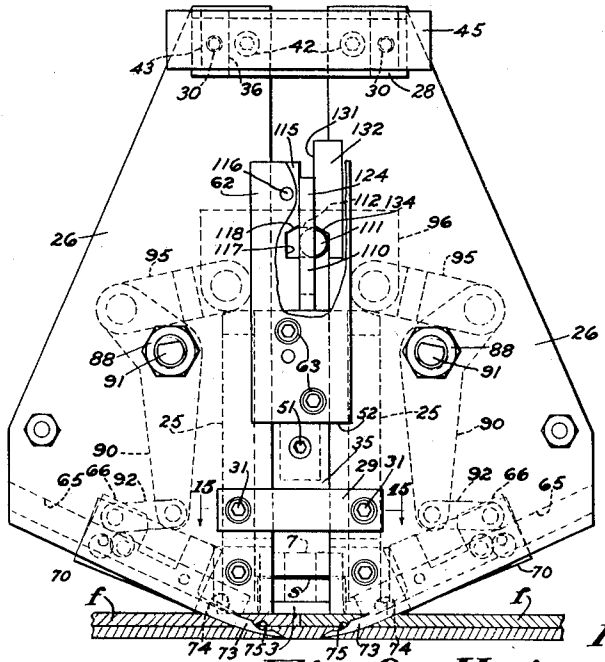


Fig. 6.

Inventor:
Howard G. Allen
By Pruning Institute
Attorneys.

Nov. 1, 1955 H. G. ALLEN 2,722,002

STAPLING MACHINE

Filed Feb. 10, 1954 5 Sheets-Sheet 3

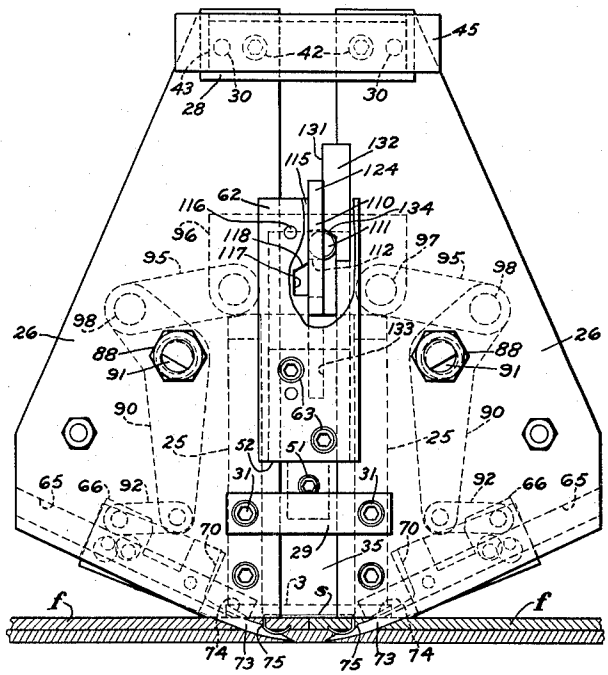


Fig. 7.

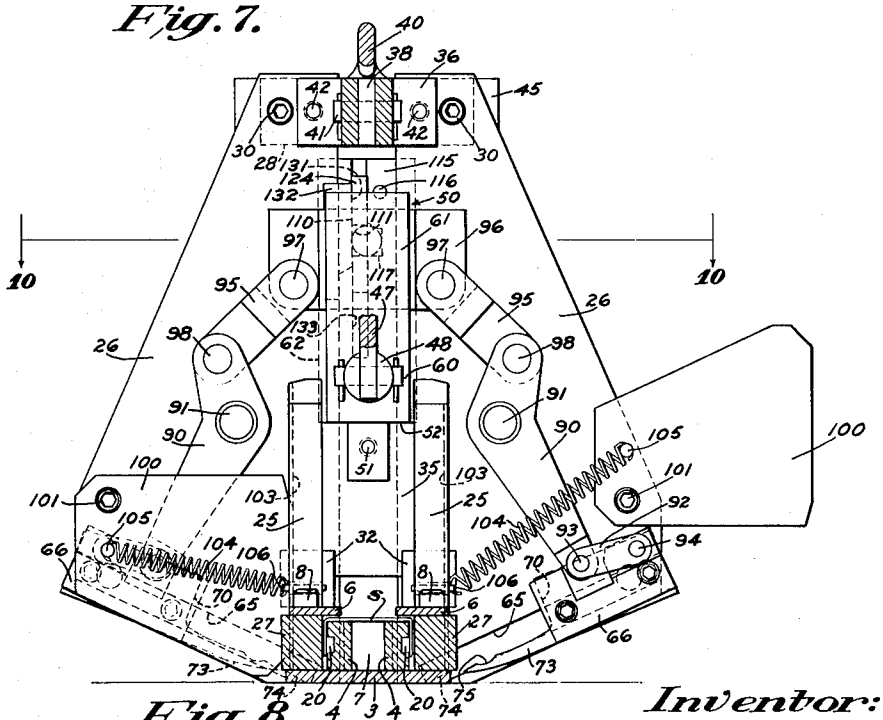


Fig. 8.

Inventor:
Howard G. Allen
By Pennington & White
Attorneys.

Nov. 1, 1955 H. G. ALLEN 2,722,002

STAPLING MACHINE

Filed Feb. 10, 1954 5 Sheets-Sheet 4

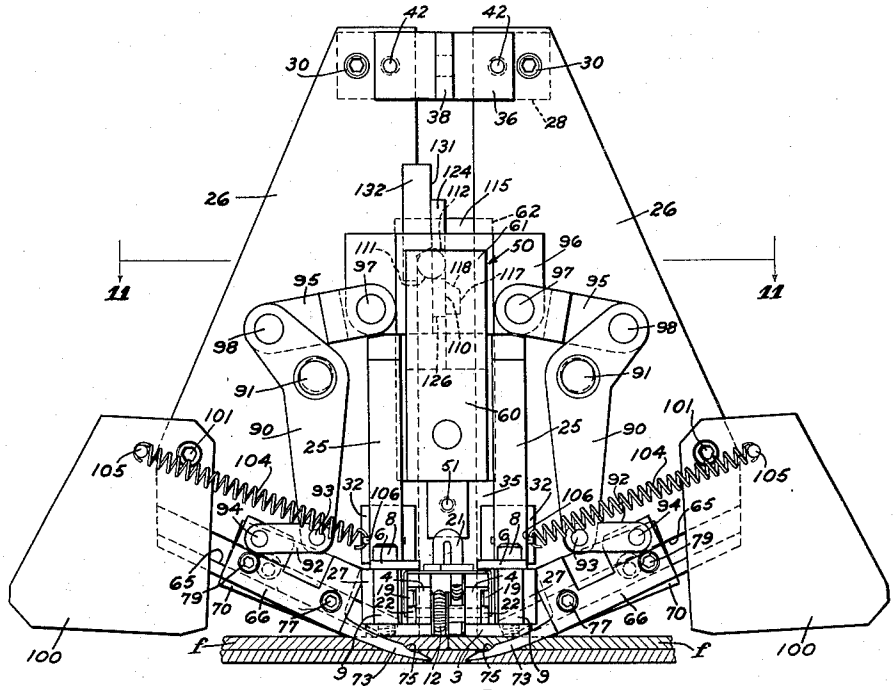


Fig. 9.

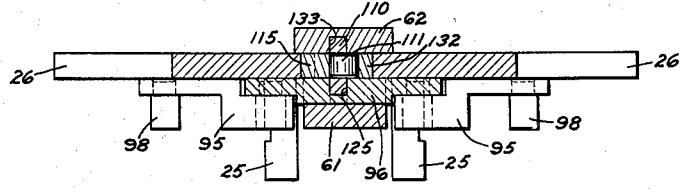


Fig. 10.

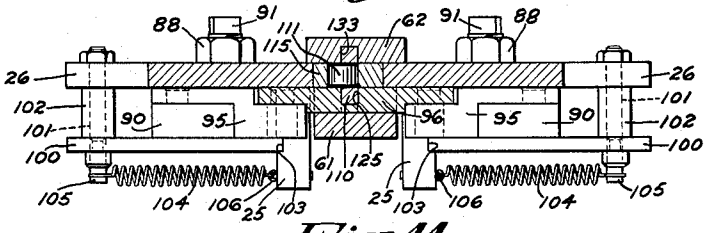


Fig. 11.

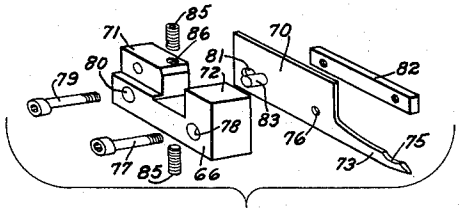


Fig. 12.

Inventor:
Howard G. Allen
By Pennington & Haseltine
Attorneys.

Nov. 1, 1955 H. G. ALLEN 2,722,002

STAPLING MACHINE

Filed Feb. 10, 1954 5 Sheets-Sheet 5

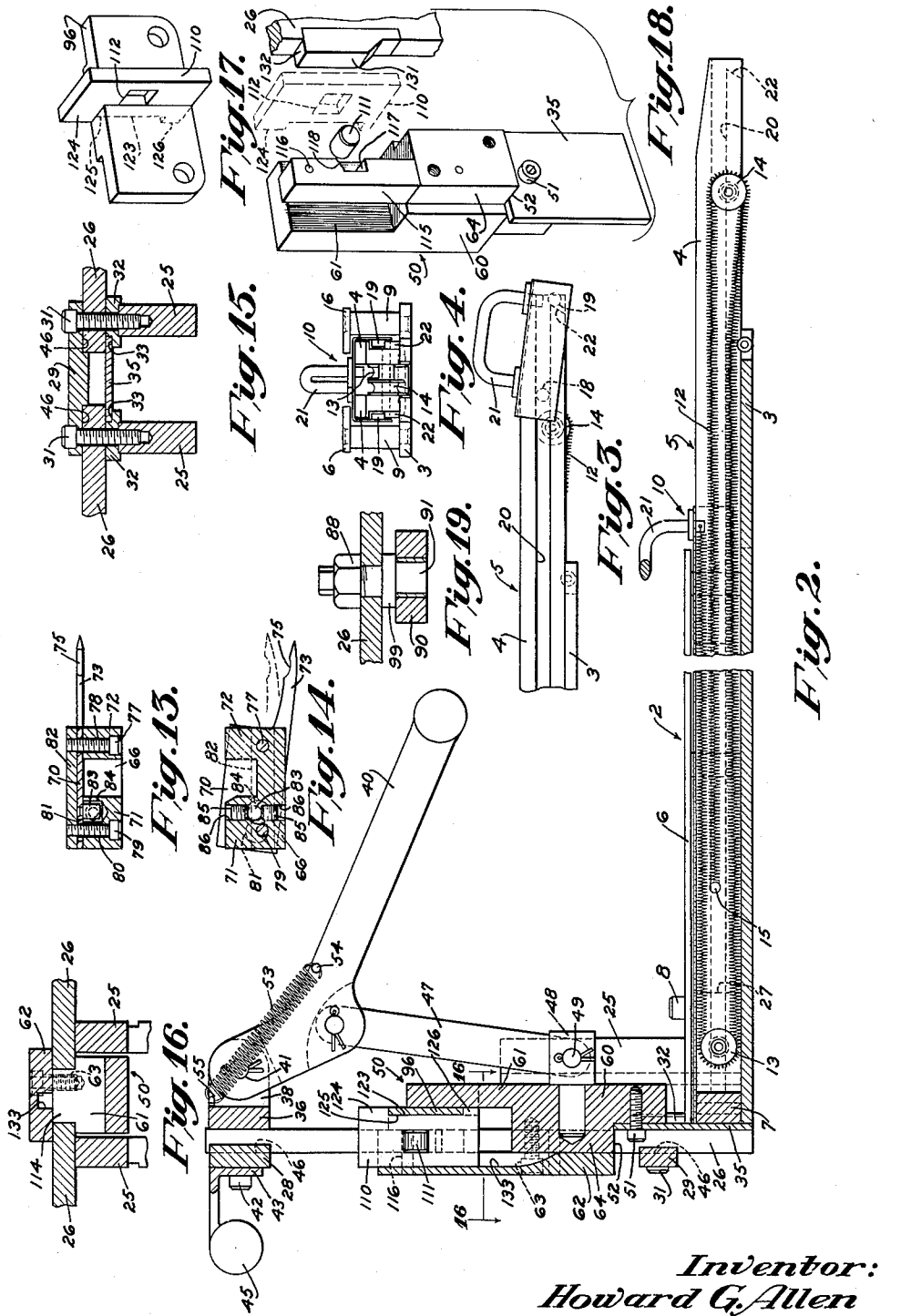


Fig. 2.

Fig. 3.

Fig. 4.

Fig. 13.

Fig. 14.

Fig. 15.

Fig. 16.

Fig. 17.

Fig. 18.

Fig. 19.

Inventor:
Howard G. Allen
By Pennington and White
Attorneys.

United States Patent Office 2,722,002 Patented Nov. 1, 1955

2,722,002

STAPLING MACHINE

Howard G. Allen, Stonington, Conn., assignor to Bostitch, Inc., Stonington, Conn., a corporation of Rhode Island

Application February 10, 1954, Serial No. 409,386

20 Claims. (Cl. 1—49)

This invention relates to improvements in stapling machines for sealing closed containers or cartons. More particularly, the present invention consists in a machine for applying staples to the overlapping flaps of a closed container by driving them therethrough and clinching their legs on the under side of the unsupported flaps by means of anvil blades penetrated through the material to position them for receiving the legs of the staple and clinching them.

One object of the invention is to provide improved means for penetrating the anvil blades through the material by operating them with a straight line motion and more positive thrust than in previously used machines of the present type.

A particular object of the invention is to provide an improved means for mounting and operating the anvil blades to eliminate the pivotal mounting and rotary movement of the blades as now common in the art.

Another object is to provide means slidable in guideways inclined toward the work with a pair of anvil blades carried thereby and operated to pierce the material of the carton by a direct straight line movement without chance of deflection or lost motion.

Another object is to provide in a machine of the present type means for mounting the anvil blades for straight line sliding motion instead of rotary movement whereby to eliminate wear and deterioration in the multiple joints and linkages of previously used constructions.

Another object is to provide slidable mountings for the pair of anvil blades with means for adjusting said blades on the mountings to regulate the extent of their penetration through the material.

Another object is to simplify the construction of the means for operating the anvil blades while rendering the mechanism more positive in action and less liable to deterioration from wear.

Further objects of the invention are set forth in the following specification which describes a preferred form of construction of the improved machine as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a side elevational view illustrating the present improved machine as prepared for operation;

Fig. 2 is a vertical sectional view of the same taken through the horizontal axis of the machine and showing the relationship of its operating parts at the completion of driving a staple;

Fig. 3 is a detailed side view of the rearward end of the magazine of the machine illustrating the means for holding the staple-pusher retracted;

Fig. 4 is an end elevational view of the staple-magazine and its cooperating parts;

Fig. 5 is a front elevational view of the main portion of the machine showing the connections between the staple-driving plunger and the anvil blades with the latter illustrated as withdrawn from operative position;

Fig. 6 is a similar view showing the anvil blades advanced into operative relationship and penetrated partially through the material of the carton flaps;

Fig. 7 is a similar front elevational view showing the anvil blades held in operative relationship and the staple-driving means at the finish of its stroke for clinching the legs of the staple;

Fig. 8 is a view similar to Fig. 5 but looking in the opposite direction to illustrate certain details of the driving means;

Fig. 9 is a view similar to Fig. 7 but looking in the opposite direction and showing one of the covers for the anvil blade slides turned back to provide access thereto for adjusting the blade;

Fig. 10 is a transverse sectional view on line **10—10** of Fig. 8;

Fig. 11 is a transverse sectional view on line **11—11** of Fig. 9;

Fig. 12 is a composite perspective view of the anvil blade and its slidable mounting showing the blade disconnected therefrom and the means for attaching it in adjusted relation on the slide;

Fig. 13 is a sectional plan view of the slide-block with the anvil blade assembled thereon;

Fig. 14 is a vertical sectional view of the same illustrating the adjusting means for varying the angular setting of the anvil blade on the slide-block;

Fig. 15 is a transverse sectional view on line **15—15** of Fig. 6 showing the construction of the guideway for the staple-driver;

Fig. 16 is a transverse sectional view of the driver-plunger taken on line **16—16** of Fig. 2;

Fig. 17 is a perspective view of the crosshead for actuating the anvil blades showing the locking plate carried thereby; and

Fig. 18 is a partially dissassembled view of the driver-plunger and certain parts for keying it to the crosshead for operating the anvil blade.

Machines of the present type have long been in use for stapling the flaps of closed cartons to seal such containers and all of the prior art devices employ the same form of construction for the anvil blades and the same method of operating them. That is to say, in every instance the anvil blades are pivotally mounted for rotation to penetrate their ends through the material of the carton flaps and locate them in position for receiving the legs of the staple to bend them over and clinch them in place. With these pivoted rotary anvil blades complicated linkages requiring a multiplicity of joints and connections are employed for actuating the blades. As the anvil blades must be constructed of relatively thin metal to render their points needle-like for piercing the material of the cartons it is obvious that their pivotal joints must be of limited dimension and therefore particularly subject to wear. The numerous joints in the linkages for operating the anvil blades are also subject to extreme wear so that the mechanism soon becomes loose and shackly at the joints, resulting in considerable play and lost motion. Due to this extreme wear the jointed parts of the operating mechanisms must be replaced frequently requiring disassembling substantially the complete machine and reassembling it with substitute repair parts. Prior to the present invention no atempt has been made to eliminate the defects and deficiencies of such previously used machines employing rotary anvil blades.

Now comes the present inventor who has devised a novel and ingenious construction in which the anvil blades are mounted on slidable members which travel in inclined guideways to provide a direct and positive thrust for impaling their points through the material of the carton. The present invention is herein illustrated and described as embodied in a portable machine designed for manual operation, but it is to be understood that the same or equivalent mechanisms may be operated by power means, for example either pneumatic or hydraulic. In general,

the present improved machine comprises a relatively long magazine for containing a large supply of U-shaped staples, a pair of slidably mounted anvil blades adapted to be penetrated through the work to position them for clinching the legs of a driven staple, and staple driving means for forcing the legs of the staple through the unsupported material to engage their legs with the anvils for clinching them on the under side thereof.

Means are provided for initially operating the slidable anvil blades to cause them to penetrate their sharpened ends through the material in position for receiving the legs of a staple and for thereafter actuating the staple-driver with delayed action to drive the staples into the work. Means are provided in the machine for adjustment of the anvil blades on their slidable mountings to set them at varying angles so that they may be adapted to penetrate partially through the folded flaps of a carton without emerging therebeneath, such adjustment being made in accordance with the thickness of the material or the number of layers into which the staples are to be driven. One purpose of this adjustment is to provide against driving the staples completely through the folded flaps and into any fragile objects packed in a carton which would be damaged thereby, and likewise to prevent penetrating packages of comestibles packed in the container.

Referring to Fig. 1 of the drawings, the present machine embodies an elongated staple-magazine **2** fixedly mounted on a base plate **3** which forms the support for the complete machine. The magazine **2** is of hollow construction comprising a pair of longitudinally-extending side rails **4** fastened to the base plate **3** and across which the staples *s* may be straddled in stick form. The rails **4** provide a so-called core **5** and the staples *s* are held down thereon by overlying top strips **6** extending throughout the greater portion of the length of the magazine. A shear-block **7** (Fig. 2) is mounted at the forward end of the core **5** for supporting the strip of staples when the foremost one is sheared from the stick by the descent of the driver. The top strips **6** are fastened to the base plate **3** at the front by means of screws **8** and at points spaced rearwardly therefrom by studs **9** reduced at their ends for riveting through the strips and through the base plate **3**, see Fig. 4.

A staple-pusher **10** of conventional type constructed of folded sheet-metal is slidably mounted in straddled relation on the core **5** to be urged forwardly by a helical spring **12** (Fig. 2) fastened thereto and extending around a roller or pulley **13** to direct it rearwardly to a similar pulley **14** and thence forwardly with its end anchored to a crosspin **15**. The pusher **10** is provided on the inside of its legs with a pair of projections **18** and **19** which are adapted to slide in horizontal slots **20** extending longitudinally along the sides of the rails **4**. A fingergrip **21** on the pusher adapts it to be drawn rearwardly for loading the magazine and held by canting its rearward end downwardly so that the projections **19** will engage in notches **22** on the under side of the rails **4** as shown in Fig. 3; it being noted that the rearward end of the rails are inclined downwardly or beveled to provide for tilting or canting the pusher in this manner. It will further be noted that the overlying hold-down strips **6** which extend longitudinally above the sides of the rails **4** extend only a portion of the length of the core **5** to provide for loading a strip of staples thereon at the rearward end thereof. Several strips of staples may thus be loaded in the magazine by placing them on the rearward end of the core and pushing them forwardly therealong, after which the pusher **10** is released and engaged with the rearmost staple in the series for feeding the staples progressively to the driving means.

Referring to Figs. 1 and 5, the slidable anvil blades, their operating mechanism and the staple driving means are mounted above the forward end of the magazine **2** on a superstructure comprising a pair of vertical bars or stanchions **25** with wing-like side plates **26** of triangular shape supported therefrom above the base plate **3**. The vertical bars or stanchions **25** may be formed with right-angular extensions or feet **27** seated on the base plate **3** and held in place by the studs **8**, previously referred to as fastening the side rails **4** of the core **5** in place at the front of the magazine.

Referring to Fig. 5, the side plates or wings **26** abut the front of the stanchions **25** and are fastened together by upper and lower cross-strips **28** and **29**. Suitable screws **31** (Fig. 15) are inserted through the lower cross-strip **29** and the plates **26** and screwed into the sides of the stanchions **25** to fasten the plates thereto. Between the rearward faces of the plates **26** and the forward sides of the stanchion bars **25** are strips **32** slotted at their inner ends to provide guide-ways **33** for slidably receiving the lateral edges of the staple-driver **35**, to be later described. A bracket **36** extending across the rearward sides of the plates **26** and fastened thereto by screws **42**, later referred to, is formed with a projecting ear **38** which provides a bearing for mounting the end of a hand-lever **40** pivoted thereto by means of a cross pin **41**, see Figs. 1 and 8. Fastened to the cross-strip **28** by the screws **42** is a right-angled bracket **43** terminating in a cylindrical bar **45** which forms a hand-rest for holding the machine down against the work to be operated on. The cross-strips **28** and **29** have their ends recessed at **46** to receive the ends of the plates **26** engaging shoulders therein for bracing the plates in spaced apart relationship.

The machine may be operated by pressing down on the lever **40** which is connected by a link **47** to the bifurcated head of a stud **48** by means of a pin **49**, said stud being held in a slidable plunger **50** to which the staple-driver **35** is fastened by means of a screw **51**. The driver blade **35** is mounted in a recess at the front of the plunger **50** with its upper end abutting a shoulder **52** to take the thrust of the plunger. The lever **40** may be returned to inoperative relationship by a spring **53** (Fig. 1) connected thereto at one end by a pin **54** and anchored at its opposite end by suitable means such as a hook **55** in the bracket **36** at the top of the plate **26**. The reciprocable plunger **50** is constructed in two parts comprising a rearward main section in the form of a rectangular block **60** which is cut away across its upper front portion at **61** on its forward side (Figs. 2, 16 and 18). Fastened to its lower portion at its forward side is a front section **62** in the form of a rectangular plate fastened thereto by screws **63**. As shown in Fig. 16, the forward projecting portion **64** of the main section **60** (Fig. 18) is reduced in width to adapt it to enter between the edges of the side plates **26** for slidable engagement therewith. The sides of the front plate **62** of the plunger **50** overlap the forward sides of the plates **26** to hold the plunger in place, thus providing vertical slots on the sides of the plunger for slidably mounting it between the edges of the side plates.

As before indicated, the anvil blades are carried by slidable elements actuated by the reciprocable plunger **50**, the construction and arrangement of this part of the mechanism being as next described. Referring to Fig. 9, the rearward faces of the two side plates **26** are formed at the bottom with slots **65** inclined downwardly toward each other at the center. The slots **65** form guideways for the slidable elements or blocks **66** on which the anvil blades **70** are mounted as illustrated more particularly in Figs. 12, 13 and 14, each block being formed with a main base portion and upstanding abutments **71** and **72** at its ends. The anvil blades **70** are constructed from hardened sheet-metal and formed with main rectangular portions fitted to the sides of the blocks **66** and fastened thereto. Each blade **70** has a forwardly projecting needle-like extension **73** terminating in a sharpened point. Rearwardly of their pointed ends the upper edges of each needle-extension **73** is hollowed out or recessed arcuately to form an anvil portion **75** for receiving the end of the staple leg to bend it over and clinch it in place.

The anvil blades **70** are mounted on the sides of the

slidable block 66 for angular adjustment with respect thereto by means next described. Substantially midway between the ends of each anvil balde 70 its main portion is formed with a hole 76 (Fig. 12) for receiving the shank of a screw 77 extending through a hole 78 in the forward end of the slide block or mounting 66. A second corresponding screw 79 extends through a hole 80 in the block and also through an enlarged hole 81 in the blade 70 (Fig. 13). The ends of the screws 77 and 79 are screwed into threaded holes in the ends of a key-like strip or spline 82 which overlies the side of the anvil blade 70 to fasten it against the side of the block 66. The key 82 has a further function to serve as the runner for the block 66, being adapted to slide in its respective slot 65 in the rear face of the plate 26.

For adjusting the angularity of each anvil blade 70 a pin 83 riveted or otherwise secured thereto projects from its side into an enlarged hole 84 in the block 66 (Fig. 14). A pair of set-screws 85 are engaged in threaded bores 86 at top and bottom of the block 66 with their ends engageable with the adjusting pin 83 projecting from the side of the anvil blade. It will thus be seen that by loosening the set-screws 85 the blade 70 may be rocked about the axis of the screw 77 to raise or lower the sharpened end of its needle-portion 73, the enlarged hole 84 permitting the rearward end of the blade to move relatively to the screw 79. After the blade has been adjusted to the desired angularity the set-screws 85 are set up against the opposite sides of the pin 83 to secure the blade in adjusted relationship as shown in Fig. 14.

The slide blocks 66 carrying the anvil blades 70 are slidable forwardly in the guideways 65 by means of levers 90 (Fig. 9) connected thereto and operated by the descent of the plunger 50. The levers 90 are pivoted on studs 91 secured in the opposite side plates 26. Each lever 90 is connected to its respective slide block 66 by a relatively short link 92 pivoted on a pin 93 at its lower end and pivotally connected to the side of the block by a similar pin 94. The upper shorter arms of the levers 90 are connected by links 95 to a crosshead or member 96 which is carried by the plunger 50 and adapted to be released therefrom during the last part of the downward stroke of the plunger after it has advanced the anvil blades 70 into their foremost positions. The links 95 are pivoted to the member 96 by pins 97 with their opposite ends pivotally connected to the short arms of the levers 90 by pins 98. The studs 91 may have their body portions which mount the levers 90 formed slightly eccentric to their end portions held in bores in the plates 26 (Fig. 19) to adapt them to be rotated for adjusting the relationship of the pivotal axes of the levers. Nuts 88 on the threaded ends of the studs 91 are set up against the faces of the plates 26 to bind the flanges 99 on the studs against the opposite sides of the plates for securing them in adjusted relationship. The adjusting means last described provides for accurate setting of the anvil blades in operative relationship. It is to be noted that the links 92 are connected to the blocks 66 within the recesses in the sides of the abutments 71 so that the front faces of the links are flush with that of the main portions of the blocks. The purpose of this construction is to provide means engageable across the outer faces of the blocks 66 for holding them in place with their splines 82 engaged in the slots 65. Provided for this purpose are cover-plates 100 pivoted on screws 101 projecting from the side plates 26 through spacer collars 102 (Fig. 11) to adapt the plates to overlie the forward faces of the blocks 66 and also the links 92 as shown at the left in Fig. 8; or to be swung away therefrom as shown at the right in this view and also similarly illustrated in Fig. 9. With the cover-plates 100 in closed position their forward edges engage in grooves 103 in the sides of the stanchions 25 to resist any lateral movement thereof. Springs 104 connected to pins 105 on the plates and anchored at 106 to the sides of the stanchions 25 normally hold the plates closed while adapting them to be swung open against the tension of the springs. When the cover-plates 100 are swung back with the springs 104 passing across their pivotal axes they hold the plates open for rendering the parts accessible for adjusting the anvil blades 70. When closed the cover-plates 100 protect the parts from insinuation of dirt or foreign particles.

In order that the anvil blades 70 may be operated to penetrate their ends through the carton flaps and assume their operative relationship before a staple is driven the crosshead or member 96 is carried through only a portion of the downward stroke of the plunger 50. As the plunger 50 reaches a certain point in its descent the crosshead or member 96 will bring up against the top of the stanchions 25 to arrest its motion and cause it to be disconnected from the plunger by automatically operated means as next described. The member 96 carries a so-called key-plate 110 (Figs. 7, 17 and 18) by which it is connected to the plunger 50 during the initial part of its descent and then released therefrom. The key-plate 110 mounts a roll 111 in a central opening 112 which is initially engaged with a recess or slot 117 in the plunger 50 and thereafter released therefrom to disconnect the member 96 from the plunger 50. The rearward or main section 60 of the plunger 50 is cut away across its upper portion, as before described, and has a lower projecting rectangular portion 64 at its front of somewhat less width than that of the main part. The driver-blade 35 is fastened to a lower recessed portion of the plunger 50 by means of the screw 51. Mounted above the forwardly projecting portion 64 of the plunger 50 is an upright bar-like element 115 which, in effect, forms a part of the plunger itself, being fastened thereto by the front section or plate 62 by means of a pin 116 (Fig. 2). The element 115 is recessed on its side with the slot or opening 117, previously mentioned, and is formed with an upper inclined or beveled cam-face 118. The opening 117 is adapted to receive the roll 111 which constitutes the key or shiftable connecting means between the plunger 50 and the crosshead or member 96 for actuating the levers 90 which slide the anvil blades 70. The crosshead member 96 is assembled on the main section 60 of the plunger 50 extending at right-angles across its upper recessed portion at the rear of the upright bar 115 with its lower edge abutting the top of the projecting portion 64 at the front of the recess.

The member 96 carries the key-plate 110 that is cut away at 123 to form a projection or lug 124 overlying the upper edge of said member with its rearward recessed edge portion received in a vertical slot 125 (Figs. 10 and 11). At the bottom of the key-plate 110 is a lug or projection 126 which engages an offset portion of the slot 125 to effectually lock the plate 110 vertically with respect to the member 96. The forward portion of the plate 110 engages in a vertical slot 133 (Fig. 2) in the rearward side of the front plate 62 of the plunger 50 to adapt it to slide therein. The crosshead or member 96 is assembled on the main section 60 of the plunger 50 with the key-plate 110 abutting the side of the upright bar 115.

Referring to Fig. 5, when the crosshead or member 96 is at the upper end of its stroke with the anvil blades 70 withdrawn the roll 111 is engaged in the opening or cam-slot 117 to lock said member in connection with the plunger 50; the roll being maintained in this relationship as it bears against the face 131 of an insert 132 set into the edge of the side plate 26 as shown in Fig. 18. The lower portion of the insert 132 is recessed and formed with an inclined cam-face 134 for a purpose later explained. The insert 132 is fixedly held in the slotted edge of the plate 26 and forms a rigid part thereof, being made separate for the purpose of constructing it of hardened metal; this also being the purpose of forming the element 115 separate from the main portion of the plunger 50. During the first portion of the downward stroke of the plunger 50 the roll 111

will ride along the face 131 to maintain it engaged in the opening 117 of the element 115 to lock the member 96 in connection with the plunger. When, however, the member 96 is carried down sufficiently to engage it with the upper ends of the stanchion 25 the roll 111 will have reached the position shown in Fig. 6 and will be cammed out of the opening 117 to pass through the opening 112 and be received in the lower cut-away portion of the insert 132 beneath its cam-face 134. Upon this release of the member 96 from the plunger 50 the plunger will continue its descent as indicated in Fig. 7 to drive the staple into the work. The legs of the staple are thus engaged in the clincher recesses 75 of the anvils 70 to cause them to be bent around and clinched in the manner illustrated in Fig. 7. After driving and clinching a staple in place the plunger 50 is withdrawn upwardly by release of the hand-lever 40 to allow the spring 53 to rock the lever upwardly. The mechanism of the complete machine having been described in detail its method of operation is explained as follows.

To prepare the machine for operation the magazine 2 is loaded with a supply of staples *s* by sliding the refills or sticks along the core 5 after the staple pusher 10 has been withdrawn and latched in the position illustrated in Fig. 3. The pusher 10 is then released to cause the spring 12 to slide it forwardly into engagement with the rearmost staple on the core 5 for feeding the whole series of staples forwardly with the foremost one advanced beyond the end of the shear-block 7. It will be understood that when the machine is first loaded the plunger 50 is raised with the foremost staple *s* held in the space between the end of the shear-block 7 and the rearward faces of the plates 26. With the plunger 50 raised the slide blocks 66 will be withdrawn to the outer ends of the grooves 65 and the anvil blades 70 retracted rearwardly to the position shown in Fig. 8. The machine is placed on the work which may be the top or bottom of a fiberboard carton having its flaps folded to close it over the contents packed therein. The operator presses down on the rest 45 above the front of the machine to hold its base plate 3 firmly against the work and the lever 40 is then operated to slide the plunger 50 downwardly for performing the several operations as next explained; it being understood that pneumatic or hydraulic power means may be provided for operating a piston in place of the plunger 50 to actuate the mechanism previously described. With the plunger 50 at the top of its stroke the crosshead 96 is connected to the plunger by the roll 111 in the key-plate 110 engaging the socket 117 in the bar-portion 115 of the main section 60 of the plunger 50. As the member 96 is carried downwardly with the plunger 50 the links 95 connected thereto will rock the levers 90 about their pivots 91 whereby their longer arms will slide the side blocks 66 forwardly. As the blocks 66 are slid forwardly along the grooves 65 the pointed needle-like portions 73 of the anvil blades 70 are carried forwardly and downward to cause their pointed ends to pierce through the material of the carton. Fig. 9 illustrates the blades as penetrated through the upper folded flaps *f*, *f* of the carton without emerging below the underneath layer of the material. It will be understood that in Fig. 9 the anvil blades 70 are shown as adjusted in angularity to effect the particular result explained above so that the staples can be applied with their legs clinched in the material without protruding through the lower layer or under flaps of the carton, a desideratum necessary in sealing cartons packed with fragile objects or foodstuffs and the like. It will be understood further that the adjustment of the anvil blades in the manner described may be to provide greater or lesser angularity in accordance with the thickness of the material into which the blades are to be penetrated. It is further to be observed that by adjusting the eccentric studs 91 on which the levers 90 are pivoted the relationship of the anvil blades 70 may be regulated to insure that the legs of a staple being driven will engage properly with the clincher depression 75 in the blades. It is here noted that the forward end of the base plate 3 of the machine is cut away at its sides as indicated at 74 in Fig. 1 to permit the needle projections 73 of the anvil blades 70 to pass thereunder without striking the plate.

As the plunger 50 descends the member 96 eventually makes contact with the upper ends of the stanchions 25 (Fig. 9) and at this point the anvil blades 70 will have been advanced to their forward operative positions and the motion of the crosshead or member 96 is arrested. The unlocking or uncoupling of the crosshead 96 from the plunger 50 takes place as the roll 111 reaches a point where it can ride off of the forward face of the insert 132 (Fig. 6) and be shifted laterally out of the recess 117 in the upright portion 115 of the plunger (Figs. 6 and 18). The roll 111 is forced out of the recess 117 by the upper inclined face 113 of the opening acting thereagainst to cam it laterally through the opening 112 in the key-plate 110 as indicated in Fig. 6, thereby releasing the member 96 to allow the plunger 50 to continue its descent. During this latter descent of the plunger under continued depression of the lever 40 the driver blade 35 is forced downwardly to drive the legs of the staple *s* through the work as shown in Fig. 7. As the legs of the staple pierce the material of the carton flaps *f*, *f* their ends engage in the clincher depressions 75 at the ends of the blades 70 and are bent or curled around to clinch them in place for securely fastening together the abutting ends of the flaps as shown in Fig. 7.

After driving and clinching a staple in the work the parts of the machine are returned to initial position in the following manner. When pressure is released on the hand-lever 40 the spring 53 will rock it upwardly to withdraw the link 47 and thereby raise the plunger 50 to its initial position shown in Figs. 1 and 8. As the plunger 50 is thus returned toward the upper end of its stroke the crosshead or member 96 is connected therewith as the slot or opening 117 in the member 115 of the plunger moves past the position shown in Fig. 6 to permit the roll 111 to enter said slot. The transfer of the roll 111 into the slot 117 results from the upward motion of the key-plate 100 which causes the cam-face 134 at the lower end of the insert member 132 to force the roll through the opening 112 in the key-plate 110 and into the slot 117 where it acts to connect the key-plate with the plunger 50. As the plunger 50 is thus reconnected with the crosshead or member 96 through the means of the key-plate 110 the roll 111 will ride along the face 131 of the insert 132 to retain it in the slot 117 and thereby maintain the plunger and crosshead connected. In this manner the rise of the plunger 50 will pick up the crosshead 96 and slide it upwardly to rock the levers 96 and thereby withdraw the slide-blocks 66 to return the anvil blades 70 to inoperative position as illustrated in Fig. 8. After the parts of the operating mechanism have been returned to initial position as shown in Figs. 1 and 8 the machine is ready for the next operation to apply a staple to the work at another location by merely sliding it along the work.

It will be observed from the foregoing description that the present invention provides an improved method of penetrating the anvil blades into or through the work by sliding them in straight paths to insure a more positive piercing action at their points. Through the use of the novel and ingenious means herein illustrated and described rotary anvil blades as previously used are eliminated and a more direct action is effected without the danger of backlash and lost motion due to wear on the pivots of the rotary blades and the multiplicity of the joints in the linkages for actuating them. It is to be particularly noted that in the present form of construction the pivots for the operating levers are of considerable size or diameter to provide for longer wear, and likewise

the pivotal connections between the levers and their linkages are of sufficiently large dimensions to insure against extreme wear. Furthermore, any wear in these parts causing the slightest lost motion may be compensated for by adjusting the pivots **91** for the levers **90** in the manner as described above.

While the invention is herein described and illustrated in a preferred form of construction it is to be understood that modifications may be made in the structure and arrangement of the parts of the device without departing from the scope of the invention as expressed in the accompanying claims. Therefore, without limiting myself in this respect, I claim:

1. In a stapling machine having means for driving staples into the work, the combination of a pair of anvil blades, means for sliding said anvil blades longitudinally in continuous straight paths inclined toward the work to penetrate therethrough in position for engaging the legs of a driven staple to clinch them on the under side thereof, and means for simultaneously sliding said anvils.

2. In a stapling machine having means for driving staples, the combination of a pair of continuous straight guideways inclined downwardly toward each other, a member slidable in each guideway, an anvil blade fixedly mounted on each slidable member in substantially parallel relation to the respective guideway in which the member slides, and means for sliding said members in straight courses to penetrate the anvil blades into the work and locate them in position for engagement with the legs of a staple to clinch them on the under side of the work.

3. In a stapling machine having means for driving staples into the work, a pair of anvil blades, means for moving said anvil blades in continuous straight paths inclined toward the work to penetrate them through several thicknesses of the material, and means for adjusting said blades at varying angles with respect to the work to regulate the extent of their penetration through the material in accordance with the thickness thereof.

4. In a stapling machine having means for inserting staples into the work, a pair of anvil blades for penetration into the work in position to clinch the legs of the staples, slides for mounting said anvil blades, means for adjusting the blades on said slides in angular relation to the work, and means for moving said slides in continuous straight paths inclined toward the work to cause said anvils to advance longitudinally in inclined planes and penetrate the work to locate their ends in position for clinching the legs of a staple inserted therein.

5. In a stapling machine having means for driving staples, the combination of a pair of continuous straight guideways inclined downwardly toward each other, a mounting slidable in each guideway, an anvil blade fixedly attached to each mounting and disposed in substantially parallel relation to the respective inclined guideway in which said mounting slides, means for adjusting each blade angularly on its mounting to regulate the amount of its penetration into the work, and means for sliding said mountings to move said anvil blades longitudinally in planes substantially parallel with the respective guideways in which the mountings slide to position them for clinching the legs of a staple on the under side of the work.

6. In a stapling machine having means for driving staples into the work, a pair of continuous straight-line guideways inclined toward the work, a member slidable in each guideway, an anvil blade pivoted to each slidable member to adapt it to be adjusted in angular relation to the work, means for securing said blades in adjusted fixed relationship on said members to position them in substantially parallel relation to the guideways in which the members slide, and means for sliding the members in the guideways to penetrate the anvil blades into the work and locate them in position for clinching the legs of the staples.

7. In a stapling machine having means for driving staples into the work, a pair of anvil blades adapted for penetration into the work, means for mounting said anvil blades to move in continuous straight paths inclined toward the work, a reciprocable crosshead, and bell-crank levers connecting said crosshead to said mountings to slide said anvils toward the work for penetration thereinto.

8. In a stapling machine having means for driving staples into the work, a pair of continuous straight-line guideways on said machine inclined downwardly toward the work, a slide slidable in each guideway, an anvil blade carried by each slide, bell-crank levers for sliding said slides in their guideways through a straight course to position them for clinching the legs of a staple, a reciprocable member connected to actuate said bell-crank levers to slide the slides, and means for reciprocating said member.

9. In a stapling machine, a frame, a member reciprocable vertically on said frame, straight guideways on the frame inclined downwardly toward each other throughout their full length, a slide slidable in each guideway, bell-crank levers pivoted to the frame with one arm connected to a slide and its opposite arm connected to the reciprocable member for sliding said slides in their guideways, and means for reciprocating the reciprocable member to actuate said levers.

10. In a machine having an upright frame, a plunger reciprocable vertically on said frame, a pair of guideways on the frame inclined downwardly toward each other in continuous straight planes, a slide slidable in each guideway, an anvil blade mounted on each slide in substantially-parallel relation to the respective guideway for said slide and formed to penetrate into the work, levers pivoted on said frame and connected to slide said slides in their guideways, means connecting said plunger to actuate said levers to slide the slides, and a staple-driver reciprocable with said plunger for driving a staple after the anvil blades have been penetrated into the work.

11. In a machine of the type indicated having a reciprocable plunger, staple driving means reciprocable by said plunger, anvil blades formed to penetrate into the work in position to receive and clinch the legs of a driven staple, means for guiding said anvil blades to advance longitudinally in straight courses continuously inclined toward the work, means connecting said plunger to slide said anvil blades during the initial part of its descent, and means to disconnect said connecting means from the plunger after the anvils have been penetrated into the work to release said plunger for operating the staple driving means.

12. In a stapling machine, a slidable plunger having means for driving a staple into the work, a pair of anvil blades shaped to penetrate into the work in position for clinching the legs of a staple, means for sliding said anvil blades longitudinally in straight courses continuously inclined toward the work, means for releasably connecting said sliding means to the plunger during the initial part of its descent, means for sliding the plunger, and means for disconnecting the anvil blades from said plunger after they have been moved into operative position to permit the plunger to continue its descent for driving a staple into the work.

13. In a machine of the type indicated, a slidable plunger, a staple-driver carried by said plunger, a pair of anvil blades adapted for penetration into the work, means for mounting said anvil blades to slide longitudinally in straight paths continuously inclined toward the work, means releasably connected to said plunger for sliding said anvil blades, means for arresting the movement of said blade-sliding means when the anvil blades are advanced into operative relationship, and means for disconnecting said blade-sliding means from the plunger to permit it to continue its motion for driving a staple into the work.

14. In a machine of the type indicated, a vertically reciprocable plunger, a staple-driver carried by said plunger, a pair of anvil blades shaped for penetration into the work, means for mounting said anvil blades to slide longitudinally in straight paths continuously inclined toward the work, means releasably connected to said plunger for sliding said anvil blades, means for arresting the movement of said last-named means when the anvil blades are advanced into operative relationship, means for disconnecting said blade-sliding means from the plunger to cause the latter to continue its motion for driving a staple into the work, and means for reconnecting the blade-sliding means with said plunger to adapt it to withdraw the anvil blades as the plunger is raised after driving a staple.

15. In a machine of the type indicated, a frame adapted to be applied to the work, a plunger reciprocable vertically on said frame, a staple-driver operable by said plunger to drive a staple into the work, a pair of straight guideways inclined downwardly toward the work, slides slidable in said guideways, anvil blades having sharpened portions for insertion into the work, means for mounting said anvil blades on said slides, levers for sliding said slides in their guideways to penetrate the anvils into the work, a crosshead carried by the plunger and connected to actuate said levers, means for releasably locking said crosshead to said plunger, means for unlocking said means after the plunger has descended sufficiently to actuate the levers for advancing the anvil blades into operative relationship, and means to reconnect said crosshead with the plunger during the upward stroke of the latter to withdraw the anvil blades from operative position after the legs of a driven staple have been clinched.

16. In a machine of the type indicated, a frame, a plunger slidable vertically on said frame, a staple-driver operable by said plunger, a pair of anvil blades mounted on said frame to slide in straight courses inclined downwardly toward each other, a crosshead connected to slide said anvil blades toward each other for penetrating them into the work, a connecting member extending between said crosshead and plunger, said member having an opening therein, a roll in said opening in said member engageable in a notch in the plunger to operatively connect the crosshead therewith, means engageable by said roll in the opening of the connecting member to maintain it engaged in the notch in the plunger, and means to release said roll from the notch in the plunger after the latter has descended to a predetermined extent.

17. In a machine of the type indicated comprising a base, a frame comprising side plates vertically mounted on said base, a plunger reciprocable in ways formed by said side plates, a pair of slots in said plates forming guideways extending downwardly in angular relation toward each other, slides having runners slidable in said slots, anvil blades carried by said slides for insertion into the work, levers pivoted to said side plates, means mounting said levers to said slides, a crosshead releasably connected to said plunger, and means connecting said crosshead to said levers to slide the slides and advance the anvil blades toward each other to penetrate their ends into the work.

18. In a machine of tthe type indicated, a magazine for holding a supply of staples, a vertical frame surmounting said magazine, a plunger slidable on the frame, a staple-driver operable by said plunger for driving staples into the work, a pair of slotted guideways extending in straight paths inclined toward the work, slides slidable in the guideways, anvil blades carried on said slides and having portions shaped to penetrate the work to receive and clinch the legs of a driven staple, levers pivoted on the frame and connected to slide said slides, and means for releasably connecting said levers to the plunger for advancing the anvil blades into operative relationship and thereafter disconnecting said levers from said plunger at a predetermined point in its descent so as to permit the plunger to operate the driver to drive a staple with the clincher blades in position to clinch the legs of the staple.

19. In a machine of the type indicated, a frame, a pair of anvil blades mounted to slide in straight courses inclined downwardly toward each other to penetrate their ends into the work, a plunger slidable on said frame, a driver operated by said plunger to apply the staples to the work, a crosshead reciprocable by said plunger and connected to slide said anvil blades, a member extending between said plunger and said cross-head at right-angles thereto and formed with a central opening, a roll held in said opening, said plunger having a notch for receiving the roll to lock said crosshead in connection with said plunger, and a stationary member having a bearing face engageable by the roll in the opening of said member during the initial portion of the descent of the plunger to maintain the roll engaged in the notch in the plunger, said stationary member being recessed below its bearing face to permit the roll to be shifted out from the opening in said member to release it from the notch in the plunger as the latter reaches a predetermined point in its descent.

20. In a stapling machine having a base adapted to rest on the work, a frame surmounting the base and formed with means for slidably mounting a plunger, a driver operable by said plunger for driving staples into the work, a pair of anvil blades slidable in straight courses inclined downwardly toward the work to adapt their sharpened ends to penetrate thereinto, a crosshead for sliding said anvil blades, a member projecting from said crosshead into a slot in the plunger and provided with a central opening, a roll carried in said opening for engaging in the slot in the plunger, said slot having an inclined cam-face at the top, and a stationary member having a vertical face engageable by said roll to hold it in engagement with the slot in the plunger and formed with a recess therebelow shaped with an inclined cam-face, said recess adapted to receive the roll to release it from the slot in the plunger to unlock the crosshead therefrom during the descent of the plunger, and said cam-face on the stationary member adapted to force said roll through the opening in the connecting member to engage it in the slot in the plunger to reconnect the crosshead therewith when the plunger moves upwardly in its return stroke.

References Cited in the file of this patent

UNITED STATES PATENTS

1,878,417	Matveyeff	Sept. 20, 1932
2,488,940	Schafroth	Nov. 22, 1949