

Nov. 15, 1960

H. F. PETERSSEN

2,959,786

FASTENER-APPLYING MACHINE

Filed Feb. 20, 1958

5 Sheets-Sheet 1

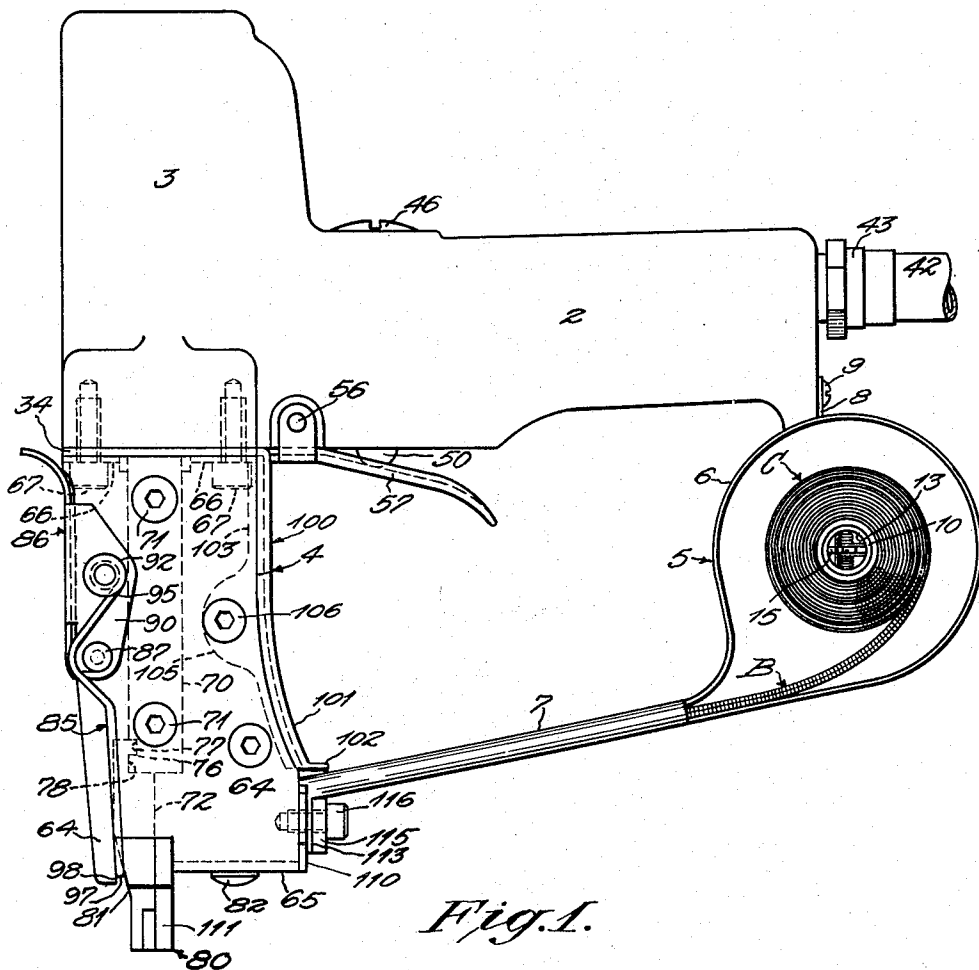


Fig. 1.

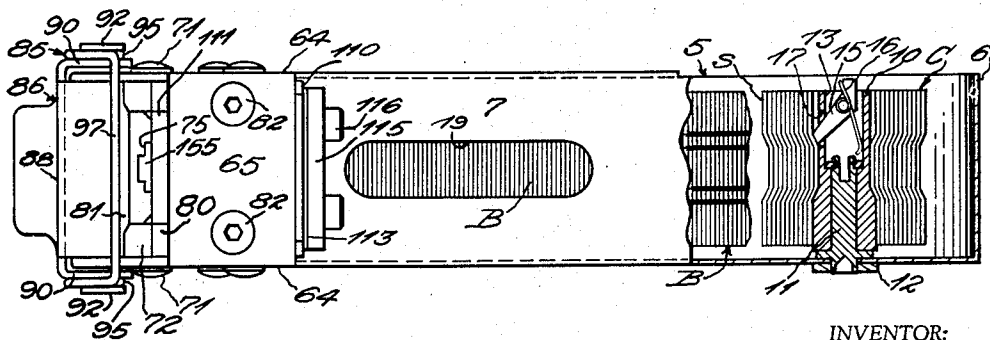


Fig. 2.

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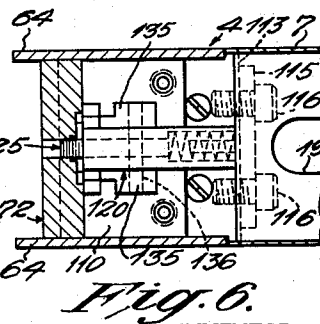
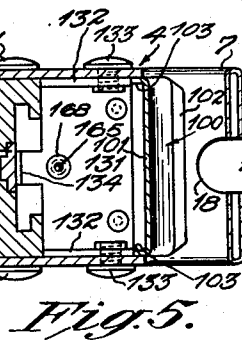
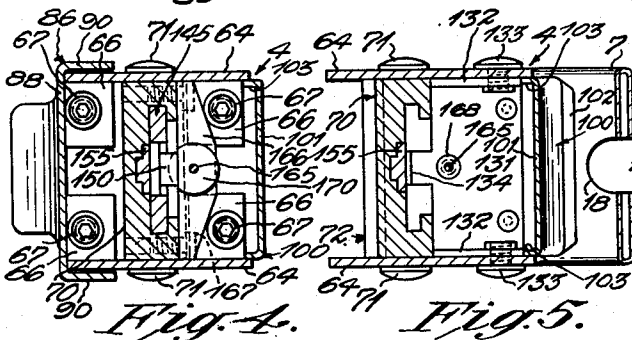
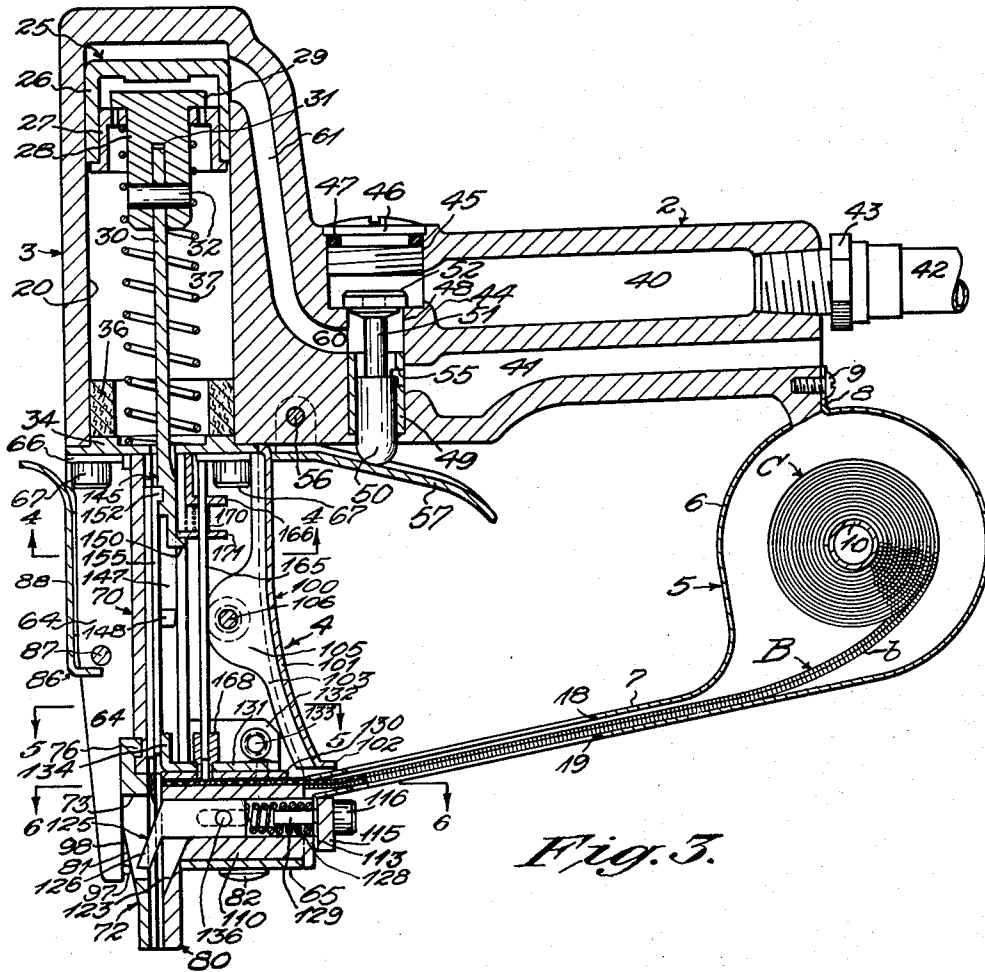
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FASTENER-APPLYING MACHINE

Filed Feb. 20, 1958

5 Sheets-Sheet 2



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FASTENER-APPLYING MACHINE

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5 Sheets-Sheet 3

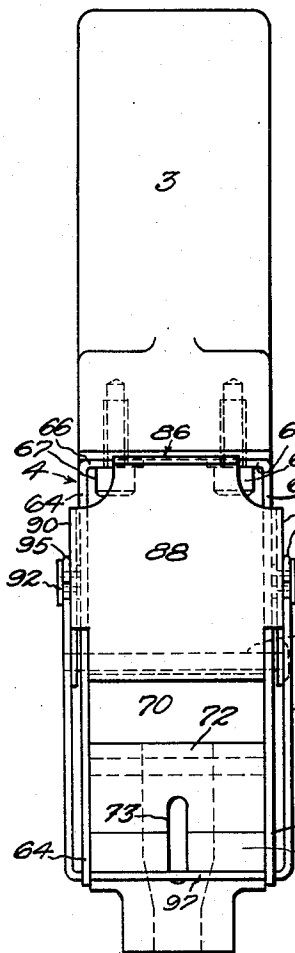


Fig. 8.

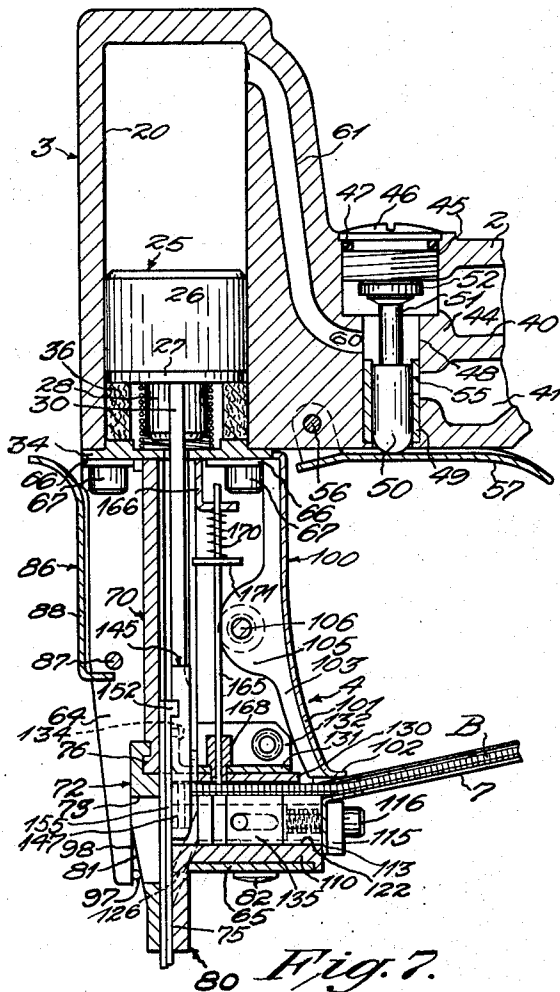


Fig. 7.

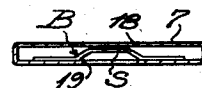


Fig. 10.

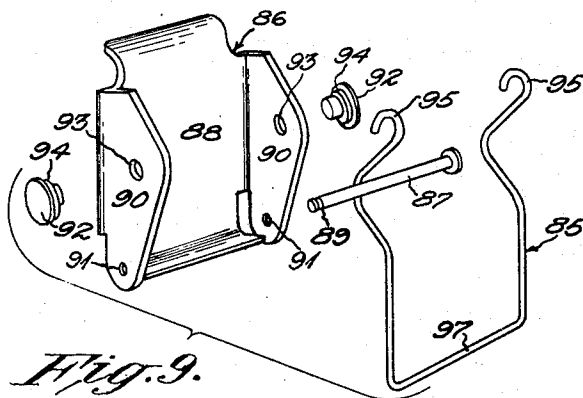


Fig. 9.

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FASTENER-APPLYING MACHINE

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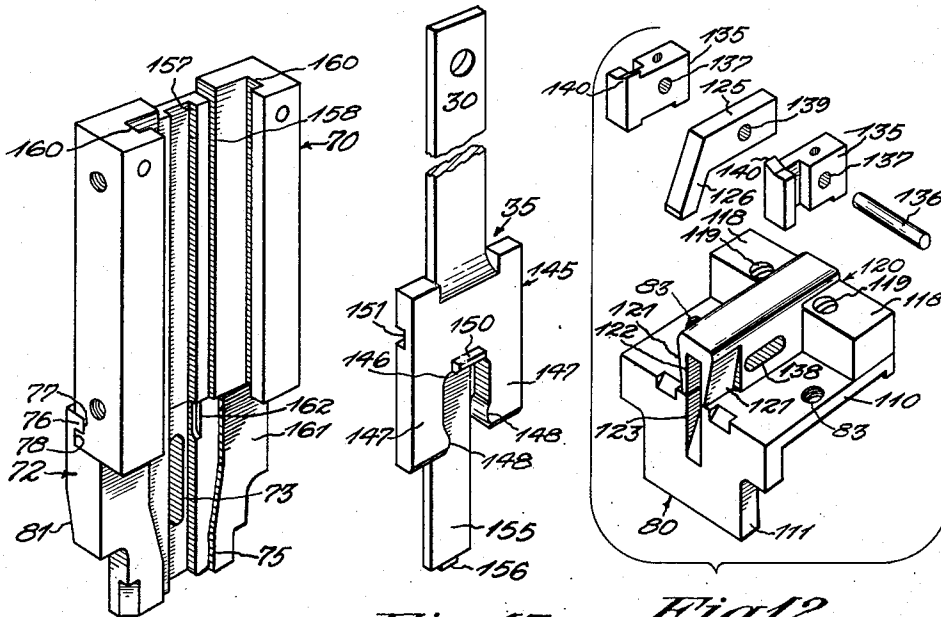


Fig. 11.

Fig. 13.

Fig. 12.

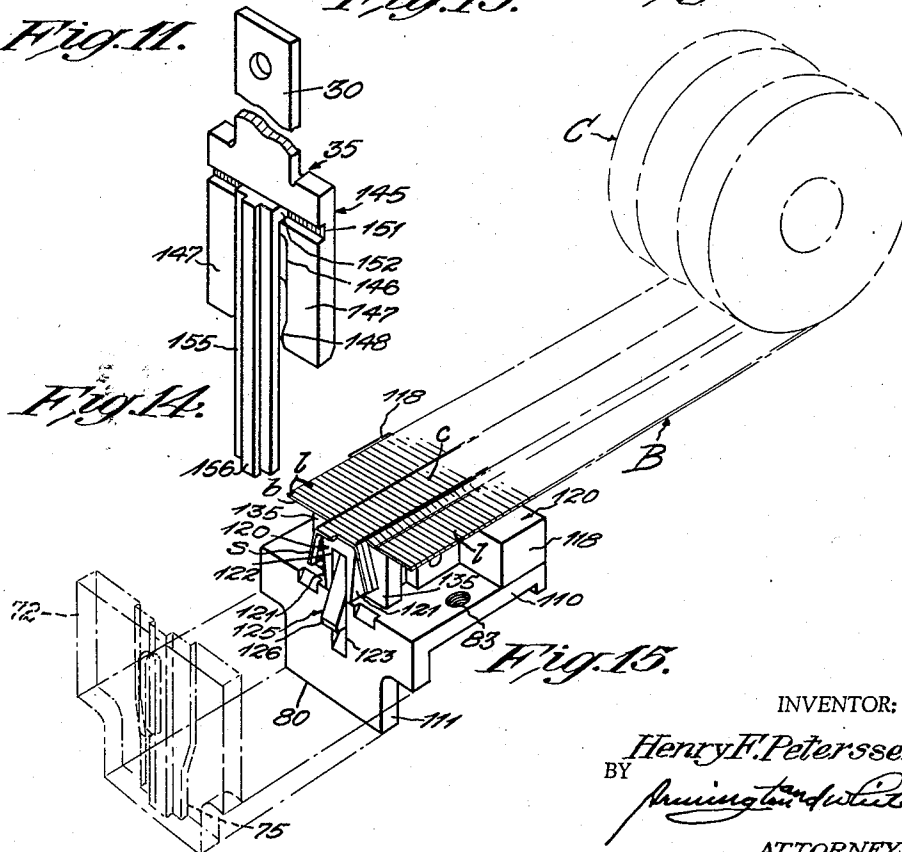


Fig. 14.

Fig. 15.

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FASTENER-APPLYING MACHINE

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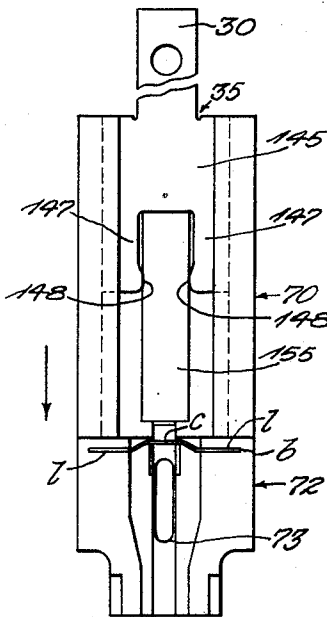


Fig. 16.

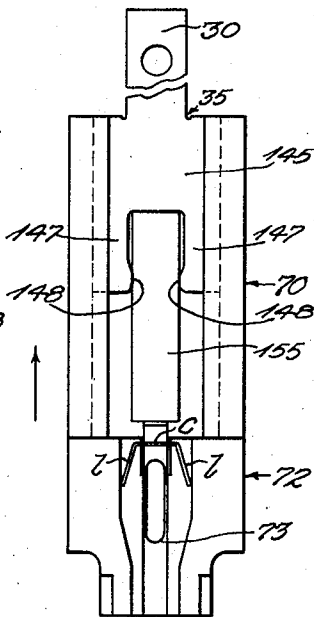


Fig. 17.

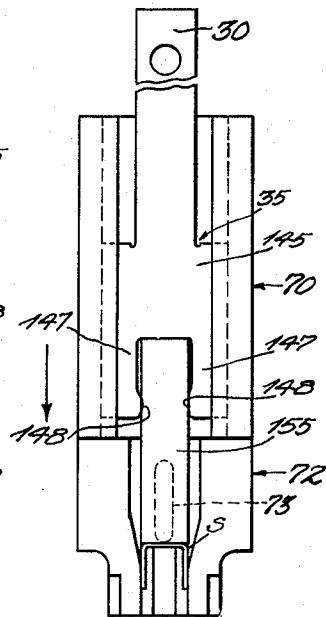


Fig. 18.

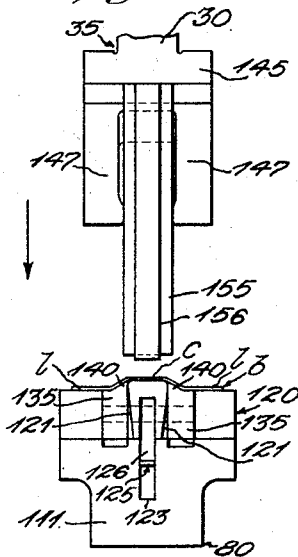


Fig. 19.

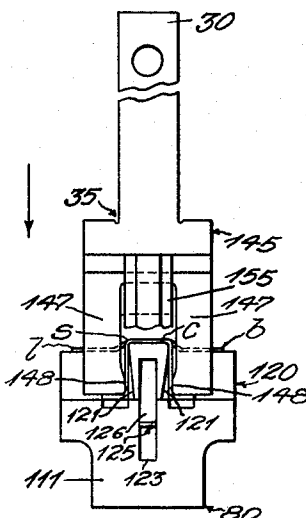


Fig. 20.

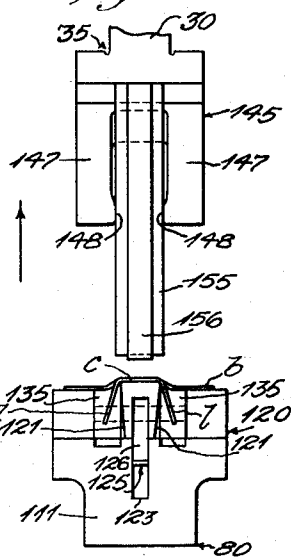


Fig. 21.

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2,959,786

FASTENER-APPLYING MACHINE

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Filed Feb. 20, 1958, Ser. No. 716,478

13 Claims. (Cl. 1-44.4)

This invention relates to fastener-applying implements and machines and more particularly to a portable power-operated machine for industrial use in the manufacture of various objects and articles of commerce.

One important object of the invention is to provide an implement of the type indicated capable of containing a large supply of fasteners with automatically-operated means for continuously feeding and applying the fasteners to the work without frequent interruption to renew the supply.

Another object of the invention is to provide means for storing a coiled strip or band of connected units or blanks of partly formed staples and automatically operated means for completing the formation of the staples and driving them into the work.

Another object is to provide for forming and applying the final staple at the end of the feeding strip without leaving one or more to clog the machine or cause waste.

Another object is to provide an implement or machine of the type indicated having a magazine for containing a rolled strip of partly-formed staples with means for feeding the strip, means for completing the formation of a plurality of the staples at each operation and driving them individually into the work.

Another object is to provide in a machine of the type indicated a closure for the front of the implement comprising a door with means to clamp it in closed relationship, said means being manually releasable to permit opening the door for gaining access to the throat through which the staples are driven.

One preferred embodiment of the invention is described by way of example in the following specification and illustrated by the accompanying drawings in which:

Fig. 1 is a side elevational view of the complete machine or implement;

Fig. 2 is a bottom plan view of the same with the bottom wall of the staple magazine shown as broken away at its end and the mounting for the coiled band of staple-blanks shown in section through the axis thereof;

Fig. 3 is a sectional view of the machine taken in a vertical plane common to its axis to illustrate the operating elements of the mechanism in their cooperative relationship;

Fig. 4 is a transverse sectional view of the fore part of the implement beneath its head taken on the line 4-4 of Fig. 3 and showing the fastener-driver and its operating piston in normal raised relationship;

Fig. 5 is a similar transverse sectional view taken on line 5-5;

Fig. 6 is a similar transverse sectional view taken on line 6-6;

Fig. 7 is a vertical sectional view of the fore part of the implement, similar to Fig. 3 and in the same plane, showing the fastener-driver and the piston at the end

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of their descent for driving a staple with the adjacent elements in cooperating relationship;

Fig. 8 is a front view of the implement showing the access door at the front of the throat and the clamping means for holding it in closed relationship;

Fig. 9 is a composite perspective view of the door-clamping means shown with the parts disassembled;

Fig. 10 is a transverse sectional view of the tubular runway or guiding trough through which the strip or band of partly-formed staples feeds to the forming and driving means;

Fig. 11 is a perspective view of the closure construction at the forward part of the implement showing the detachable door which is clamped across the staple-throat and adapted for removal to give access to a considerable extent of the throat by release of the clamping means;

Fig. 12 is an exploded perspective view showing the parts at the rear of the throat including the staple-pusher, the forming anvil and the staple-supporter in disassembled relationship;

Fig. 13 is a perspective view of the staple-former and staple-driver shown in connected relationship as viewed from the rear;

Fig. 14 is a similar perspective view showing the combined staple-former and -driver as viewed from the front;

Fig. 15 is a view similar to Fig. 12 showing the several elements in assembled relationship and illustrating the manner in which the said elements act on the staple strip or band during the feeding and forming of the staples;

Figs. 16, 17 and 18 show the staple-forming and -driving means as viewed from the rear and illustrate sequential stages in the operation thereof; and

Figs. 19, 20 and 21 show the same parts as in Figs. 16 to 18, but viewed in the opposite direction during different stages in the forming of the staples.

The invention is herein shown and described as applied to a portable stapling implement adapted to be held in one hand and operated by either pneumatic or hydraulic power controlled by trigger-actuated valve-means. It is to be understood, however, that the present improvements are adapted to be applied to other types of stapling and wire-stitching machines, either stationary or portable; as for example, staple-hammers or pliers.

As herein illustrated the implement to which the invention is applied is similar generally to that shown in my pending application for United States patent Serial No. 683,067, filed September 10, 1957, now Patent No. 2,888,679 granted June 2, 1959. The rolled staple-strip or band for use in the present machine may correspond to that disclosed in my United States patent application Serial No. 649,736, filed April 1, 1957.

Referring to Figs. 1 to 3, the implement illustrated herein may comprise a hollow handle 2 having a cylindrical head 3 at its forward end and mounted therebelow a casing 4 for enclosing the staple-forming and -driving mechanism. Suspended below the handle 2 of the implement is a sheet-metal magazine 5 formed with a cylindrical casing 6 for containing the coiled strip or band B of staple-blanks b and a flat tubular raceway 7 projecting forwardly therefrom for guiding the band to feed the blanks to the forming and driving means of the machine. The rim of the casing 6 may be sheared to provide a tab 8 bent upwardly to abut the end of the handle 2 and pierced to receive a screw 9 for attaching the magazine 5 thereto. As will be observed by reference to Fig. 2, the casing 6 is open on one side for insertion of the coil C therein to mount it on the holder 10. A cover, not shown, may be applied to the open side of the casing 6 if desired, with suitable means provided for releasably fastening it in place. The forward

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end of the tubular raceway 7 is supported at the lower end of the casing 4 (previously referred to) by means later described.

The coil or roll C may be mounted on a tubular sleeve or holder 10 (Fig. 2) rotatable on a spindle 11 fastened to the side of the casing 6 by a nut 12. Pivotaly mounted in a bore 13 in the end of the spindle 11 is a pawl 15 operated by a spring 16 to project its end through a slot 17 for engaging the interior of the coil to lock it to the holder 10 for rotation therewith on the spindle.

The cylindrical head 2 of the implement is formed with an axial bore 20 for receiving a slidable piston 25 (Fig. 3) comprising interconnected cup-shaped members 26 and 27 adapted for reciprocating the combined staple-former and -driver to be later described. Connected to the piston 25 to permit slight axial movement relatively thereto is a cylindrical plug-like plunger-element 28 having a flanged head 29 overlying the top of the inner piston-member 27. A relatively flat blade-like extension of the element 28 projects downward axially within the bore 20 to constitute a plunger 30 for carrying the staple-former and -driver 35, to be later described. The upper end of the plunger 30 is held in a transverse slot 31 in the member 28 with a crosspin 32 inserted therethrough for fastening it thereto. A helical spring 37 surrounds the plunger 30 with its upper end bearing against the upper wall of the inner piston-member 27 and its lower end seated on a plate 34 forming the bottom closure for the bore 20 of the cylinder 3. A resilient annulus 36 of rubber or the like seated on the plate 34 acts as a bumper adapted to cushion the stroke of the piston 25 at the end of its descent in the bore 20. The arrangement of these last-described parts is substantially the same as in the machine of application Serial No. 683,067, now Patent No. 2,888,679 granted June 2, 1959.

The handle 2 is cored out longitudinally to provide a pressure-chamber 40 (Figs. 3 and 7) and therebelow is a smaller exhaust passage 41 opening into the atmosphere at its end. The chamber 40 is connected to a source of pressure-fluid, such as compressed air, by means of a hose 42 attached to the end of the handle 2 by a nipple 43. At the forward end of the air-chamber 40 is a valve-housing 44 formed with a relatively large vertical bore 45 closed at the top by a screw-plug 46 carrying a gasket 47. Extending downwardly from the bore 45 is a smaller bore 48 in which is inserted a bushing 49 for slidably mounting a poppet 50. The poppet 50 is constructed with a stem 51 enlarged at the lower end in a portion slidable in the bushing 49 and surmounting its upper reduced portion is a head 52 screwed thereon or otherwise fastened thereto. The head 52 is adapted to seat against the upper end of the smaller bore 48 to close it against the ingress of pressure from the chamber 40 into the bore 45. An opening 55 in the side of the bushing 49 leads into the exhaust passage 41, being opened when the poppet 50 is depressed with its head seated against the end of the bore 48 by pressure from the chamber 40.

Pivoted on the under side of the handle 2 by means of a crosspin 56 is a trigger 57 engageable with the lower rounded end of the poppet 50 for sliding it upwardly to unseat its head 52 from the opening to the bore 48. At the side of the bore 48 is a port 60 opening into a serpentine-shaped duct 61 leading upwardly to debouch in the upper end of the bore 20 in the head 3 for applying pressure to the piston 25 to operate the staple-former and -driver of the implement.

As previously indicated, the staple-forming and -driving means are housed in the casing 4 fastened to the underside of the head 3 and extending downwardly therefrom for connection with the tubular raceway 7 through which the staple-blanks are fed from the magazine 5. The casing 4 is closed at the sides by a pair of substantially rectangular sheet-metal plates 64 folded up-

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wardly from a base-plate 65 (Figs. 1, 3 and 4). The side plates 64 have rectangular ears 66 bent inwardly at right-angles at the top and fastened to the under side of the head 3 by means of screws 67 passing through the closure plate 34.

The front of the casing 4 is closed throughout the greater part of its extent by a relatively thick plate-like wall 70 (Fig. 11) that is slotted vertically to form a guideway for the combined staple-former and -driver 35 (Figs. 13 and 14), hereinafter described in detail. The wall 70 is fastened in position between the two side plates 64 of the casing 4 by means of socketed-head screws 71 (Figs. 1, 2 and 4) with its upper end abutting the closure plate 34 on the under side of the head 3. Forming an extension of the wall 70 is an access door 72 which is constructed to provide a downward continuation of the raceway for the staple-former and -driver. The inner face of the door 72 is slotted as later described with the slot 75 constituting a staple-throat through which the staples are driven. The upper end of the door 72 has a slot 78 extending across its width (Fig. 11) and forming a projecting key or spline 76 which engages in a groove 77 at the lower end of the wall 70 for holding the door suspended therefrom. The rearward face of the door 72 abuts the front of a nose-piece 80, later described, which has a rearward extension overlying the bottom plate 65 of the casing 4. The forward face of the door 72 is beveled at 81 to adapt it to be engaged by the clamping means with a wedging action for holding the door in closed relationship as next explained.

Referring to Figs. 1 and 9, the clamping means comprises a U-shaped loop of wire 85 pivotally connected at its upper ends to a latch-like operating member 86 which is pivoted to the side plates 64 by means of a headed pin 87 engaging through holes in said plates. The manually-operable latch 86 (Figs. 1 and 9) may be constructed of sheet-metal formed with a rectangular front wall 88 and hinge-ears 90 bent at right-angles thereto at the sides thereof to project rearwardly therefrom. The lower ends of the ears 90 are pierced with holes 91 to receive the pivot-pin 87, previously referred to, which extends through holes in the side plates 64 with a head at one end and a groove 89 at its opposite end for receiving a spring-ring retainer (not shown) engaged therewith for holding the pin in place. The upper portion of the front plate 88 of the latch 86 is preferably rolled or curled forwardly to provide a finger-hold for swinging the latch about the pivot-pin 87. A pair of headed studs 92 having their shanks inserted through holes 93 in the hinge-ears 90 are riveted over on the inside to hold them in place. The studs 92 have shouldered portions 94 around which the bent ends 95 of the arms of the loop 85 are hooked to rockably mount the clamping loop thereon. By forcing the latch-member 86 against the edges of the side plates 64, as shown in Fig. 1, the crossbar 97 of the loop 96 may be drawn upwardly to cam against the beveled face 81 on the front of the door 72 to bind it in place abutting the front of the nose-piece 80. As shown in Figs. 1 and 7, the side plates 64 which project forwardly from the front of the vertical wall 70 are recessed at the bottom to provide shoulders 98 for engaging the crossbar 97 of the clamping member 85 to bind it against the beveled face 81 on the door 72. When it is required to clear the staple-throat 75 due to jammed staples therein or other causes, the door 72 may be removed by swinging the latch-member 86 outwardly from the front of the machine, thereby lowering the loop 85 to release its crossbar 97 from the beveled face 81 on the door. After replacing the door it is locked in position by swinging the latch-member 86 back into the position shown in Fig. 1.

The rearward side of the casing 4 is closed by a sheet-metal plate 100 (Figs. 3, 4 and 5) in the form of an upper vertical portion sloping outwardly toward the bottom at 101 and terminating in a short horizontal step

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102. The upper end of the plate 100 is bent inwardly to about the edge of the closure plate 34 on the under side of the head 3 of the handle 2. Narrow flanges 103 on the sides of the plate 100 abut against the inside of the side plates 64 and are extended in ears 105 which are fastened to the side plates by studs 106 (Figs. 1 and 3). The ends of the studs 106 may be swaged over or otherwise suitably formed to secure them in the holes in the side plates 64.

As previously indicated, the nose-piece 80 (Figs. 3, 12 and 15) has a vertical portion at the front projecting downwardly from a flat horizontal base 110 with its lower portion of reduced width and serving as a foot 111 for resting the implement against the work. Referring to Figs. 2, 7 and 12, the base 110 of the nose-piece 80 is recessed on its under side to receive the plate 65 that connects the two side plates 64, with the rearward edge of the plate engaging a shoulder at the end of the nose-piece. The nose-piece 80 is held down on the base 110 by a pair of screws 82 extending upwardly therethrough and engaging threaded holes 83 at the sides of the nose-piece. The end of the bottom wall of the raceway 7 (Figs. 3 and 7), previously mentioned, is bent downwardly at 113 to abut the end of the nose-piece 80 with a cross strip 115 overlying it and fastened in place by a pair of screws 116. By this means the forward end of the raceway 7 is securely held between the step 102 on the plate 100 and the cross strip 115 to adapt it to deliver the staples across the top of a saddle-member 120 overlying the nose-piece 80.

The saddle-member 120 is of T-shape in plan view, being formed with a forwardly-extending portion and abutments 118 projecting laterally at its rearward end. Its lateral portions 118 are fastened to the plate portion 110 of the nose-piece 80 by means of a pair of screws 119 (Fig. 12) passing downwardly therethrough. The saddle-member 120 extends forwardly from the raceway 7 to support the band B of staple-blanks *b* as it feeds the blanks *b* to the forming and driving means. The top of the saddle-member 120 is shaped and dimensioned to accommodate the blanks *b* with their bent portions overlapping its sides. The forward end of the saddle 120 is undercut on the sides to provide inclined recesses 121 for the legs of the staples as they are bent downwardly to straddle its sides (Fig. 15). The saddle-member 120 is formed with a longitudinal slot 122 on its under side adapted to receive a staple-supporter 125 slidably mounted therein. The staple-supporter 125 has a downwardly inclined extension 126 at the front which normally projects forwardly from the end of the slot 122 (Figs. 3 and 15) and is engaged by the staple-former and -driver 35 during their descent for camming it rearwardly within the slot during the driving of a staple. As shown in Fig. 3, the forward end of the nose-piece 80 is formed with a beveled slot 123 to provide for receiving the inclined front portion 126 of the supporter 125 when the latter is retracted in the slot 122 (Fig. 7). Normally, the supporter 125 is urged forwardly by a helical spring 128 (Figs. 3 and 7) pocketed in the rearward end of the slot 122 in the saddle-member 120 surrounding a pin 129 which projects forwardly from the cross strip 115.

Extending across the top of the saddle 120 is a bridge-plate 130 (Figs. 3 and 5) which is spaced thereabove to provide a narrow channel for the staple-blanks *b* to slide through. The plate 130 is riveted or welded to an overlying plate 131 having ears 132 fastened to the side plates 64 of the casing 4 by screws 133. The forward end of the plate 131 is bent upwardly to form an abutment 134 for guiding the lower end of the combined staple-driver and -former 35.

The staple-supporter 125 is constructed to act as a staple-pusher for feeding the staples forwardly on the saddle 120 after their legs have been bent downwardly toward its sides (Fig. 15). Connected to the sides of the supporter 125 are a pair of staple-pusher members 135

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(Fig. 12) mounted to slide along the top of the plate 110 at the sides of the saddle 120. A pin 136 passing through holes 137 in the pushers 135 and longitudinal slots 138 in the sides of the saddle 120 engage through a hole 139 in the supporter 125 to connect the pushers thereto. The pin 136 may be held in place by a driving fit in the holes 137 or by any other suitable means. The under side of the pushers 135 are recessed slightly to reduce their frictional contact with the top of the plate 110 and their sides are slotted toward the front to reduce their weight. The forward faces of the pushers 135 extend upwardly at the top in pointed projections 140 to adapt them to conform to the bent shoulder-portion of the staple-blanks *b* whereby to insure full engagement with the legs of the partly formed staples *s* (Figs. 12 and 19).

As previously stated, the rearward side of the front wall 70 of the casing 4 (Figs. 3 and 11) is slotted vertically to form a guideway for the staple-former and -driver 35. The rearward face of the door 72 is likewise of substantially the same formation and continued downwardly in the staple-throat 75. As before indicated, the staple-former and -driver (Figs. 13 and 14) are combined in a single element 35 constructed as next described. The staple-former 145 is constructed as a part of the plunger 30 attached to the piston 25, its lower portion being thickened and widened in substantially H-shape. The plunger 30 merges into the top of the former 145 with shoulders at the sides thereof and therebelow the former is bifurcated by a central opening 146 providing spaced legs 147 terminating on the inside in rounded cam-faces 148. A narrow lip 150 projects at right-angles to the face of the former at the top of the opening 146 between the two legs 147. The opposite face of the former 145 is formed with a transverse slot 151 (Fig. 14) which is engaged by a key or spline 152 at the upper end of the staple-driver 155. The staple-driver 155 is of usual blade-like construction with a narrow rib or spline 156 extending downwardly therealong centrally thereof.

Referring to Figs. 3 and 11 the vertical wall 70 which closes the front of the casing 4 is constructed with a relatively narrow central slot 157 in its rearward face and a wider slot 158 overlying it. The wider slot 158 receives the main body of the staple-driver 155 with its rib 156 engaging in the narrower slot 157 to mount the driver for reciprocation. The wall 70 is also formed with wider spaced slots 160 in its thicker lateral portions for mounting the staple-former 145 to slide therein. The narrow slot 157 which receives the rib 156 on the driver 155 and the wider slot 158 for its main portion are both continued downwardly in the face of the door 72, with the slot 158 forming the staple-throat 75 which is narrowed at the bottom for a purpose later explained. At the sides of the throat 75 are relatively wide flat faces 161 against which the leading blanks *b* engage, as later explained, to prevent the band B from feeding forwardly until the legs of the first staple have been bent downwardly. A narrow cut 162 is formed in the side of the slot 157 at the upper end of the door 72 to provide a clearance for the staple-blanks *b* as they are fed forwardly into the throat 75 in the door.

Detent-means are provided for preventing retrogressive movement of the band B of staple-blanks *b* and this may consist of a vertical rod 165 (Figs. 3 and 7) slidable in an angle-shaped bearing member 166 fastened to the wall 70 by screws 167 (Fig. 4) or other suitable means. The lower end of the rod 165 is slidable in a tubular bushing 168 having its lower reduced end held in a hole extending through the plates 130 and 131. A helical spring 170 surrounding the upper end of the rod 165 is held under compression between the bearing member 166 and a washer-like collar 171 secured fast on the rod. The spring 170 tends to force the rod 165 downwardly to frictionally engage its lower end against

the top of the staple band B for resisting retrogressive movement thereof. The rod 165 is lifted to release its end from the band B and permit the staple-blanks *b* to feed forwardly by engagement of the lip 59 on the staple-former 145 with the collar 171 as the former is withdrawn upwardly after the driving of a staple.

One form of machine embodying the invention having been described, its method of operation is explained as follows: To load the magazine 5 of the implement a roll or coil C of the flexible band B of staple-blanks is entered into the casing 6 through its open side and mounted on the holder 10 with the pawl 15 locking it thereto for rotation about the spindle 11. The free end of the band B leading from the coil C is inserted into the rearward end of the raceway 7 (Fig. 1) and slid forwardly to feed the staple-blanks *b* along the top of the saddle 120 (Figs. 3 and 15). To assist this operation the band B may be gripped between the fingers inserted through the openings 18 and 19 (Figs. 2 and 3) provided for this purpose in the top and bottom of the raceway 7. At this time the detent-rod 165 is held in raised relationship by the lip 150 on the former 145 engaging its collar 171. As shown in Fig. 15 and illustrated in my United States patent application Serial No. 649,736, the staple-blanks *b* are formed with their legs *l* depressed to extend in a plane parallel to and below the plane of their crossbars or crowns *c*. Due to this novel and ingenious method of preforming the staple-blanks the downwardly bent shoulder portions of their inner legs overlap the sides of the saddle 120 and thereby act to guide the band B therealong without lateral displacement thereon.

After the implement has been connected to a source of power, such as compressed air, it is ready for use by grasping the handle 2 in one hand and pressing the foot 111 of the nose-piece 80 against the work. With fluid pressure supplied to the chamber 40 in the handle 2 the trigger 57 (Fig. 7) may be drawn upwardly by placing the finger thereunder to lift the poppet 50 for opening the port 60. The pressure is then caused to flow through the duct 61 to enter the upper end of the bore 20 above the piston 25; it being noted that with the piston raised as shown in Fig. 3 the port at the end of the duct 61 will be opened initially to only a slight extent so descent of the piston will be started at relatively slow speed. As the pressure admitted into the bore 20 is increased the piston 25 gains speed and is carried downwardly at high velocity to operate the staple-former and -driver 35 under maximum power. As the staple-former 145 descends and releases the detent-rod 165, by disengaging the lug or lip 150 from the collar 171, the spring 170 will force the rod downwardly to frictionally engage its end with the top of the band B of preformed staple-blanks whereby to prevent movement of the band in either direction.

It should be understood that when the machine is first prepared for operation by loading the magazine 5 the forward staple-blank *b* in the band B will not be in the throat 75 for driving it since it must first be formed by bending its leg portions downwardly. Therefore, during the first stroke of the staple-driver and -former 35, only the former will act to bend down the legs of three of the blanks *b* positioned on the forward end of the saddle 120 which serves as an anvil for the bending operation. Fig. 15 shows the band B with the first staple-blank *b* (illustrated as partly broken away) positioned beyond the end of the saddle 120 but this only occurs after a previous stroke of the former 145 has bent the legs *l* downward. Stated another way, the band B is not permitted to feed forwardly sufficiently to enter a blank *b* into the throat 75 since the outwardly projecting leg portions of the first blank will bring up against the flat faces 161 that flank the groove formation in the door 72 (Fig. 16).

After the first downward stroke of the piston 25 is completed the trigger 57 is released to cause the pressure

in the chamber 40 to depress the poppet 50 and close the valve at the top as shown in Fig. 3. As the poppet 50 is depressed it uncovers the opening 55 in the side of the bore 48 of the valve so that pressure above the piston 25 in the bore 20 is released to flow down through the duct 61 and port 60 to exhaust through the passage 41 for escape into the atmosphere at its end. Release of the pressure on the piston 25 causes it to be slid upwardly in a return stroke under the force of the spring 37. As the piston 25 reaches the upper end of its stroke the valve is again opened by operating the trigger 57 to effect another downward stroke of the piston in the manner as previously explained. Meanwhile, as the piston 25 moves upwardly the lip 150 on the former 145 engages the collar 171 on the detent-rod 165 to lift the rod and release the band B to feed forwardly.

Immediately the detent-rod 165 is released from the band B the spring 128 will slide the staple-supporter 125 forwardly (Fig. 3) to cause the pushers 135 connected thereto to advance the band B by their engagement with the bent legs of the third staple-blank in the series. The leading blank *b* (Fig. 15) will thus be fed off the end of the saddle 120 and entered into the staple-throat 75 (Fig. 17) where it is supported in raised relationship by its connection with the next succeeding blank in the band B. During the first operation for forming the blanks *b* their leg portions *l* may be bent down to a sufficient extent to force them into the recesses 121 in the sides of the saddle 120. However, the spring tension of the material of the blanks will cause the leg portions to recoil so a blank must be further operated upon before the staple is completed. The final forming operation is accomplished during the driving of the staple *s* down through the throat 75 as the ends of its legs *l* engage the sides of the lower narrower portion of the throat (Fig. 17) to bend them inwardly into parallelism as shown in Fig. 18. As the driver 155 continues its descent the formed staple is driven out through the throat 75 for finally applying it to the work.

During the final stage in the driving of a staple it is supported on the supporter 125 as the latter recedes into the slot 122 in the saddle 120. As shown in Fig. 3, the inclined forward portion of the supporter 125 normally projects across the throat 75 and into the opening 73 in the door 72 and during the last part of the downward stroke of the driver 155 the former 145 slides across the inclined end of the supporter with a camming action to retract it into the slot 122 of the saddle 120 (Fig. 7) where it is housed until the former reverses its stroke as the piston rises again in the bore 20. It will be understood that during this last-described downward stroke of the piston 25 and driver 55 for driving the staple into the work, the staple-former 145 will act on the three succeeding staple-blanks *b* in the band B which have been fed onto the forward end of the saddle. In other words, the next two staples will be engaged again by the staple-former and a third blank *b* which has been fed into the range of action of the former will be operated on thereby. In this way the repeated action of the former on the second and third blanks (Fig. 15) will tend to set the bends at the shoulders of the legs *l* of these two blanks and also perform the first bending operation on the third blank.

The operation of the implement may then be continued until all the large number of blanks *b* in the band B have been formed and driven; it being noted that with the present improved form of construction and method of operation of the device the last staple in the band for each loading can be driven so that no staples remain to clog the machine and no waste of staples occurs.

The invention is herein illustrated as embodied in an industrial machine that has been tested in use and demonstrated to be entirely satisfactory for accomplishing the desired objectives. While I have shown and described only one embodiment of the invention, it is to be under-

stood that the constructional form and arrangement of the mechanism thereof may be modified variously without departing from the spirit and scope of the invention as defined in the following claims.

What is claimed is:

1. In a stapling implement for forming and driving staples extending transversely of a flexible band containing a large number of staple-units, said staple-units preformed with a central crown and legs bent downwardly from the ends of said crown and then outwardly to extend in a plane below and parallel with the plane of the crown, a stationary saddle for supporting said band to feed therealong, a reciprocable staple-former constructed and arranged to engage the legs of at least two of said staple-units during each stroke of said staple-former to bend them downwardly at the sides of the saddle, a staple-supporter slidable relatively to said saddle to project its end therebeyond for supporting a staple fed from the end of the saddle, means for intermittently advancing the band to feed single staples beyond said saddle and onto said supporter, a reciprocable staple-driver for driving a completed staple into the work, and means for simultaneously operating said staple-former and driver.

2. In a stapling implement for forming and driving staples from a supply of partly-formed blanks extending transversely of a flexible band and attached in parallel abutting relationship by frangible means, each blank consisting in a length of bendable strip-material comprising a central crown-portion with leg-portions bent downwardly therefrom and outwardly to extend in a plane below and parallel with the plane of said crown, a stationary saddle constructed and arranged to engage under the crown-portions of a plurality of said staple-blanks to adapt them to slide therealong, a staple-former engageable with the leg-portions of at least two of the blanks to bend them downwardly at an obtuse angle to their crown-portions straddling the sides of said saddle, a staple-supporter slidable in a slot on the under side of said saddle, a spring for sliding said supporter to project its end beyond the forward end of the saddle, pushers slidable by said supporter and engageable with the legs of partly-formed staples at a point beneath said band to advance the band and feed the staples successively onto said staple-supporter, a throat for receiving the staples as they are fed off said saddle, a staple-driver reciprocable in said throat for driving formed staples into the work, and camming means at the sides of said throat cooperating with said former to finally bend the legs of a staple into exact parallel relationship extending at right-angles to the crown.

3. In a fastener-applying machine, reciprocable means for driving the fasteners into the work, means for feeding a band of fastener-blanks to said driving means, a support for said band, resiliently operated detent-means engageable with said band to prevent it from movement on said support, and means on said driving means engageable with said detent-means to lift it for releasing the band to adapt it to feed to said driving means.

4. In a machine of the type indicated, means for feeding a band of connected staple-blanks, means for supporting said band to slide therealong, means for feeding the band on the support, a staple-former reciprocable for engaging said staple-blanks to form them with legs, a detent-member slidably mounted above said support to adapt it to engage the band to prevent sliding movement thereof, resilient means for sliding said detent-member to engage it with the band, and means on said staple-former engageable with said slidable member to lift it for releasing the band to adapt it to be advanced by said feeding means.

5. In a fastener-applying machine having a head with a casing extending downwardly therefrom, said casing comprising side walls and a front wall formed with a vertical raceway, a reciprocable driver slidable in said raceway, a removable door extending downwardly from said front wall and formed with a continuation of the

raceway therein, a nose-piece at the rear of said door for supporting it in abutting relationship thereto while providing a throat through which the staples may be driven, a manually-operable latching member pivoted to the side

5 walls of said casing, a U-shaped clamping member suspended by its arms pivotally connected to the sides of said latching member and formed with a crossbar, recesses in the side walls of the casing disposed for engagement with the crossbar of said clamping member, and a wedge-shaped projection on the front of said door with which said crossbar of the clamping member engages to bind the door against the front of the casing.

6. In a machine for forming and applying staples produced from a supply of blanks having a crown-portion with leg-portions bent downwardly and outwardly from the ends thereof, a saddle for supporting a series of said blanks with their leg-portions projecting laterally from the sides of said saddle, means for bending the leg-portions of the blanks downwardly in angular relation to their crown-portions, feeding means for engaging the leg-portions of the blanks at the sides of the saddle, means for intermittently reciprocating said feeding means to progressively advance the foremost blank in the series beyond the end of said saddle, and means for finally forming the foremost blank into a U-shaped staple and driving it into the work.

7. In a machine for producing and driving U-shaped staples supplied in the form of blanks having a central crown-portion extending in a substantially horizontal plane with leg-portions bent downwardly from the ends thereof and projecting outwardly in a plane below said plane of the crown-portion and substantially parallel therewith, a saddle shaped to engage under the crown-portion of the blanks between shoulders formed by the bends in their leg-portions for supporting and guiding the blanks to slide in a straight course thereon, means cooperating with said saddle to bend the leg-portions of the blanks downwardly adjacent the sides of said saddle, pushers slidably mounted at the sides of said saddle for engagement with said bent leg-portions of the blanks to feed them forwardly on the saddle, means for intermittently reciprocating said pushers, and means for driving staples formed from said blanks to apply them to the work.

8. In a machine for forming U-shaped staples from blanks having a crown-portion with leg-portions bent downwardly and outwardly from the ends thereof and applying the staples to the work, a saddle for supporting a series of said blanks with their leg-portions projecting laterally from the sides thereof, forming means for bending the leg-portions of the blanks downwardly in angular relation to the crown, pusher members reciprocable at the sides of said saddle, means connecting said pusher members to move together, means for reciprocating said pusher members to progressively advance the foremost blank in the series beyond the end of said saddle, and means for finally forming the foremost blank into a U-shaped staple and driving it into the work.

9. In a machine as defined in claim 8, a staple-supporter movable longitudinally of said saddle to project forwardly therebeyond, means for sliding said supporter forwardly to sustain a staple fed off from the end of said saddle, means connecting said pusher members to said supporter to slide forwardly therewith for engaging the legs of the blanks to advance them along the saddle and disengage the foremost staple therefrom for suspending it on said supporter in position to be driven into the work, and means operated during the driving of the staple to retract the supporter as the staple is driven into the work.

10. In a machine for producing and driving U-shaped staples supplied in the form of blanks having a horizontal crown-portion with leg-portions bent downwardly from the ends thereof and extending outwardly in a horizontal plane below and substantially parallel with the plane of

said crown-portion, a saddle engaging under the crown-
portions of said blanks for guiding them to feed there-
along, a former engageable with the leg-portions of the
blank to bend them downwardly in overlying relation
to the sides of the saddle, pushers reciprocable at the
sides of the saddle for engaging the leg-portions of the
blanks to feed them forwardly on the saddle, a supporter
slidable longitudinally of the saddle to project its end
beyond the forward end thereof, a spring for sliding said
supporter, means connecting said pusher members to
said supporter to move forwardly therewith for feeding
the endmost staple of the series off from the saddle and
onto said supporter, and means for driving a formed
staple into the work.

11. In a machine for producing and driving U-shaped
staples supplied in the form of blanks having a crown-
portion with leg-portions bent downwardly therefrom, a
saddle for supporting said blanks with their leg-portions
projecting from the sides thereof, said saddle formed
with recesses in its sides at its forward end, a bifurcated
staple former having spaced legs with cam-shaped pro-
jections on the inside thereof for engaging the leg-portions
of the blanks, means for reciprocating said former to
bend the leg-portions of the blanks inwardly toward said
recesses in said saddle, and means for driving a formed
staple into the work.

12. In a machine of the type indicated for operating
on staple-blanks having a central crown-portion with
leg-portions bent downwardly therefrom and extending
outwardly in a lower parallel plane, a saddle for sup-
porting said blanks with their leg-portions projecting
from its sides, said saddle formed with a longitudinal
slot, a staple-supporter slidable in said slot, resilient means
for sliding said supporter to position its forward end
under a blank fed off from said saddle, pusher-means
slidable at the sides of said saddle for feeding the blanks
therealong, and means connecting said pusher-means to
said staple-supporter to move therewith.

13. In a stapling implement for driving staples formed
from staple-units extending transversely of a flexible
band, said staple-units preformed with a substantially
horizontal central crown and legs bent downwardly
from the ends of said crown and then outwardly to
extend in a plane below and substantially parallel with
the plane of said crown, a magazine for containing a
rolled band of said staple-units, a substantially flat tubu-
lar runway for guiding said band to feed it from said
roll, a saddle for supporting said band to feed there-
along, feeding means movable relatively to said saddle
and engageable with the bent legs of said staple-units
projecting downwardly at the sides of the saddle, a staple-
supporter slidable relatively to said saddle to pro-
ject its forward end therebeyond for supporting a staple
fed from the end of the saddle, means connecting said
staple feeding means to said staple-supporter for move-
ment therewith to intermittently advance individual sta-
ples beyond the saddle and suspend them on said staple-
supporter, means for completely forming said units into
staples, and means for driving the formed staples into
the work.

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