Jan. 19, 1943. G. F. HITT 2,308,919

STAPLING MACHINE

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Fig. 1.

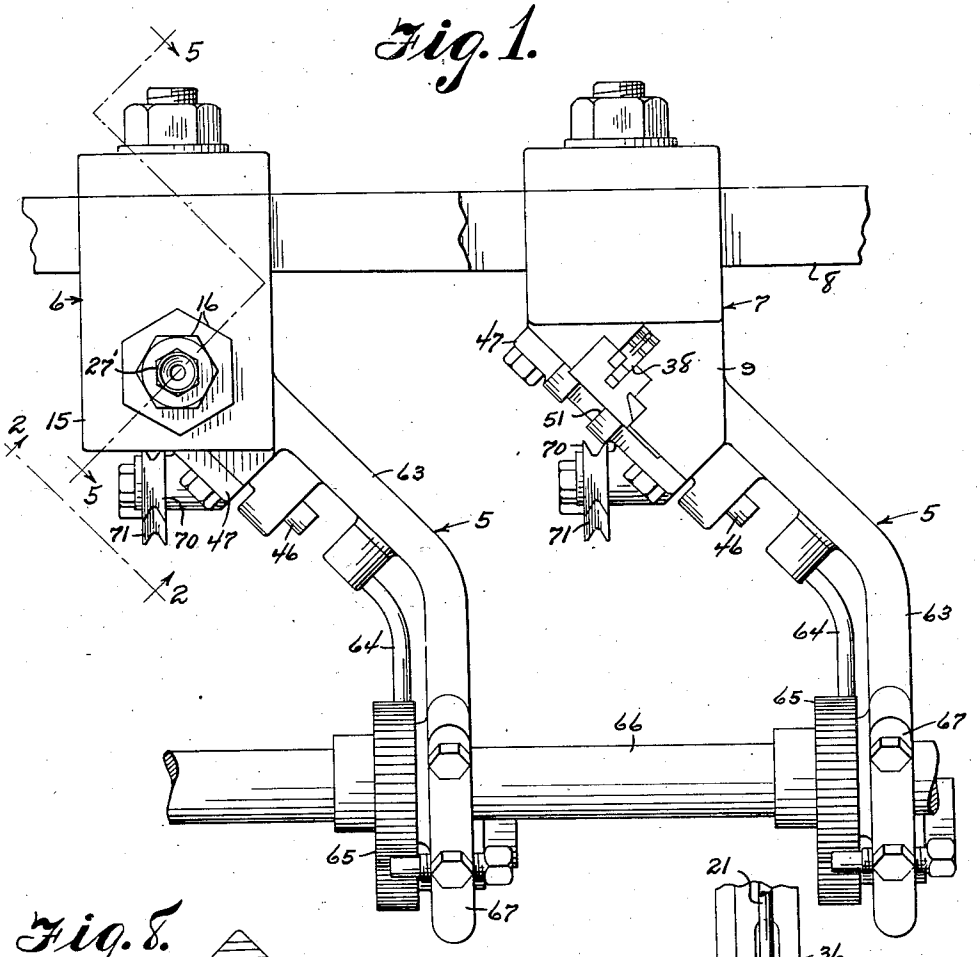


Fig. 2.

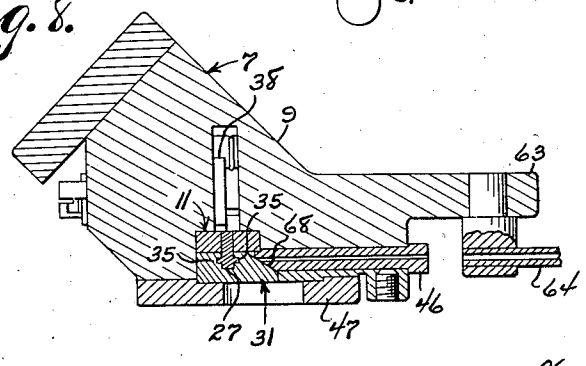
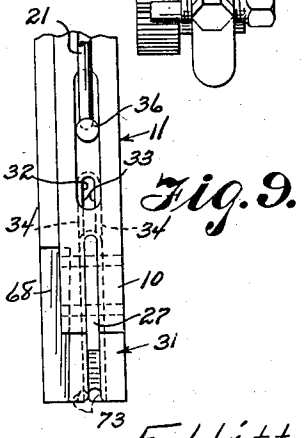


Fig. 3.



George F. Hitt
INVENTOR

BY Victor J. Evans & Co.
ATTORNEYS

Jan. 19, 1943. G. F. HITT 2,308,919

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Fig. 2.

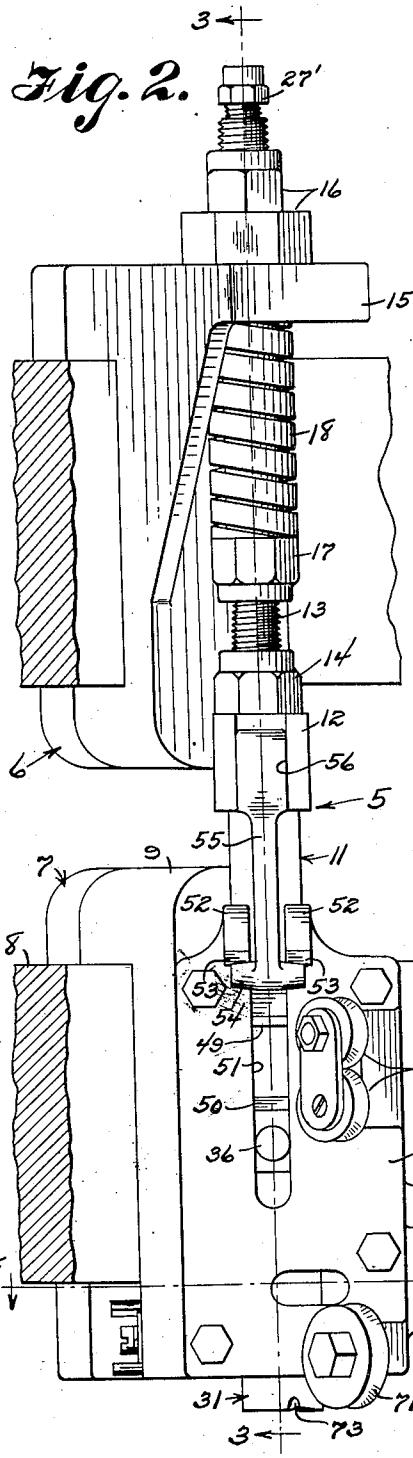
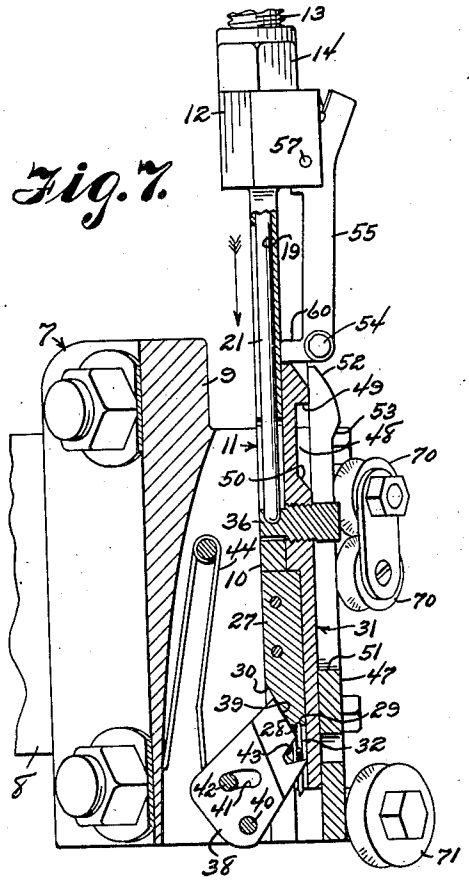


Fig. 7.



George F. Hitt INVENTOR

BY Victor J. Evans & Co.

ATTORNEYS

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STAPLING MACHINE

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Fig. 3.

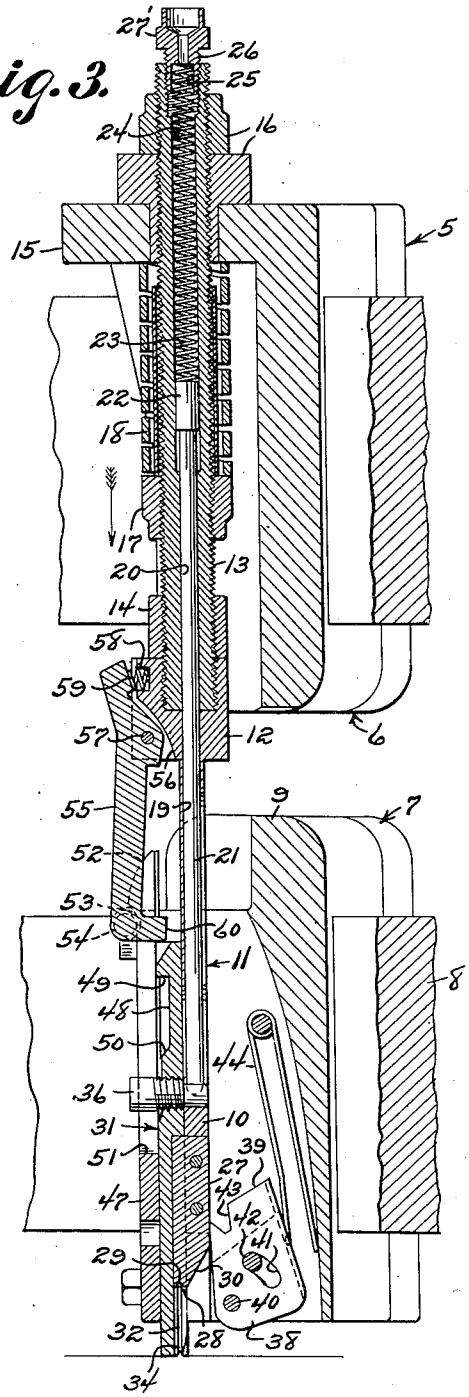
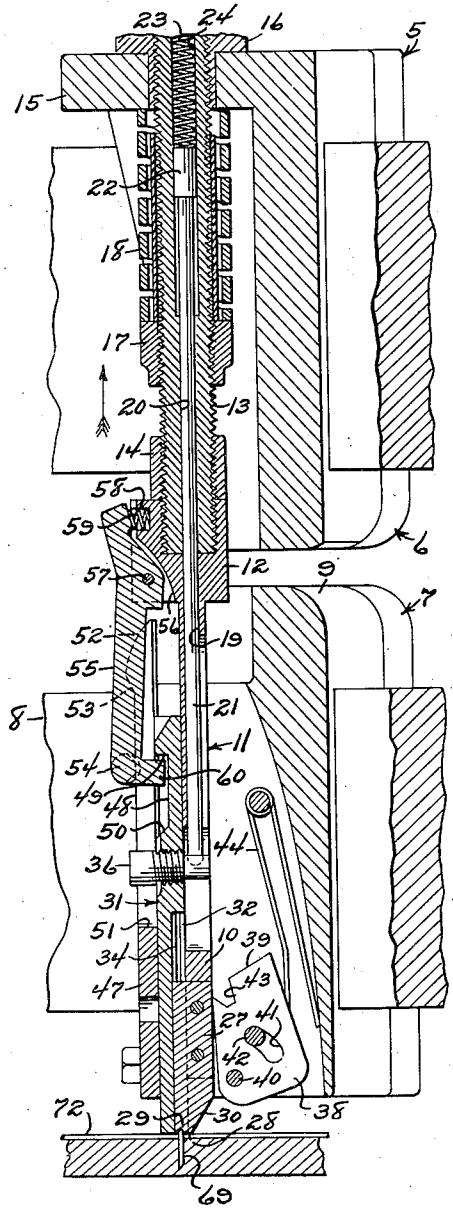


Fig. 4.



George F. Hitt INVENTOR

BY Victor J. Evans & Co.

ATTORNEYS

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Fig. 5.

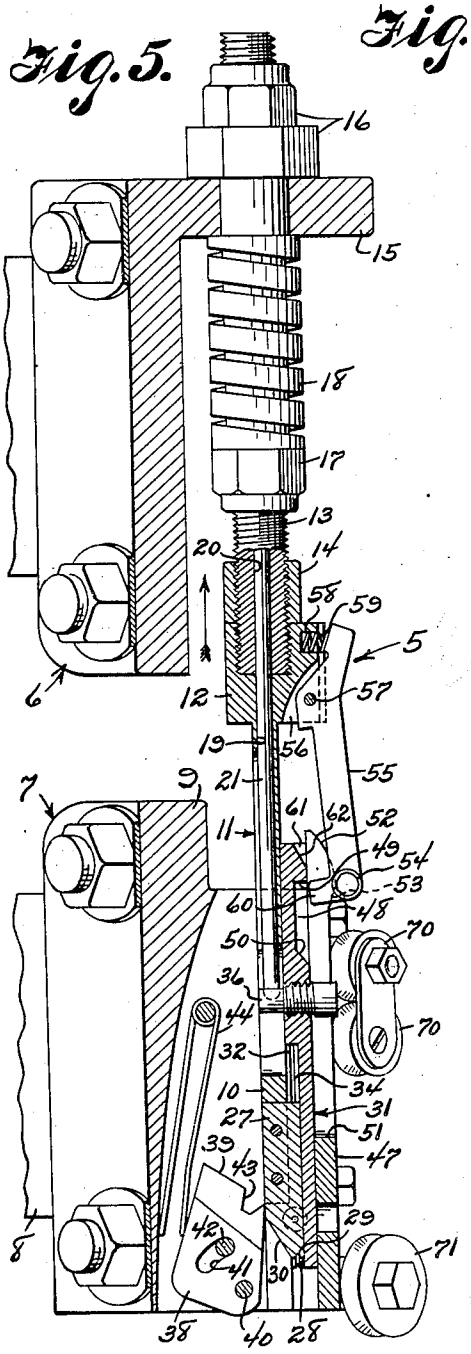
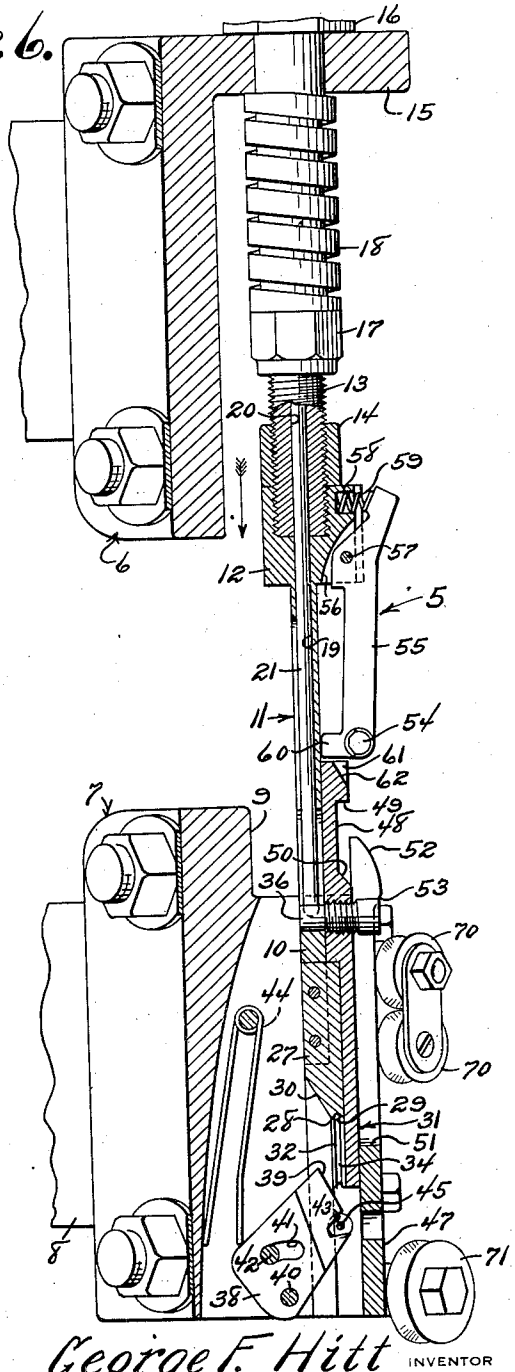


Fig. 6.



George F. Hitt INVENTOR

BY Victor J. Evans & Co.

ATTORNEYS

Patented Jan. 19, 1943 2,308,919

UNITED STATES PATENT OFFICE

2,308,919

STAPLING MACHINE

George F. Hitt, Arcata, Calif.

Application July 14, 1941, Serial No. 402,404

4 Claims. (Cl. 1—8.2)

My invention relates to stapling machines and more particularly to the staple forming and driving mechanisms thereof.

One of the principal objects of my invention is to provide a staple forming and driving mechanism or head unit for association with a stapling machine and which unit is simple in construction, durable in use, efficient in operation and economical in manufacture.

Another object of my invention is to provide a head unit of the above described character which is so constructed and arranged as to comprise a minimum number of parts and which may be substituted for head units of stapling machines already in use without substantially modifying said machines.

Other objects and advantages will be apparent from the following description, appended claims and annexed drawings.

Referring to the drawings wherein like reference characters designate like parts throughout the several views:

Figure 1 is a top plan view of a pair of my novel form of head units and illustrating the same in connected relation with certain parts of a stapling machine.

Figure 2 is a sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a vertical sectional view taken on the line 3—3 of Figure 2.

Figure 4 is a view similar to Figure 3 but illustrating the parts in staple applying position.

Figure 5 is a sectional view taken on the line 5—5 of Figure 1.

Figure 6 is a view similar to Figure 5 but illustrating the parts in position for effecting formation of a staple.

Figure 7 is a view similar to Figure 6 but illustrating the parts in intermediate staple forming position.

Figure 8 is a sectional view taken on the line 8—8 of Figure 2.

Figure 9 is a detail side elevation of the lower end of the staple former.

Certain types of boxes are provided with strands of wires enwrapping them in order to maintain the parts of the boxes in assembled relation. In boxes of this character, it is necessary that some means be employed to secure the wires fixed about the boxes, one method being the utilization of staples which are driven into the boxes with the wires extending through the staples and in appressed relation between the heads of the staples and the outer faces of the boxes. These staples are usually formed from wire and applied to the boxes by stapling machines, one type of the same being disclosed in United States Letters Patent No. 1,943,840, said machine being equipped with a staple forming and driving mechanism or head unit and it is to this latter device or unit that my invention is directed.

As illustrated in the drawings my novel form of staple forming and driving mechanism or head unit 5 is adapted for operative association with a stapling machine of the above mentioned character and may constitute an integrant of the machine or a unit for replacing head units of ordinary construction. A plurality of my units 5 may be employed and operated simultaneously or alternately through the instrumentality of and coorganization with the machine as will hereinafter be made apparent. Said unit 5 comprises a pair of relatively movable sections which, for the purpose of description, are designated upper and lower carriers 6 and 7 respectively with the upper carrier being movable towards and from the bottom carrier. The lower carrier is mounted on a cross-bar 8 of the stapling machine and above its conveyor whereby work pieces, for instance boxes or the like, on the conveyor are moved under the carrier to receive the staples in the manner and for the purpose hereinbefore set forth.

The lower carrier comprises a housing 9 and has slidably mounted therein the lower end section 10 of a staple former plunger 11, the latter being provided with an upper end section 12 into which is threadedly secured the lower threaded end portion of a shaft 13 by means of a lock nut 14. The upper end portion of the shaft 13 slidably extends through an ear 15 formed on the upper carrier 6, and is provided with lock nuts 16 for limiting one directional movement of the shaft 13 with respect to the carrier 6.

Adjustably mounted on the lower threaded end portion of the shaft 13, superjacent the lock nut 14, is a sleeve 17 engaging the lower end of a coil spring 18 sleeved on the shaft 13 between the ear 15 and sleeve 17. The upper end of the spring 18 engages the ear 15 and coacts with the sleeve 17 to urge the latter and said shaft in a downward direction with respect to the ear 15.

The plunger 11 and shaft 13 are formed with registering and communicating bores 19 and 20 in which is slidably mounted a plunger rod 21. The upper end of the plunger rod 21 is provided with a head 22 reciprocally mounted in a dia-

metrically enlarged section 23 of the bore 20 and is engaged by the lower end of a coil spring 24 within the section 23. The upper end of the coil spring 24 is disposed within a socket 25 formed in the shank 26 of a cap 27', said shank 26 being adjustably threaded into the upper end portion of the shaft 13 as clearly disclosed in Figure 3 of the drawings. Obviously, the spring 24 functions to urge the head 22 in a direction away from the cap for a purpose hereinafter more fully described.

The lower end section of the plunger 11 has subjacently fixed thereto a block or former head 27 fashioned on its lower end with a horizontally disposed lower or driving face 28 formed with a transverse groove 29 and said lower end is also fashioned with a cam face 30 disposed in an inclined plane with respect to the face 28.

The lower end section 10 of the plunger has slidably and laterally connected thereto a guide plate 31 fashioned with an elongated guideway 32 of a materially greater length than the former head 27 and in which the latter is slidably mounted. The oppositely disposed walls 33 defining the guideway 32 are fashioned with vertically extending slots 34 slidably receiving therein guide tenons 35 carried by the head.

Superjacent the guideways 32, the plate 31 has threaded therein a pin 36, one end of which is fixed to the lower end of the plunger rod 21 and constitutes a stop for the plate 31 in relation to the plunger 11, while the opposite end extends a considerable distance beyond the plate 31 and constitutes a stop for the plate in relation to the housing 9, as will be later apparent.

Within the lower portion of the housing 9 and latero-jacent the head 27, I provide a forming anvil 38 having an upper end formed with a cam face 39 for engagement with the cam face 30 of the head 27 for a purpose hereinafter set forth. The lower end of the anvil 38 has extending through one corner thereof a pivot pin 40 for pivoting said anvil with respect to the housing. Interjacent its upper and lower ends, the anvil is formed with an arcuate slot 41 having its radius generated on the axis of the pin 40.

The slot 41 has extending therethrough a stop pin 42 fixed in the housing and coacting with the end walls defining the slot 41 to limit the pivotable movement of the anvil. The slot 41 is of a sufficient length to permit the upper end of the anvil to be disposed within the path of the head 27 to effect camming engagement of the faces 30 and 39 for actuating the anvil out of said path upon descension of the head 27 for a purpose and as hereinafter more fully described.

The face 39 of the anvil 38 is slotted as at 43 to provide a staple supporting shoulder for engaging a length of wire 45 transversely fed thereon from a feed tube 46 that has its outlet terminating within the side of the housing 9 for directing the wire between the walls defining the slot 43, as clearly shown in Figure 6. It will be noted that the pivot 40 of the anvil is disposed below the outlet of the tube, so that the wire will not only be acted on above the pivot, but upon downward swinging movement of the anvil. That feature is very important to bring about efficient operation of the parts. Mounted within the housing 9 is a spring 44 which engages the anvil and serves to urge the latter in the path of the head 27, when the head is actuated to raised position.

The front face of the plate 31 is slidably disposed against the side wall 47 of the housing 9 and has its upper end fashioned with a transverse recess 48 defined by upper and lower shoulders 49 and 50 respectively, the upper shoulder 49 being disposed in right angular relation with the front face of the plate and the lower shoulder disposed in inclined relation.

The upper end section of the wall 47 is bifurcated and defines a vertical slot 51 in which the stop 37 operates. The upper end of the wall 47 on each side of the slot 51 is fashioned with the upper and lower connected cam faces 52 and 53 respectively with the lower face inclining inwardly and downwardly and with the upper face inclining upwardly and inwardly and of a materially greater area than the lower face 53 for engagement with a transversely disposed cam bar 54 integrally fashioned on the lower end of a latch lever 55.

The front end section of the latch lever 55 is pivotally conected within a kerf 56 formed in the lower corner of the upper end section 12 of the plunger 11 and pivoted to said section by means of a pivot pin 57. The section 12 of the plunger 11 is provided with a socket 58 on one side thereof in which is mounted one end of a coil spring 59, the opposite end of said spring engaging the upper end of the latch lever 55, superjacent the pivot pin 57. The spring 59 serves to urge the lower end of the latch lever 55 in a direction towards the plunger 11 subjacent the section 12.

The lower end of the latch lever 55 is fashioned with a lug 60 disposed laterally adjacent the cam bar 54 and towards the plunger 11 as clearly illustrated in Figure 6 of the drawings.

The outer face of the upper end of the plate 31, superjacent the recess 48, is formed with a triangular-shaped slot 61 defined by a pair of oppositely disposed faces and an upwardly and inwardly inclined front face 62 for engagement with the end of the lug 60 as hereinafter set forth.

One side of the housing 9 is provided with an arm 63 to which is connected one end of a tube 64 registering with and disposed in spatiality with respect to the outer end of the tube 46 carried by the housing 9. The opposite end of the tube 64 terminates in proximity to a pair of wire feed rollers 65, one of which is mounted on a drive shaft 66 operatively connected to the aforementioned stapling machine.

The other feed roller 65 is rotatably mounted on a bearing 67 carried by the arm 63 and through which the shaft 66 is journaled for rotation. The aforementioned rollers 65, shaft 66 and associated parts are of the usual construction embodied in a stapling machine of the character mentioned and operate to feed the wire, from which the staples are formed, to the head unit and inasmuch as said rollers, shaft and associated parts form no part of the present invention per se, a more detailed disclosure of the same is not believed necessary.

As illustrated in Figure 8 of the drawings, one of the side faces of the plate 31 is beveled as at 68 and forms, at its lower end, a cutting edge coacting with the end of the tube 46 to sever the staple wire extending under the plate 31 at a sharp angle upon descension of the plate 31 as hereinafter set forth, thus forming relatively sharp points on the severed portion from which a staple 69 is subsequently formed.

The housing 9 has mounted thereon upper and lower grooved guide rollers 70 and 71 respectively

for guiding the binding wire 72 which secures the box parts together when said binding wire 72 is drawn diametrically under the stapling mechanism to be thereby stapled to the box parts as is the common operation in stapling machines of the aforementioned character. The lower end of the plate 31 is formed with a pair of diametrically aligned slots 73 for receiving and maintaining the binding wire in position during the stapling operation.

In operaton, assuming that the parts of the head unit are in the positions illustrated in Figure 6 and that the work pieces are being fed under the head unit by the conveyor of the stapling machine together with the binding wire being disposed on the exposed faces of the work pieces for receiving the staples, movement is transmitted from the stapling machine to the upper carrier 6 to effect descension of the same towards the carrier 7 and which movement of the carrier 6 causes a like movement of the plunger 11 and plate 31, the latter being latched to the plunger by the engagement of the lug 60 of the lever 55 with the upper end of the plate 31. When the plate thus descends the cutting edge formed on its lower end severs that portion of the staple forming wire extending through the slot 43 of the anvil 38. When the portion of stapling wire is thus severed the ends thereof are drawn downwardly by the lower end of the plate and disposed within the slots 34 and with the interjacent section of said portion supported on the shoulder 43 of the anvil as illustrated in Figure 7 of the drawings. Also, when the plate 31 descends, the cam face of the head 27 engages the cam face of the anvil 38 as illustrated in Figure 7 of the drawings. When the cam faces are thus brought into engagement, the anvil is pivoted out of the path of the head 27 and the interjacent section of the portion of wire is actuated into the groove 29 in the lower face of the head 27 as illustrated in Figure 5 of the drawings. During the aforementioned descension of the plunger 11, the cam face 52 of the wall 47 engages the cam bar 54 and effects outward pivoting of the lower end of the lever 55 to disengage the lug 60 from the upper end of the plate 31 whereby said lug is disposed subjacent the shoulder 49 to permit lowering of the head 27 with respect to the plate 31 when the latter engages one of the work pieces as clearly illustrated in Figure 4 of the drawings. When the head 27 is thus lowered with respect to the plate 31, said head serves to drive the staple into the work piece and over the binding wire, it being understood that the spring 24 is compressed during the movement of the head 27 with respect to the plate 31.

When the binding wire has thus been stapled, the carrier 6 is moved upwardly with respect to the carrier 7 and during said movement the spring 24 urges the head 27 upwardly within the guideway 32. During upward movement of the plate 31 with respect to the carrier 7 the cam face 53 engages the cam bar 54 and effects outward movement of the lug 60 to disengage the same from the shoulder 49, thus permitting raising of the head 27 with respect to the plate 31 through the medium of the spring 24. Continued raising of the carrier 6 serves to reposition the parts for another stapling operation as heretofore described.

The terms designating certain parts of the device, such as "top," "bottom," "upper," "lower" and "ends" are employed in a relative sense for the purpose of description and without intent to limit myself thereby. It has been more convenient to explain the invention by the employment of terms such as quoted but it will be obvious that if the parts were of other form, such terms might not so clearly apply as, for instance, when the head unit is disposed in a horizontal plane instead of a vertical plane as described. While I have shown and described my invention in connection with supplying staples to boxes for securing the parts thereof together, it is to be understood that the same may be employed in connection with other types of receptacles, for instance barrels and the like.

Without further elaboration, the foregoing will so fully explain the invention that others may, by applying current knowledge, readily adapt the same for use under various conditions of service. Moreover, it is not indispensable that all the features of the invention be used conjointly since they may be employed advantageously in various combinations and sub-combinations.

It is obvious that the invention is not confined to the herein described use therefor as it may be utilized for any purpose to which it is adaptable. It is therefore to be understood that the invention is not limited to the specific construction as illustrated and described as the same is only illustrative of the principles of operation, which are capable of extended application in various forms, and that the invention comprehends all construction within the scope of the appended claims.

What I claim is:

1. In a machine of the character described, the combination with a reciprocatory staple forming mechanism having a bevelled surface and means for feeding staple forming wire in the path of and in a direction perpendicular to the movement of the forming mechanism, of a pivot supported closely adjacent to the forming mechanism and transversely of its direction of movement, an anvil rockably supported on the pivot and disposed in upstanding position, the said anvil having a bevelled upper edge provided with a notch, the said notched portion being movable inwardly for engagement with the wire for looping the same in cooperation with the staple forming mechanism, the said bevelled edge portion of the anvil being engageable with the lower portion of the forming mechanism when the latter moves downward to swing the notched portion outwardly of engagement with the wire, and means yieldingly urging the notched portion of the anvil to inward wire engaging position.

2. In a machine of the character described, a vertically reciprocating staple forming member having an inclined surface at its lower portion, a pivot supported adjacent to and transversely of the path of movement of the said forming member, a vertically disposed anvil rockably supported on the pivot in an upwardly directed position, the said anvil having an inclined edge portion at the top provided with a notch adapted to receive wire stock therein for looping in conjunction with the forming member when the anvil is in inwardly extended operative position, the said notched portion of the anvil being disposed to be swung upwardly and outwardly to inoperative position by reason of the engagement of the said inclined surfaces during downward movement of the forming member, and means resiliently urging the said notched portion of the anvil to inward wire looping operative position.

3. In combination with a wire bound box stapling machine having a support member, a vertically reciprocating staple forming member mounted on the support member, means for feeding a wire transversely of and in the path of the said forming member, a staple driving member movable parallel with the forming member having a cam surface, a pivot pin mounted transversely on the support member on an axis below and parallel with the wire feed axis, the said pivot being disposed laterally of the staple forming and driving members, an anvil having its lower portion provided with an aperture through which the said pivot pin extends, the upper portion of the said anvil having a notch therein movable to an operative position transversely of the axis of the feed wire for looping a staple in cooperation with the forming member, the upper edge of the anvil being shaped to form a cam surface cooperative with the cam surface of the driving member for moving the anvil to an inoperative position when the driving member is depressed to staple driving position, and means for yieldingly forcing the upper notched portion of the anvil to operative staple looping position.

4. In combination with a wire bound box stapling machine having a support member, a vertically reciprocating staple forming member mounted on the support member, means for feeding a wire transversely of and in the path of the said forming member, a staple driving member movable parallel with the forming member having a cam surface, a pivot pin mounted transversely on the support member on an axis below and parallel with the wire feed axis, the said pivot being disposed laterally of the staple forming and driving members, an anvil having its lower portion provided with an aperture through which the said pivot pin extends, the upper portion of the said anvil having a notch therein movable to an operative position transversely of the axis of the feed wire for looping a staple in cooperation with the forming member, the upper edge of the anvil being shaped to form a cam surface cooperative with the cam surface of the driving member for moving the anvil to an inoperative position when the driving member is depressed to staple driving position, a spring bearing against the said anvil so as to yieldingly force the same to operative staple looping position, and means for limiting the angular movement of the said anvil.

GEORGE F. HITT.