Nov. 18, 1952 H. A. IMHOF 2,618,400

METHOD OF AND MACHINE FOR INSERTING BLIND FASTENINGS

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Fig. 1.

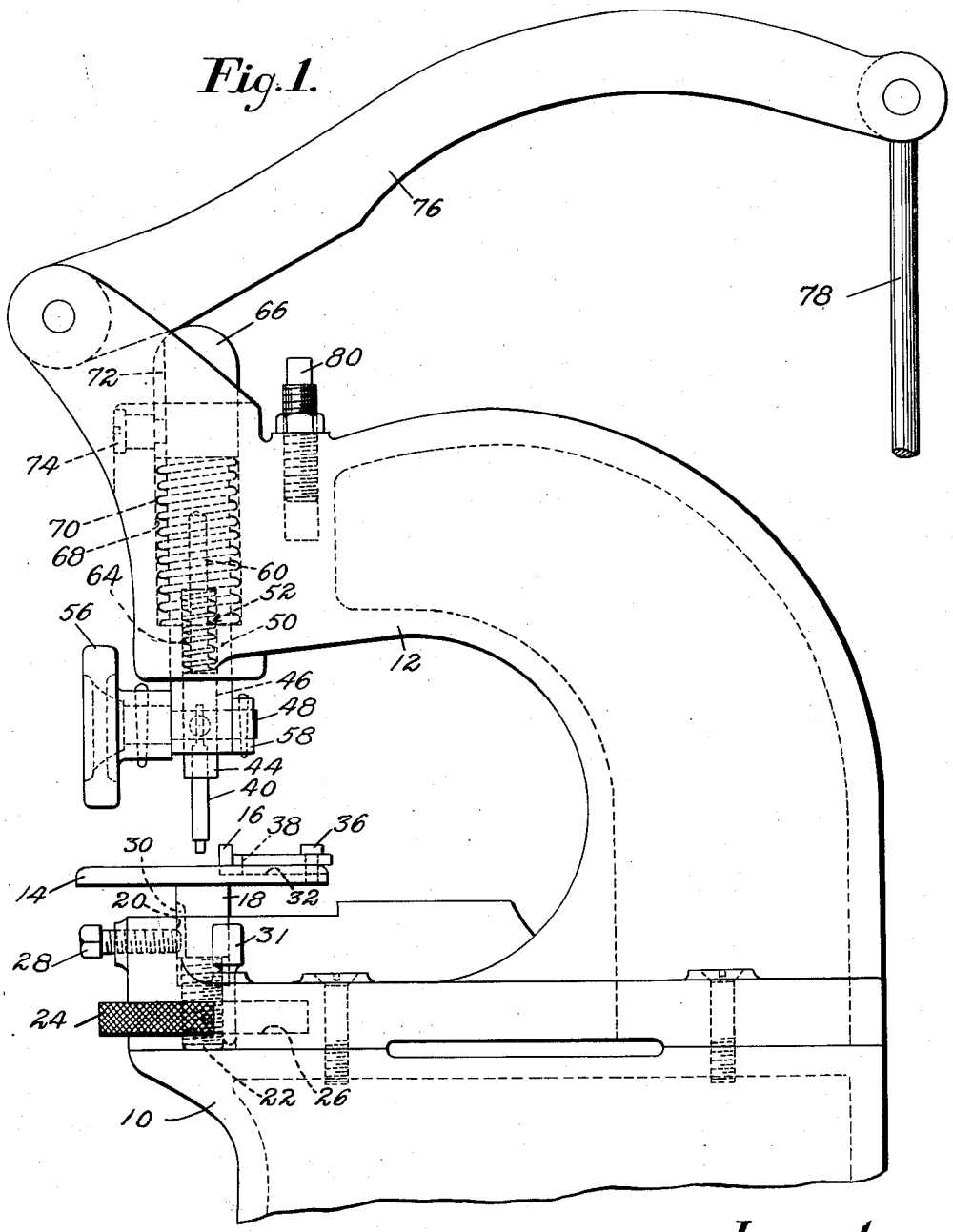

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Fig. 2.

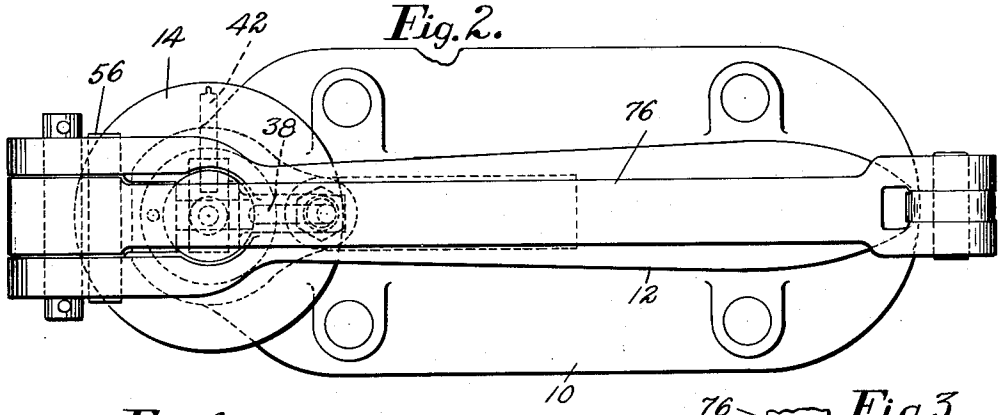


Fig. 4.

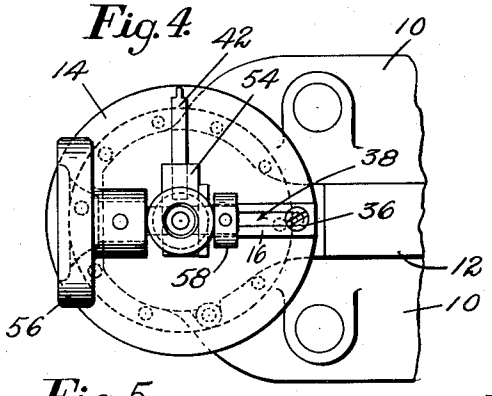


Fig. 3.

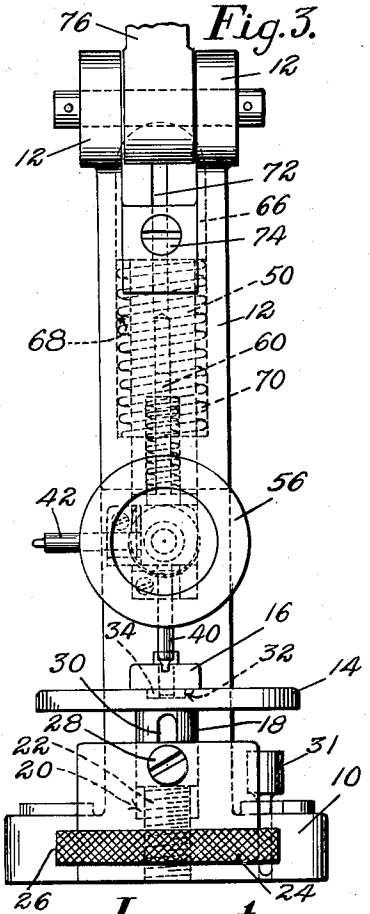


Fig. 5.

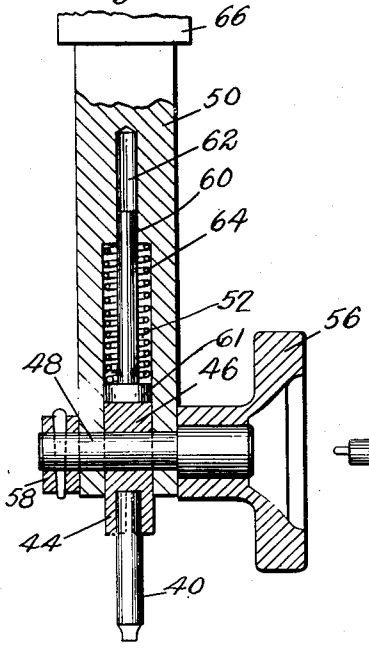
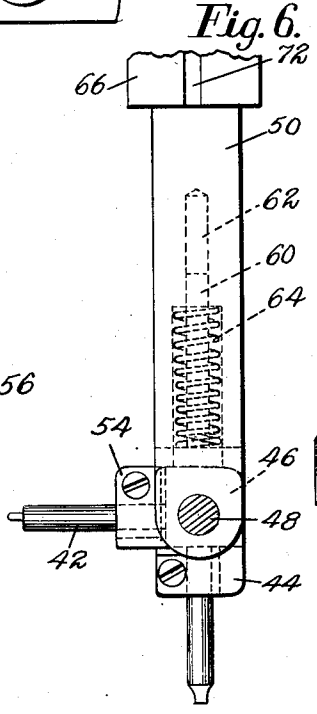


Fig. 6.



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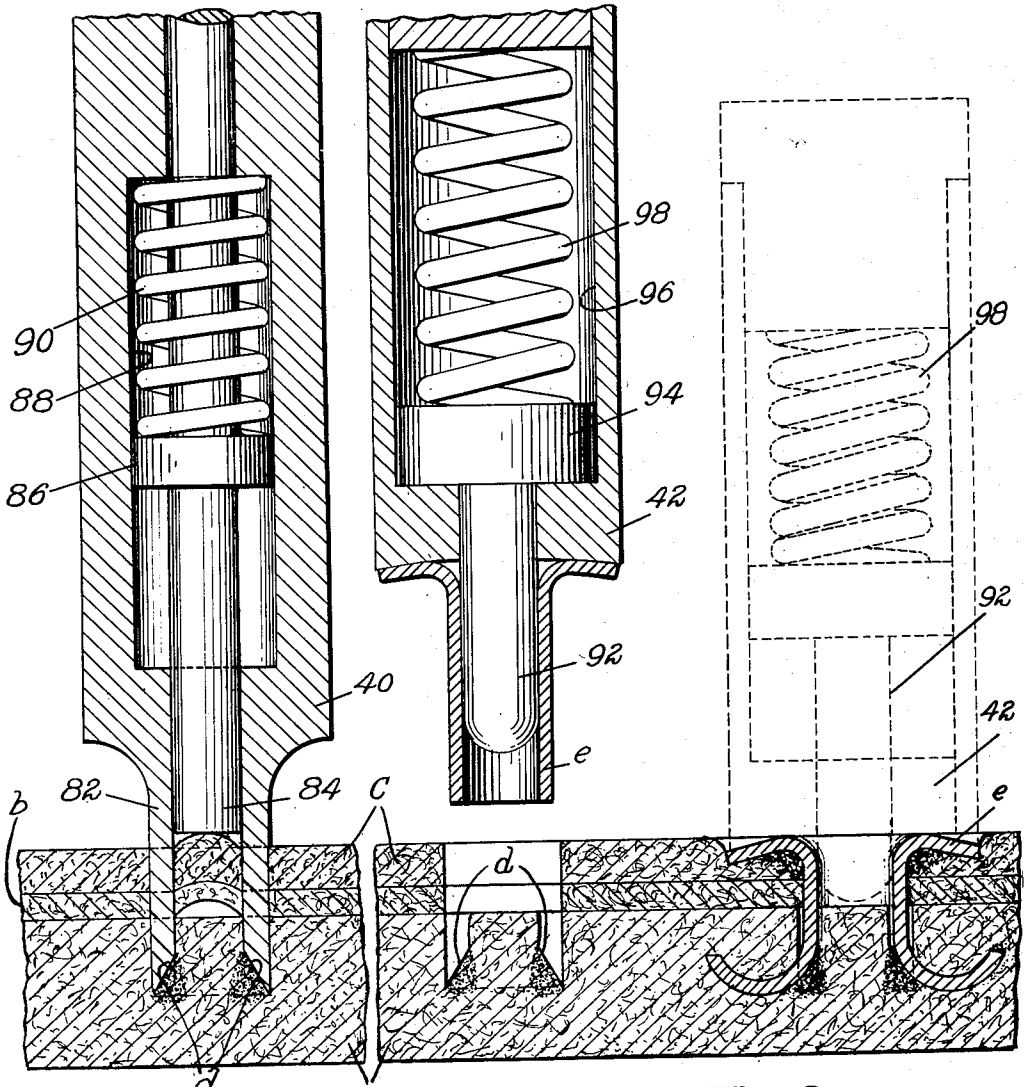

Fig. 7.

Fig. 8.

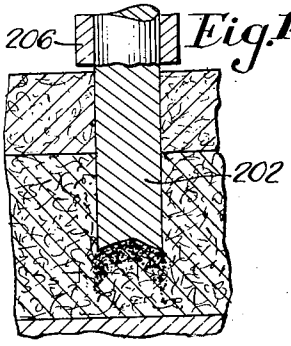

Fig. 14.

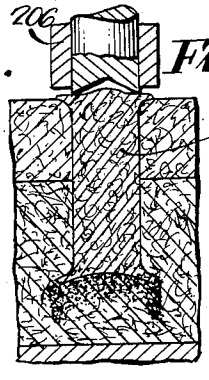

Fig. 15.

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Fig. 9.

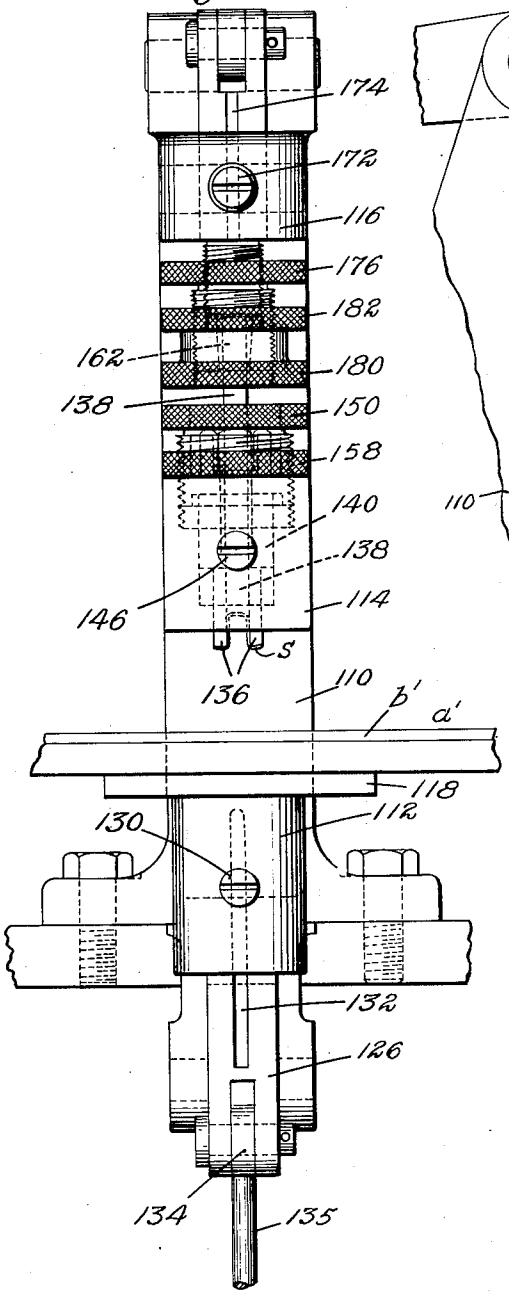

Fig. 10.

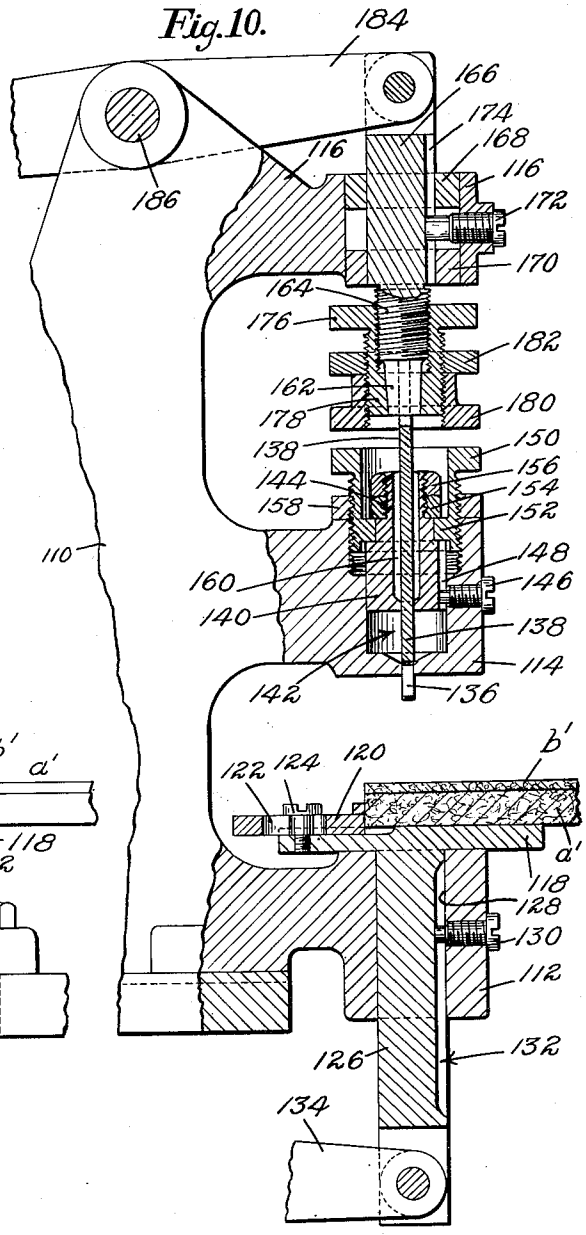

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Fig. 11.

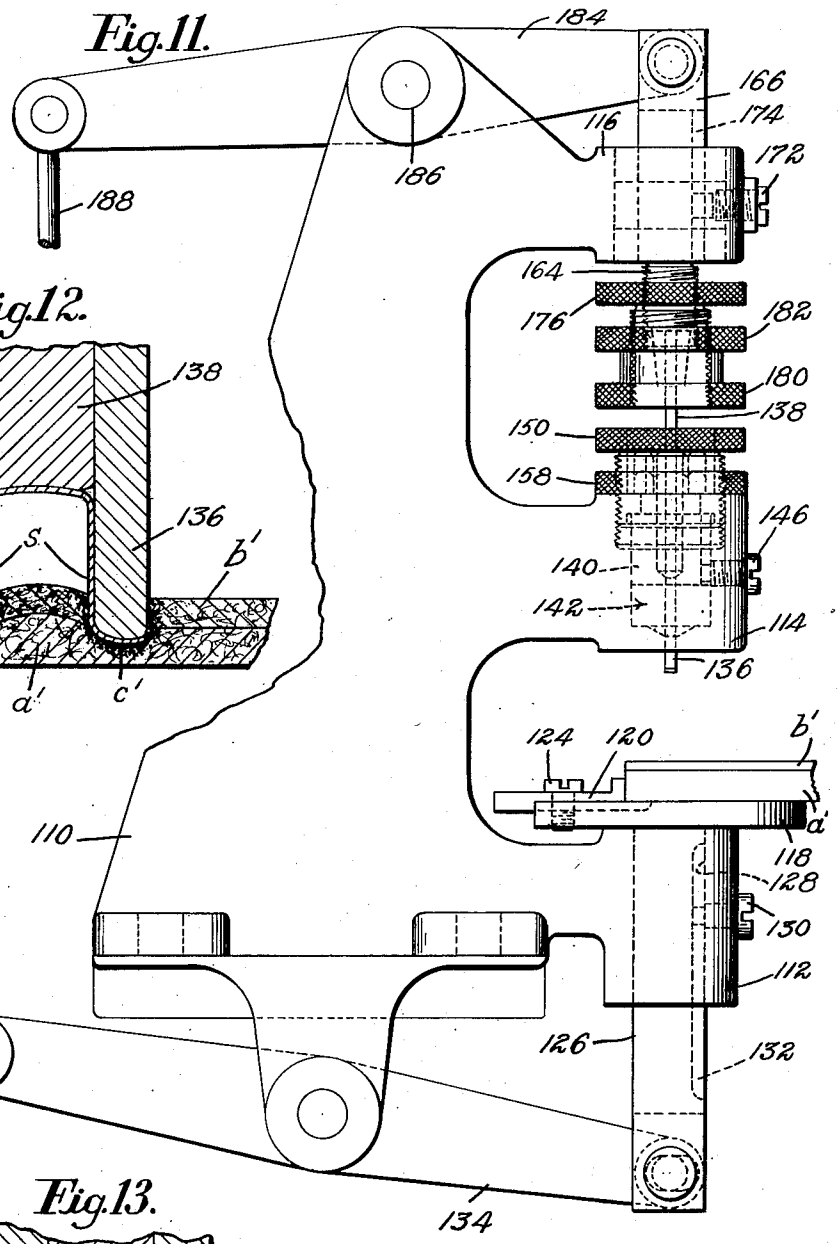
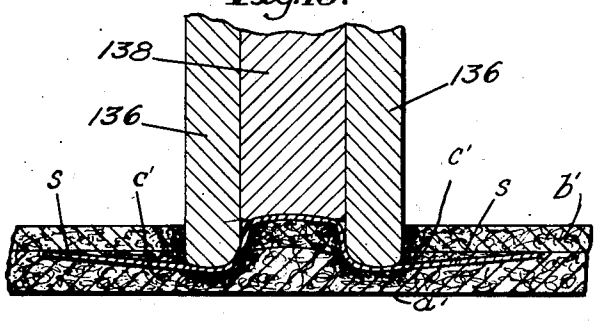


Fig. 12.

Fig. 13.



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UNITED STATES PATENT OFFICE

2,618,400

METHOD OF AND MACHINE FOR INSERTING BLIND FASTENINGS

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Application November 4, 1948, Serial No. 58,233

11 Claims. (Cl. 218—29)

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This invention relates to improvements in methods of and machines for inserting fastenings into work parts or stock, either for the purpose of securing together such work parts or for the attachment of articles such as ornaments to work parts or stock, or both, the fastenings being so inserted that they do not penetrate through the entire thickness of the combined parts or the stock, but become anchored within the substance of the combined work parts or the stock. Fastenings of that type are frequently referred to in the trade as blind fastenings.

It is a purpose of the invention to improve upon and to simplify the insertion of blind fastenings, generally speaking, while resorting to no, or a minimum of, extraneous or auxiliary deflecting elements.

In accordance with one of the principal features of the invention the work itself into which the blind fastening is to be inserted is relied upon as the primary, if not the exclusive, deflecting factor, and to this end an interior portion of the work, at the location where the fastening is to be inserted, is compacted prior to the insertion of the fastening, whereupon the fastening is so inserted that its leading end portion becomes deflected by the compacted portion of the work and thus is caused to penetrate into and become anchored within an adjacent noncompacted portion of the work without penetrating the entire thickness of the work. The features of the invention may be advantageously employed to fasten materials or objects to a relatively thick piece of leather or of any other material which, like leather, is adapted to become densely compacted throughout portions which are subjected to a heavy impact pressure, and adapted to remain compacted after the pressure has been removed. In addition to leather, examples of two suitable materials possessing requisite physical characteristics are vulcanized fiber and a leather substitute sold under the trade name of Darex, extensively used as an insole material in shoemaking.

In its method aspect, the invention, therefore, is characterized generically by the two important steps of compacting an interior portion of the combined work parts or stock and then deflecting a fastening progressively rearwardly from its leading end portion by driving the fastening against only the compacted portion of the work parts or stock so it becomes anchored within the substance of the combined work parts or stock.

While it is possible that, as actual tests have shown, the above-defined method steps may be

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practiced manually without the use of any specific mechanism or machine, the method by preference may be practiced by the use of novel mechanism embodying additional novel features of the invention. Since the invention is capable of embodiment in several forms, two preferred embodiments of the invention are herein illustrated, one being an eyeleting machine, and the other a stapling machine, both machines having in common the provision of means for compacting an interior portion of the work parts or stock presented to the machine in combination with means for so inserting a fastening, be it an eyelet or a staple, into the stock that the leading end portion of the fastening becomes deflected by the compacted portion of the stock into an adjacent noncompacted portion of the stock without penetrating the entire thickness of the stock, thus anchoring the fastening well within the substance of the stock.

These and other features of the invention will now be described in detail in connection with the accompanying drawings and will be pointed out in the appended claims.

In the drawings:

Fig. 1 is a view in right-hand side elevation of an eyeleting machine in which the invention is shown as embodied;

Fig. 2 is a plan view of the machine illustrated in Fig. 1;

Fig. 3 is a front elevation of the machine illustrated in Fig. 1;

Fig. 4 is a plan view of the tool supporting and controlling mechanism of the machine illustrated in Fig. 1;

Fig. 5 is a left-hand side elevation, in section, of the mechanism illustrated in Fig. 4;

Fig. 6 is a front elevation of the mechanism illustrated in Fig. 4;

Fig. 7 is a detail view, in section, of a punching tool illustrating the operation of the tool upon the work parts presented to the machine;

Fig. 8 is a detail view of an eyelet inserting and setting tool illustrating the operation of the tool upon the portion of the work parts prepared by the punching tool illustrated in Fig. 7;

Fig. 9 is a view in front elevation of a stapling machine constituting another embodiment of the invention;

Fig. 10 is a view in left-hand side elevation of the essential parts of the machine illustrated in Fig. 9, the parts being shown in section;

Fig. 11 is a view in left-hand side elevation of the machine shown in Fig. 9;

Figs. 12 and 13 illustrate the progressive ac-

tions of the staple presenting and staple inserting tools of the machine shown in Fig. 9;

Fig. 14 is a detail view, in section, of a modified punching tool illustrating the operation of the punch upon work parts to be fastened by a fiber peg; and

Fig. 15 is a detail view, in section, of a fiber peg inserting and setting tool illustrating the operation of the tool upon a peg driven against the portion of the work parts prepared by the tool illustrated in Fig. 14.

It has been indicated that since the invention is capable of embodiment in several tangible forms, two preferred embodiments of the mechanical features of the invention are shown in the drawings, namely an eyeleting machine illustrated in Figs. 1 to 8, and a stapling machine illustrated in Figs. 9 to 13. It also has been stated that both machines have in common the generic features of first compacting an interior portion of the work parts or stock presented to them and then so inserting a fastening into the work parts or the stock that the leading end portion of the fastening becomes deflected by the compacted portion of the stock and enters into an adjacent noncompacted portion of the stock without penetrating the entire thickness of the stock.

Referring first to the eyeleting machine of Figs. 1 to 8, it will be noted that the machine comprises a frame 10 provided with an overhang 12. The illustrated work parts are superimposed layers of material *a*, *b*, *c* (Figs. 7 and 8) which are to be secured together by an eyelet *e* in the fashion indicated in Fig. 8. As heretofore related, the material, comprising the layer *a* and within which the fastening is to be deflected and anchored, must be first compressible to produce densely compacted interior portions which will then maintain their compacted state after the removal of the compressing force, so that the material in these portions may be employed as a deflecting medium for anchoring the fastening within the stock. In the case of the eyelet type fastening, illustrated in Figs. 7 and 8, the layer *a* should also be of sufficient thickness to permit the leading end portion of the fastening to be firmly embedded therein without penetrating through the entire thickness of the stock. As an illustrative example, let it be supposed that an impervious outer layer *c* of clear plastic is to be used as an outer covering for a sheet *b* of decorative paper, and it is desired to apply these upon a piece of leather backing *a*, this leather stock having a thickness of about an eighth of an inch. The eyelet *e* may be suitably formed from a ductile metal such as brass, copper or aluminum, the wall thickness of the skirt or lower leading edge portion of this eyelet being thin enough to become upset when driven against a compacted portion of leather. The requisite length for the skirt portion would depend upon the aggregate thicknesses of the layers *b* and *c*, and the depth, beneath the surface of layer *a*, to which the compacted portion has been carried by the punching operation, for the skirt must penetrate this distance before it begins to be upset by the compacted portions during its driving. The foregoing is not to be construed in any way as limiting the practice of the invention to the anchoring of metallic fastenings into leather stock, for it is within the contemplation of this invention to vary the fastening material to best suit the characteristics of the stock in which the fastening is to be upset. For instance a heavily calendered backing of vulcanized fiber might require the use of steel eyelets, whereas a plastic eyelet might suffice for forming a fastening to be anchored into a backing of soft wood. The work parts *a*, *b*, *c* are placed upon a work table 14 mounted in the machine frame 10, as will be described, and provided with a gage 16 which determines the operative position of the work parts upon the work table 14.

The table 14 is in the shape of a round disk and is vertically adjustable in the machine, as will be presently described. Integral with the table 14 is a downwardly extending stem 18 (Fig. 1) which engages a vertical bore 20 provided in a portion of the machine frame 10. The stem 18 has a threaded lower end 22 in threaded engagement with which is a hand nut 24 contained in a horizontal slot 26 provided in the frame portion 10. The hand nut 24 thus is held against vertical movement but is capable of rotation about the central axis of the stem 18. A horizontal guiding screw 28 is threaded through a portion of the machine frame 10 and extends into a groove or keyway 30 provided in the front portion of the stem 18 so as to prevent rotation of the stem 18 and of the table 14 but to permit vertical adjustment of the table 14 on rotation of the hand nut 24. The hand nut 24 may be held in adjusted position by a manually operated plunger 31 removably held in the machine frame 10 and extending into one of a series of holes provided in the peripheral portion of the hand nut 24.

For the purpose of adjusting the edge gage 16 horizontally and with relation to the table 14 there is provided a groove 32 (Fig. 3) in the table 14, the groove extending in the longitudinal direction of the machine (forward and rearward) and receiving a guide piece 34 integral with the bottom portion of the edge gage 16. Thus the edge gage may be adjusted along the groove 32. It is held in adjusted position by a clamping screw 36 (Fig. 1) which extends through a slot 38 (Figs. 1 and 2) provided in the edge gage 16, and is threaded into the table 14.

The two work engaging or operating instrumentalities or tools of the machine (illustrated in Figs. 1 to 8) are a punch 40 and an eyelet inserting and setting tool 42. As illustrated in Fig. 6, the punch 40 is held in a clamping collar 44 which is part of a rotary carrier 46 secured on a shaft 48 rotatably mounted in the lower portion of a vertically reciprocating plunger 50. The rotary carrier 46 is partly received in a recess 52 (Fig. 5) provided in the lower portion of the plunger 50. The setting tool 42 is held in a clamping collar 54 corresponding to the collar 44 and also a part of the rotary carrier 46, the tool 42 extending at right angles to the punch 40. In the position of the parts illustrated in Fig. 6 the punch 40 is located in its effective position with relation to the reciprocating plunger 50 so that on downward movement of the plunger 50 the punch 40 will become operative to punch a hole into the work supported on the table 14, as will be described. Upward movement, thereafter, of the plunger 50 withdraws the punch 40 from the work and on rotation of the shaft 48 and the carrier 46 in a counterclockwise direction (as viewed in Fig. 6) the punch 40 will be moved out of its effective position with relation to the plunger 50 and the setting tool 42, to which in the meantime an eyelet has been presented in a manner well-known in the art, will be moved into its effective position with relation to the plunger 50. Downward movement of the plunger 50 then

will result in an operation performed by the eyelet inserting and setting tool 42 upon the work parts, more specifically, the tool 42 will insert the eyelet previously presented to it into the hole provided in the work by the punch 40 and upset the eyelet therein. To rotate the shaft 48 so as to move the punch 40 and the tool 42 alternately into and out of their effective positions with relation to the plunger 50, there is secured upon a forwardly extending portion of the shaft 48 a hand wheel 56. To hold the shaft 48 in place, there is mounted on a rearwardly extending portion thereof a collar 58 which is pinned to the shaft 48 and abuts the rear wall of the lower portion of the plunger 50, as best shown in Fig. 5.

To lock or hold either the punch 40 or the tool 42 in their respective effective positions with relation to the plunger 50, there is provided a spring lock mechanism comprising a small plunger 60 vertically movable in the recess 52 and in an upper reduced extension 62 thereof. The plunger 60 has a head 61 on its lower extremity upon which is seated the lower end of a spring 64, the upper end of which engages a shoulder portion of the recess 52. The spring 64 thus tends to depress the plunger 60 with the head portion of the plunger engaging one of two flat faces disposed at right angles to each other on the rotary carrier 46. Rotation of the carrier 46 to move one or the other of the two tools 40, 42 into effective position results in a temporary upward displacement of the plunger 60 against the pressure of the spring 64 whereupon, after the tool has arrived in its effective position, the head portion of the plunger 60 engages the corresponding flat face on the carrier 46 under the pressure of the spring 64 to hold the tool.

The above-mentioned tool operating plunger 50 is mounted for vertical reciprocation in the machine and is operated in a manner which will now be described. Formed on the upper extremity of the plunger 50 is a head 66 (Figs. 1, 3, 5 and 6) which is guided for vertical reciprocating movements in a bore 68 provided in the forward portion of the overhang 12. Beneath the head 66 there is mounted in the bore 68 and surrounding the plunger 50 a spring 70, the lower end of which is seated upon the bottom of the bore 68. The spring 70 thus tends to elevate the head 66 and the plunger 50. The upper end portion of the head 66 is rounded and the front face of the head 66 is provided with a groove or keyway 72 which is engaged by a screw 74 threaded into the front portion of the overhang 12, this to prevent the head 66 and plunger 50 from turning about their vertical central axis during their reciprocatory motions. The rounded upper end portion of the head 66 is engaged by an operating lever 76 (Fig. 1) pivotally secured at its front end to a lug provided on the overhang 12 and pivotally connected at its rear end to a treadle rod 78. The lower end of the treadle rod 78 is pivotally connected to a treadle (not shown) which, in a manner well-known in the art, is normally so held by a treadle spring (not shown) that the treadle rod 78 is maintained in its uppermost position. Depression of the treadle results in a downward motion of the rod 78, thereby swinging down the lever 76 and depressing the head 66 and plunger 50 against the pressure of the spring 70 to operate either one of the tools 40, 42. After the operation of the respective tool, the treadle is released to cause upward movement of the treadle rod 78 and upward swinging movement of the operating lever 76, the compressed spring 70 at the same time moving the head 66 and plunger 50 upwardly. The lower end of the path of downward swinging movement of the operating lever 76 and accordingly the lower end of the operative stroke of either the punch 40 or the setting tool 42, are adjustably determined by a stop screw 80 which is threaded into the overhang 12 and with which the operating lever 76 contacts on downward swinging motion.

Referring now more in detail to the construction and operation of the punch 40 and the setting tool 42, it will be noted in Fig. 7 that the punch 40 has a reduced lower portion 82 which is hollow and provided with a cutting edge at its lower extremity. Movable in the hollow portion 82 is a plunger 84 which serves to expel the cutting waste from within the portion 82 on elevation of the tool 40 after the completion of a punching stroke. The plunger 84 is provided with a collar 86 which is guided for vertical reciprocation in a bore 88 of the main portion of the punch 40, there being mounted a spring 90 on the collar 86, the upper end of the spring abutting a shoulder of the bore 88. The spring 90 thus tends to depress the plunger 84 within the punch 40 so that the lower end of the plunger 84 is located close to the lower extremity of the punch 40 in the normal inoperative position thereof. After location of the punch 40 in its effective relation to the plunger 50 and downward movement of the plunger 50, the lower portion 82 of the punch is caused to punch a hole through the layers *c* and *b* of the combined work parts and into the layer *a* which may be considered the body portion of the stock. It is to be understood that while the body portion of the stock *a* must possess certain characteristics which permit it to be compressed to form a suitable deflecting medium, those materials forming the layers *b* or *c* which are to be completely punched through may have an almost infinite diversity of physical properties or characteristics. The cutting waste produced by punching through the layers *c* and *b* enters the lower portion 82 of the punch 40 (as illustrated in Fig. 7) forcing the plunger 84 upward against the pressure of the spring 90. Upon withdrawal of the punch 40 from the work, the spring 90 is free to expand, forcing the plunger 84 downward in the punch and expelling the waste material.

As already stated, the punch enters into the layer *a* or body portion of the work without penetrating its full thickness, it being understood that the force of the punch is considerable so that when the punch has reached its final operative position (illustrated in Fig. 7) the interior portion of the layer *a* between the lower end of the punch and the lower surface of the layer *a* will have become considerably compacted, particularly along the slanting face *d*, indicated in Figs. 7 and 8.

The setting tool 42 is provided in the customary manner with a pilot 92 which extends from the lower portion of the tool 42 and is movable with relation thereto. The upper end of the pilot 92 is provided with a collar or head 94 vertically movable in a bore 96 provided in the tool 42 and biased by a spring 98, the upper end of which contacts the upper end portion of the bore 96. The spring 98 thus tends to push the pilot 92 outwardly with relation to the tool 42 so that in a normal inoperative position of the tool 42 an eyelet *e* may be placed over the protruding pilot 92 and may be frictionally held thereon.

After the completion of the operative stroke of the punch 40 the plunger 50 is again elevated whereupon the hand wheel 56 is rotated to rotate both tools 40 and 42 in a counterclockwise direction, as viewed in Fig. 6, thereby moving the punch 40 out of its effective position with relation to the plunger 50 and moving the setting tool 42 into its effective position. The plunger 50 again is depressed by the manipulation of the treadle with the result that the eyelet *e* held on the tool 42 is inserted into the hole previously made in the work by the punch 40 (see Fig. 8). Continued operation of the setting tool 42 results in a displacement of the pilot 92 into the interior of the tool 42, and in a driving of the eyelet *e* along the previously punched hole in the work with the result that the lower or leading end portion of the eyelet *e* is caused to impinge upon the compacted slanting face *d* and to become laterally deflected thereon into an adjacent noncompacted portion of the layer *a*, as illustrated in the right-hand side of Fig. 8. Thus, the eyelet *e* is deflected progressively rearwardly from its leading end by driving the eyelet against only the compacted face *d*. It will be seen, therefore, that the three layers *a b* and *c* are firmly secured together by the driven and upset eyelet *e* and that the eyelet *e* is firmly anchored within the body portion of the work without penetrating through the entire thickness of the work. As already stated, the eyelet may be inserted also in such a fashion that it not only secures the three layers *a*, *b* and *c* together but attaches thereto an article such as an ornament. The setting tool 42 having completed its operative stroke, the punch 50 is raised to withdraw the tool 42 from the work. Rotation of the hand wheel 56 in a clockwise direction (as seen in Fig. 6) thereupon results in the setting tool 42 again being moved out of its effective position with relation to the plunger 50 and simultaneously in the punch 40 being moved into its effective position (shown in Fig. 6) in readiness for the next descent of the plunger 50 to punch a hole into the work adjacent to the previously made hole, the work having, in the meantime, been manually fed across the table 14.

The stapling machine, shown in Figs. 9 to 13, illustrates a further embodiment of the invention, as already pointed out. The stapling machine has a frame 110 (Figs. 9 to 11) provided with three vertically spaced and forwardly extending arms or brackets 112, 114 and 116. The lower bracket 112 carries a work table 118 provided with a work gage 120. The gage is mounted for horizontal adjustment with relation to the table 118 and to this end is provided with a slot 122 (Fig. 10) through which extends a clamping screw 124 threaded into the table 118 and adapted to hold the edge gage 120 in its position of adjustment similar to the gage arrangement of the eyeleting machine of Figs. 1 to 8. The work parts to be operated upon comprise two superimposed layers *a'*, *b'* which are to be secured together by a staple *s* (Figs. 12 and 13). As in the case of the eyelet inserted by the previously-described eyeleting machine, the staple when being driven into the work parts becomes anchored within these parts without penetrating their entire thickness in that during the driving of the staple, the staple legs are laterally deflected by interior compressed portions *c'* (Figs. 12 and 13) of the layer *a'* which constitutes the body portion of the work.

For a purpose to be described, the work table 118 and the gage 120 which locates the work parts *a'*, *b'* in operative position on the work table 118 are mounted for vertical reciprocation in the frame bracket 112. To this end the table 118 has extending downwardly from it an integral stem 126 which is vertically movable in a bore 128 provided in the bracket 112. A guide screw 130 threaded into the bracket 112 extends into a vertical groove or keyway 132 provided in the front portion of the stem 128, thus preventing rotation of the stem 126 and the table 118 during vertical reciprocation thereof. The lower end of the stem 126 is pivotally connected to the front end of a two-armed lever 134 rotatably mounted in the machine frame 110 midway between its ends and also pivotally connected at its rear end to a treadle rod 135 (Fig. 11). The treadle rod 135 is pivotally connected at its lower end to a treadle (not shown) which is spring-biased to hold the treadle rod 135 elevated and which, upon depression, lowers the treadle rod 135 to impart to the lever 134 a swinging movement in a counterclockwise direction (as viewed in Fig. 11) to elevate the stem 126 and table 118.

The illustrated stapling machine also is provided with two main work contacting or operating instrumentalities or tools, namely a punch 136 and a driver 138. The punch 136 is normally held fixed in the frame bracket 114 and is provided with two prongs (as shown in Figs. 9 and 12). The two prongs of the punch 136 are the lower extremities of a block 140 (Figs. 9 to 11) which is mounted in a bore 142 provided in the frame bracket 114. The block 140 has a threaded upper extension 144 by means of which the block may be adjusted heightwise of the machine. To prevent rotary motion of the block during heightwise adjustment, a guide screw 146 threaded into the bracket 114 engages a vertical groove or keyway 148 (Fig. 10) provided in the front portion of the block 140. The upper portion of the bore 142 provided in the bracket 114 is of enlarged diameter and is tapped to receive a hollow hand screw 150. The hand screw 150 has an inwardly projecting radial shoulder portion 152 (Fig. 10) which at its bottom face engages a shoulder on the block 140 and at its top face a nut 154 in threaded engagement with the upper extension 144 of the block 140. The nut 154 is held in position by a check nut 156 also in threaded engagement with the upper extension 144 of the block 140. To hold the hand screw 150 in its position of adjustment and accordingly to hold the entire assembly supported by it, primarily the block 140 and the punch 136, in its heightwise adjusted position, a check nut 158 is in threaded engagement with the hand screw 150 and is tightened against the top face of the bracket 114. Thus block 140 and punch 136 are held normally fixed in the machine frame.

The above-mentioned driver 138 is mounted for vertical reciprocation between the two prongs of the punch 136 (as shown best in Figs. 9, 12 and 13). The driver extends upward from the prongs 136 through the bore 142, as well as a bore 160 provided in the block 140 and its upper extension 144, through the hand screw 150 into a chuck 162. The chuck 162 is provided on the threaded lower extension 164 of a vertically reciprocating slide 166. The slide 166 is guided in bushings 168, 170 mounted in a bore provided in the upper frame bracket 116. A guide screw 172 threaded into the bracket 116 extends into a vertical keyway 174 provided in the front portion of the slide 166 to prevent rotation of the

slide about its longitudinal axis during its vertical reciprocation. A clamping screw 176 has a tapped hole in its upper portion which is in threaded engagement with the extension 164. The lower end portions 178 of the clamping screw 176 are wedge-shaped to engage the inclined outer faces of the chuck members 162. It will be seen that manual rotation of the clamping screw 176 results in a clamping of the upper portion of the driver 138 in the chuck 162 or a release therefrom depending upon the direction of rotation of the screw 176. Threaded upon the lower end portion of the screw 176 is a stop nut 180 which is spaced a predetermined distance from the upper portion of the hand screw 150 and which is held in adjusted position upon the screw 176 by a check nut 182.

To reciprocate the slide 166 and thereby to impart reciprocatory motion to the driver 138, the upper extremity of the slide 166 is pivotally connected to the front end of a two-armed operating lever 184 pivotally secured at 186 to the machine frame, the rear end of the lever 184 being pivotally connected to a treadle rod 188 (shown in Fig. 11). The treadle rod is pivotally connected at its lower end to a spring-biased treadle (not shown), depression of which causes elevation of the rod 188 and swinging movement of the lever 184 in a clockwise direction (as viewed in Fig. 11) with the result that a downward driving motion is imparted to the driver 138 to the extent permitted by the selected spacing between the stop nut 180 and hand screw 150.

The arrangement is such that in the normal inoperative position of the machine parts (as viewed in Fig. 9) the lower end of the driver 138 is located a considerable distance above the lower end of the two prongs of the punch 136 so that a staple *s*, the legs of which have laterally deflected end portions, may be placed upon the prongs of the punch 136 with the bar of the staple resting against the lower extremity of the driver 138. By now depressing the treadle connected with the treadle rod 135, upward movement is imparted to the work table 118 and the work parts *a'*, *b'* supported thereon until the stationary punch 136 has penetrated entirely through the layer *b'* and has partly penetrated through the body portion *a'* of the work, as illustrated in Fig. 12. In doing so, the previously mentioned interior portions *c'* of the layer *a'* have become compacted and at the same time the staple *s* has been partially and bodily inserted or pushed into the work. While maintaining the work table 118 in its elevated position, e. g. by maintaining the corresponding treadle depressed, and thus maintaining the relative positions of the punch and the work parts *a'* and *b'*, the driver 138 is caused to descend by the depression of the treadle connected to the treadle rod 188 with the result that the driver 138 drives the partially inserted staple home to the position indicated in Fig. 13. In driving the partially inserted staple *s* home, the staple legs are progressively deflected rearwardly from their leading end, upon reaching the lower end of the punch prongs, in a lateral direction by the compacted interior portions *c'* of the work so that the staple legs become securely anchored in the work parts without penetrating through the entire thickness of these parts. The final position of the inserted staple is shown in Fig. 13. Release of the two treadles then results in a withdrawal of the work from the punch 136 and in an elevation of the driver 138 with relation to the punch into the position illustrated in Fig. 9.

It already has been mentioned that the invention is capable of embodiment in many forms and as a third example of an embodiment of the invention may be mentioned the insertion of a fiber peg into work parts by a cylindrical driver which has a cupped lower end and is given two strokes during one inserting cycle. The first stroke of the driver 202, as illustrated in Fig. 14, results in a hole being punched partway into the work and due to the cupped end of the driver an interior portion of the work between the bottom of the punched hole and the opposite or lower surface of the work becomes considerably compressed so that the fiber peg 204, thereafter inserted into the punched hole by the same driver during its second stroke, becomes upset or flared out at its lower extremity when impinging upon the just-mentioned compressed interior portion of the work at the bottom of the hole punched therein, and the upper end of the peg, upon being driven beyond the confining inner walls of the driver nozzle 206, becomes compacted outward by the continued driving to form a flared head on the upper extremity of the fastening.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a method of inserting a fastening into stock, the steps of first densely compacting an interior portion of the stock by punching an aperture into the stock without removing any material therefrom, and then deflecting the fastening progressively rearwardly from its leading end by driving the fastening against only said portion and thereby causing said leading end to enter an adjacent non-compacted portion.

2. In a method of inserting fastenings into stock having opposite surfaces, the steps of supporting the stock with one of the surfaces resting against a fixed support, densely compacting an interior portion of the stock by punching an aperture into the stock from the opposite surface thereof without penetrating to the first-mentioned surface and without removing any material from the body-portion of the stock, and inserting a fastening into the stock in such a relation to the aperture that the leading end portion of the fastening becomes deflected by the compacted portion into a noncompacted portion of the stock.

3. In a method of inserting an eyelet into stock and upsetting the leading end portion of the eyelet within the stock, the steps of densely compacting an interior portion of the stock by punching an annular aperture having a beveled bottom wall part-way into the stock without removing any material from the body-portion of the stock to compact the portion of the stock at the bottom of the aperture into a dense mass, inserting an eyelet into the aperture and driving it home thereby causing the leading end of the eyelet to become laterally deflected by the compacted portion.

4. In a method of inserting a staple into stock, the staple having legs provided with laterally bent end portions, the steps of engaging the laterally bent end portions and pushing them bodily part-way into the stock, thereby compacting portions of the stock ahead of the laterally bent portions of the partially inserted staple, engaging the bar of the staple and driving it home thereby causing the bent portions of the

staple to move in the direction in which they extend into noncompacted portions of the stock.

5. In a method of inserting staples into work pieces which consists in inserting a staple part-way into a work piece by engagement with laterally bent portions formed on the legs of the staple, and then completing the insertion of the staple into the work by engagement with the bar of the staple.

6. In a machine for inserting a staple into stock, the staple having legs provided with laterally bent end portions, means for engaging and supporting the laterally bent end portions of the staple, means for causing said end portions to enter into the stock thereby compacting portions of the stock ahead of said end portions and inserting the staple part-way, a driver engaging the bar of the staple and for driving the staple home thereby causing said end portions of the staple to move in the direction in which they extend into noncompacted portions of the stock and causing the staple legs to become progressively deflected by said compacted portions.

7. In a machine for inserting a staple into stock, the staple having legs provided with laterally bent end portions, a machine frame, a punch fixed in the machine frame and supporting the laterally bent staple portions, a support for the stock, means for moving the support heightwise with relation to the punch thereby pushing the laterally bent staple portions bodily into the stock as well as compacting portions of the stock ahead of the laterally bent staple portions and inserting the staple part-way, a reciprocating driver engaging the bar of the staple and driving it home thereby causing the bent portions of the staple to move in the direction in which they extend into noncompacted portions of the stock and causing the remainder of the staple legs to become progressively deflected in the same direction by said compacted portions.

8. In a machine for inserting a staple into stock, the staple having legs provided with laterally bent end portions, a machine frame, a punch fixed in the machine frame and supporting the laterally bent staple portions, means for adjusting the punch with relation to the machine frame, a support for the stock, means for moving the support heightwise with relation to the punch thereby pushing the laterally bent staple portions bodily into the stock as well as compacting portions of the stock ahead of the laterally bent staple portions and inserting the staple part way, a reciprocating driven engaging the bar of the staple and driving it home thereby causing the bent portions of the staple to move in the direction in which they extend into noncompacted portions of the stock and causing the remainder of the staple legs to become progressively deflected in the same direction by said compacted portions.

9. In a machine for inserting a staple into stock, the staple having legs provided with laterally bent end portions, a machine frame, a punch fixed in the machine frame and supporting the laterally bent staple portions, means for adjusting the punch with relation to the machine frame, a support for the stock, means for moving the support heightwise with relation to the punch thereby pushing the laterally bent staple portions bodily into the stock as well as compacting portions of the stock ahead of the laterally bent

staple portions and inserting the staple part-way, a reciprocating driver engaging the bar of the staple and driving it home thereby causing the bent portions of the staple to move in the direction in which they extend into noncompacted portions of the stock and causing the remainder of the staple legs to become progressively deflected in the same direction by said compacted portions, and means for adjusting the active stroke of the driver.

10. In a machine for inserting a staple into stock, the staple having legs provided with laterally bent end portions, a machine frame, a two-legged punch fixed in the machine frame and supporting the laterally bent staple portions, a support for the stock, means for moving the support heightwise with relation to the punch thereby pushing the laterally bent staple portions bodily into the stock as well as compacting portions of the stock ahead of the laterally bent staple portions and inserting the staple part-way, a reciprocating driver mounted for movement with relation to the punch and engaging the bar of the staple and driving it home thereby causing the bent portions of the staple to move in the direction in which they extend into noncompacted portions of the stock and causing the remainder of the staple legs to become progressively deflected in the same direction by said compacted portions.

11. In a method of inserting fastenings into stock, the steps of first compacting an interior portion of the stock by applying pressure through one means to the stock to form an aperture without removing any material therefrom, and then forcing said fastening against said portion by a second means thereby progressively deflecting said fastening along its length and causing the leading end to enter an adjacent non-compacted portion.

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