

April 26, 1927.

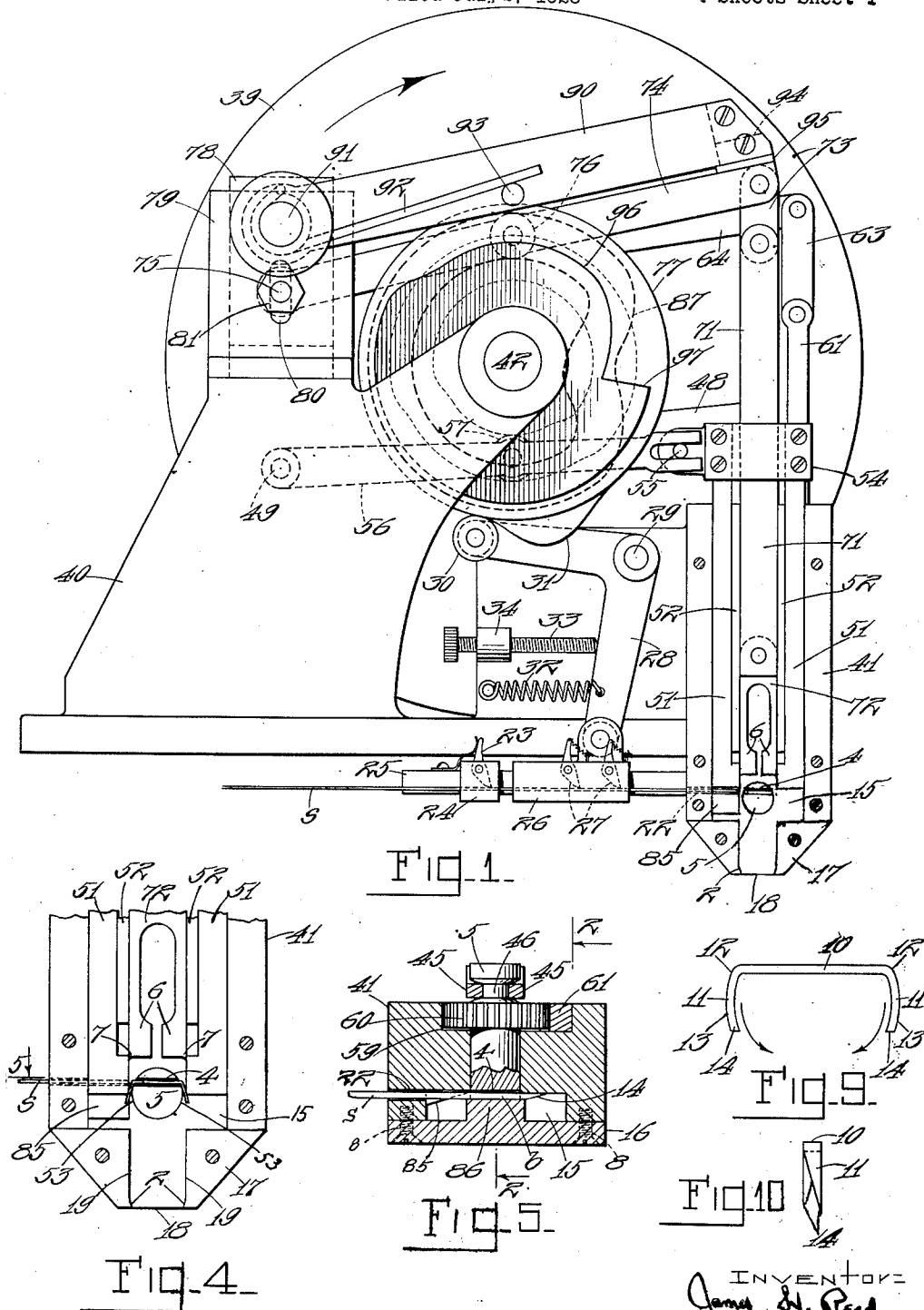
**1,625,958**

J. H. REED

## STAPLING MACHINE

Filed July 2, 1923

4 Sheets-Sheet 1



April 26, 1927.

J. H. REED

1,625,958

STAPLING MACHINE

Filed July 2, 1923

4 Sheets-Sheet 2

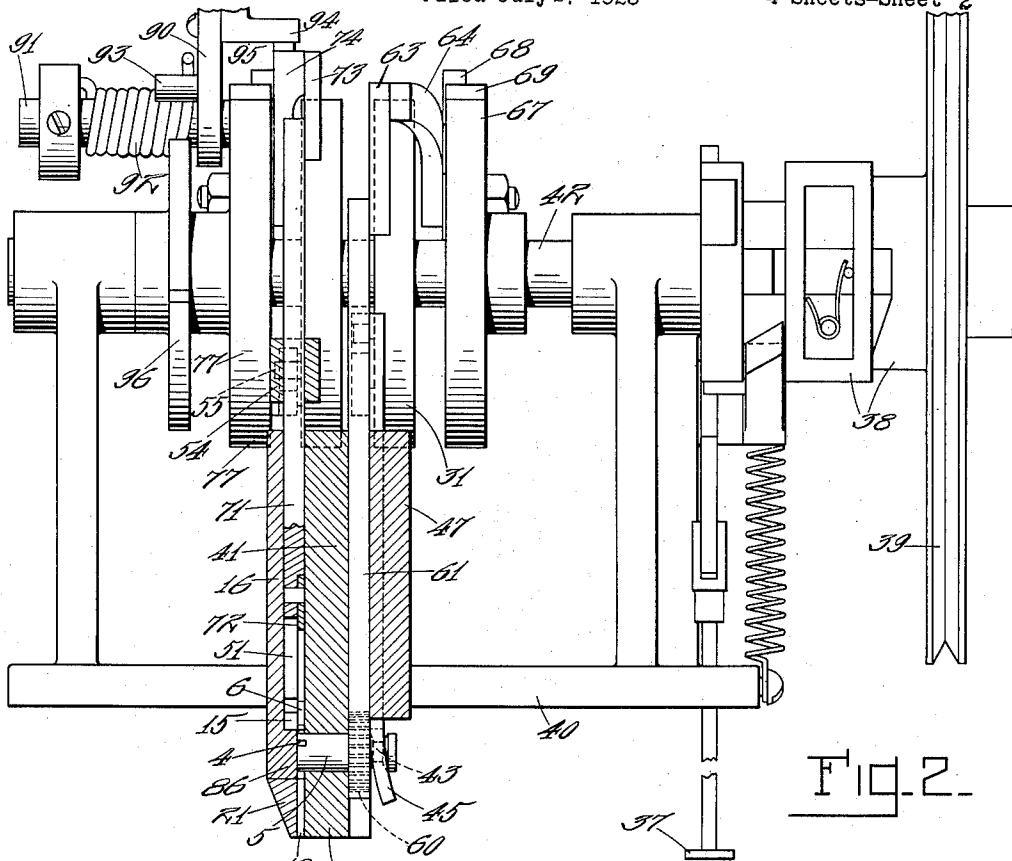


Fig. 2.

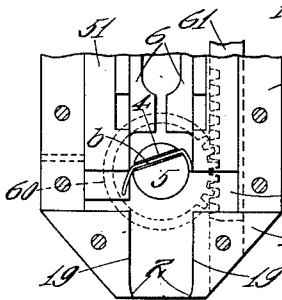


Fig. 6.

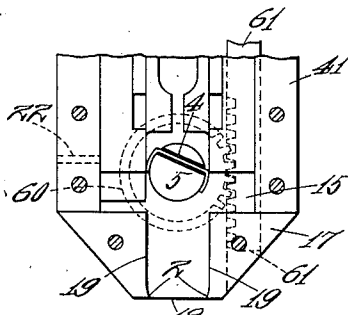


Fig. 7.

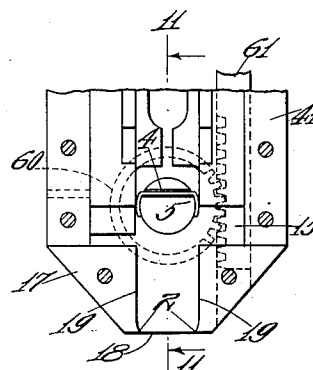


Fig. 8.

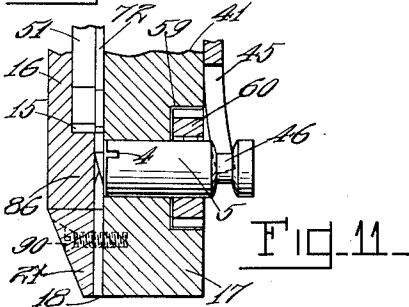


Fig. 11.

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**April 26, 1927.**

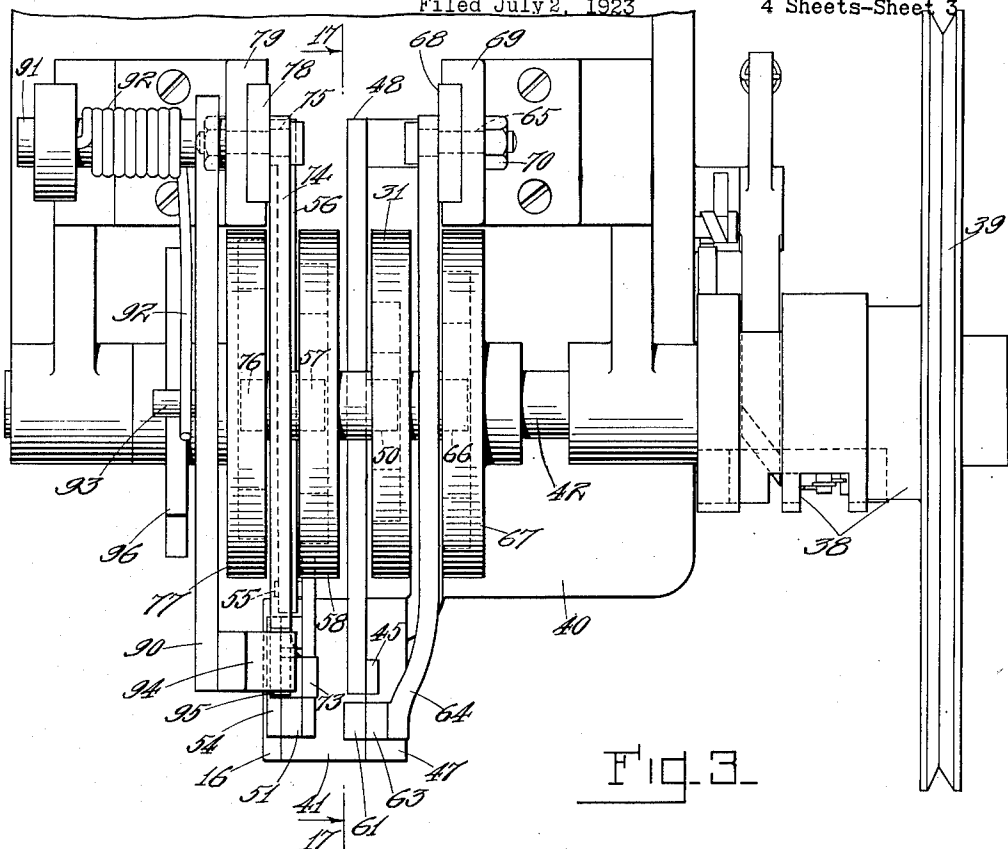
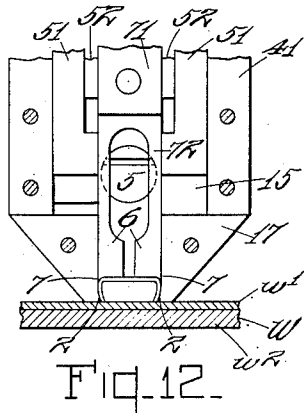
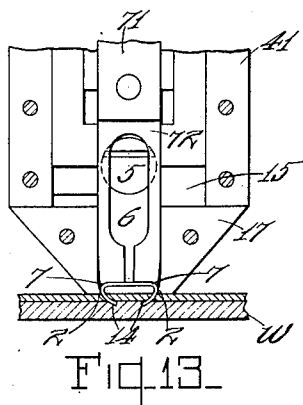
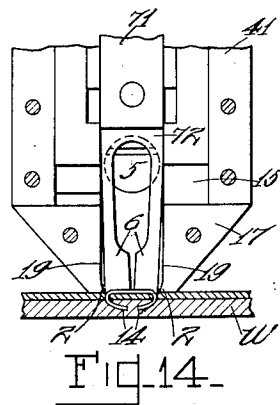
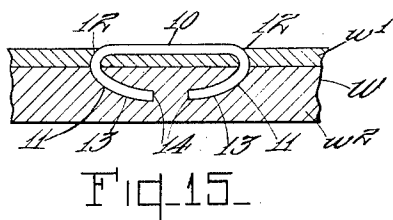
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**1,625,958**

## STAPLING MACHINE

Filed July 2, 1923

4 Sheets-Sheet 3



INVENTORY=

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**April 26, 1927.**

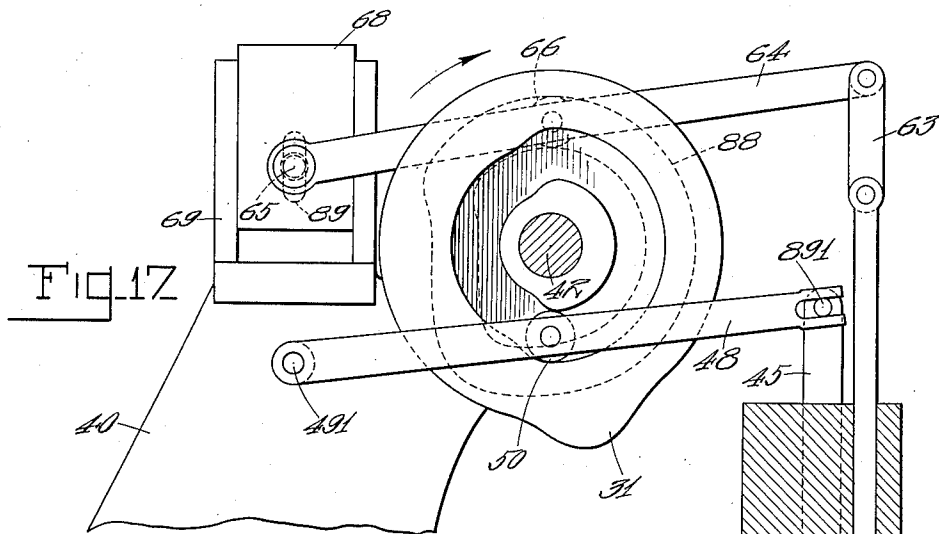
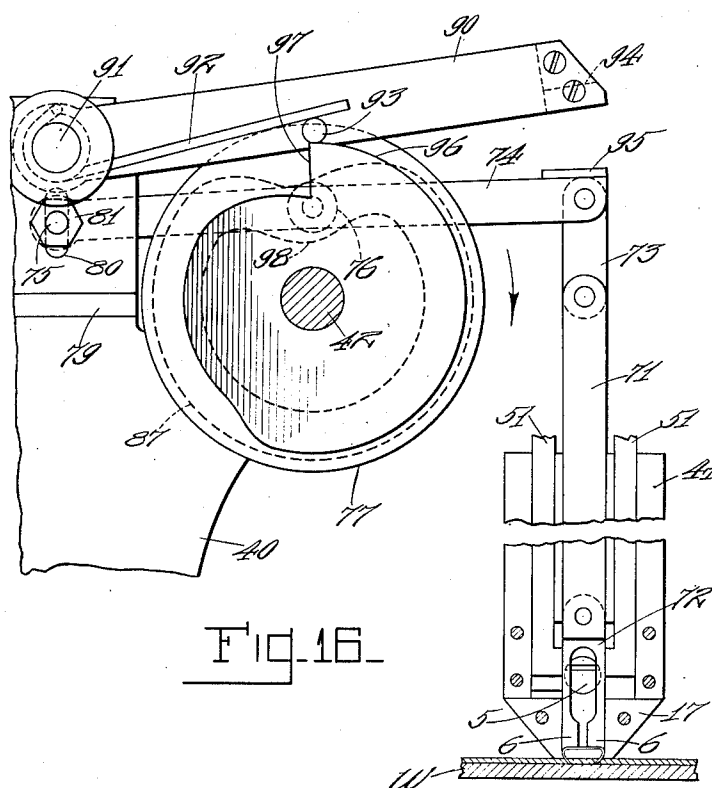
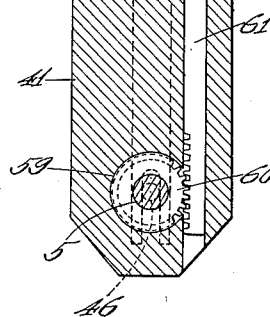
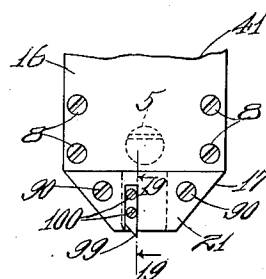
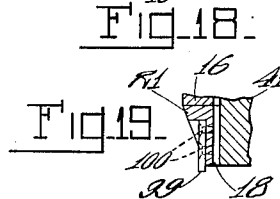
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**1,625,958**

STAPLING MACHINE

Filed July 2, 1923

4 Sheets-Sheet 4



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## UNITED STATES PATENT OFFICE.

JAMES H. REED, OF SWAMPSCOTT, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

## STAPLING MACHINE.

Application filed July 2, 1923. Serial No. 648,935.

This invention relates to machines for inserting or driving fasteners, and is herein illustrated in its application to a machine for driving staples. The invention has generally in view the provision of means for driving and anchoring fasteners without the disadvantages for some classes of work that are inherent in machines such as commonly used heretofore for the purpose. To this end the invention provides an organization having means at the same side of the work or part that receives the fastener as the driving means for operating upon the fastener to anchor or "clinch" it in the work. This is of particular advantage where the surface of the work on the opposite side from the driving means is not conveniently accessible, where the work is thicker than the length of the fastener, or where it is desired for any reason not to have the fastener penetrate, as it might, entirely through the work as, for example, in fastening uppers to insoles in the manufacture of certain types of shoes.

In the illustrative application of the invention to the driving of staples, the machine herein shown comprises means for deflecting the shanks of the staple positively in the staple driving operation by engaging different portions of the shanks successively before the different respective portions enter the work, thereby causing the shanks of the staple to enter the work in paths inclined at substantial angles to the surface of the work. For the purpose of fastening an upper to a sole or insole (hereinafter frequently termed generically the "sole") the shanks of the illustrated staple are thus deflected in such degree as to anchor them within the body of the sole without penetrating entirely through the sole. In the construction shown the shanks are deflected toward each other by the action of opposite converging walls of a staple-guiding throat.

Further to assist in anchoring the staples in the desired manner, the invention provides staple driving means constructed to engage portions of the shanks of the staple adjacent to the head and to force them toward each other in the staple driving operation. It is advantageous for the purposes in view to utilize staples having shanks that are curved so that portions adjacent to the head diverge from each other away from the head while their ends are inclined inwardly to-

ward each other. The driving means thus engages the diverging portions of the shanks and bends them toward each other, thereby compressing the staple as a whole while cooperating with the deflecting means above referred to in forcing the shanks into the work in inclined paths.

The above and other features of the invention, including also novel means for forming staples and novel means for driving them by a hammer blow, will now be more particularly described by reference to the accompanying drawings and pointed out in the claims.

In said drawings:

Fig. 1 is a side elevation of the machine with the cover plates removed from the head and throat, the parts being shown in the positions occupied thereby at the beginning of the cycle of operations.

Fig. 2 is a front elevation, with the head shown in section substantially on the line 2—2, Fig. 5.

Fig. 3 is a plan view.

Fig. 4 is an enlarged side elevation of the lower part of the head with the cover plates removed, the parts being shown in the positions assumed thereby after a blank has been severed from the stock and partly formed into a staple.

Fig. 5 is a horizontal section taken substantially on the line 5—5, Fig. 4, showing the parts before the descent of the formers.

Figs. 6, 7 and 8 are views similar to Fig. 4, showing the parts in the positions assumed thereby in successively later stages of the formation of the staple.

Figs. 9 and 10 are enlarged detail views, taken at right angles to each other, of one of the staples formed by the machine prior to the driving thereof.

Fig. 11 is a section, taken substantially on the line 11—11, Fig. 8, showing the anvil retracted and the staple about to be driven.

Figs. 12, 13 and 14 are views, similar to Figures 4, 6, 7 and 8, illustrating the staple driving operation.

Fig. 15 is a view similar to Fig. 9, showing a staple clinched in the work, the latter being shown in section.

Fig. 16 is a simplified view of the mechanism shown in Fig. 1 for operating the driver, the parts being shown in a different position.

Fig. 17 is a simplified sectional view, taken substantially on the line 17—17, Fig. 3, of the mechanism for operating the forming anvil.

Fig. 18 is a side elevation of a modified form of throat.

Fig. 19 is a section on the line 19—19, Fig. 18.

In accordance with the preferred form of the invention, the machine as a whole comprises mechanism for forming staples from a continuous strip of stock and mechanism for driving the staples so formed into the work and clinching the same within the body of said work without completely penetrating the latter.

The machine as herein shown is adapted to form and drive staples of the type disclosed and claimed in Letters Patent No. 1,512,040 granted upon my application on Oct. 21, 1924. As shown most clearly in Figures 9 and 10 of the accompanying drawings, a staple of this type comprises a substantially straight head or top 10 terminating at each end in a curved shank 11. The shanks 11 are concave toward each other, and comprise portions 12 adjacent the head which diverge from each other and portions 13 which converge toward their pointed ends 14, the arrangement being such that the maximum width of the staple, measured across the shanks 11 at points between the portions 12 and 13, is greater than the width of the head 10 or the distance between the pointed ends 14, while said pointed ends are directed slightly toward each other.

In the construction shown, the machine comprises a frame 40 supporting at its forward end a vertically disposed head 41 and provided with suitable bearings for a driving shaft 42 adapted to receive power from any suitable source through a belt pulley 39 adapted to be operatively connected with said shaft by means of a suitable clutch mechanism generally indicated at 38 and controlled by a suitable pedal 37. The head 41 is formed at one side with a vertical channel 15 forming a chamber within which operate the staple forming and driving devices hereinafter more fully described, and which is normally closed by a cover plate 16 suitably secured to said head as by screws 8 (Figure 5). At its lower end said head terminates in a driving throat 17 having an open lower end 18 of a width substantially equal to the width of the head 10 of a staple, and consequently less than the maximum width of the staple measured across the shanks, and adjacent said opening said throat is formed with oppositely disposed walls comprising curved, concave portions 2 which converge toward said open end and which preferably substantially conform in shape to the shape of the portions 13 of the staple shanks 11, said curved, concave por-

tions 2 merging into straight parallel portions 19 spaced substantially to correspond to the maximum width of the staple and adapted to guide the same into driving position. The throat 17 is closed at one side by a cover plate 21 suitably secured thereto, as by screws 90 (Fig. 11).

The stock from which the staples driven by the machine are formed comprises a wire or, preferably, a flat metallic strip *s* which is drawn from a suitable coil or other source of supply (not shown), and periodically fed, through an opening 22 in the side of the head 41, into the chamber 15 where blanks are severed therefrom and formed into staples which are subsequently driven through the throat 17. Said strip is held against retrograde movement by a spring pressed dog 23 carried by a block or collar 24 secured to a preferably square rod 25 projecting laterally from the head 41, and is periodically advanced by a slide 26 guided on said rod and provided with one or more spring pressed dogs 27 engaging said strip, which passes through said collar and slide. The slide 26 is reciprocated on the rod 25 by means of a bell crank lever 28 pivoted at 29 to the frame 40 and carrying a roller 30 which cooperates with a cam 31 on the shaft 42. The roller 30 is yieldingly pressed toward the edge of the cam 31 by a spring 32 connecting the lever 28 with the frame 40, the movement of said lever under the influence of said spring being limited by an adjustable abutment screw 33 in threaded engagement with a lug 34 on said frame.

The end of the strip *s*, as it is fed into the chamber 15, is passed into and through a slot or groove 4 formed in the end of a preferably cylindrical mandrel or anvil 5 disposed with its axis transverse to said chamber, said slot or groove being located above said axis. The bottom of the slot 4 provides a substantially straight or flat surface for forming the heads of the staples, at the opposite ends of which head forming surface are cylindrical shank forming surfaces 53 which, following the circular outline of the anvil, diverge adjacent said head forming portion and thereafter converge, corresponding in form to the desired form of the shanks 11 of the staples.

The anvil 5 is mounted to turn on its axis and to slide longitudinally in the head 41 and projects from the rear face thereof, or that opposite the chamber 15. Said anvil is moved longitudinally to project the slotted end thereof into the chamber 15, as shown in Figs. 2 and 5, or to retract the same therefrom, as shown in Fig. 11, by means of a cam slide 45 having a forked end which engages an annular groove 46 formed in said anvil adjacent the rear end thereof. The slide 45 is guided between the head 41 and a plate 47 secured thereto, and is provided

at its upper end with a stud 891 (Figure 17) which is engaged by the bifurcated end of a lever 48 fulcrumed on a stud 491 projecting from the frame 40, said lever carrying a cam roll 50 which is received in a cam groove in the face of the cam 31.

Disposed at opposite sides respectively of the anvil 5 is a pair of forming members 51 which are guided for vertical movement between the side walls of the chamber 15 and vertical ribs 52 extending into said chamber and secured to or formed integral with the head 41. The inner faces of the lower ends of the forming members 51 move in planes which are approximately tangential to the anvil 5, being spaced therefrom by a distance substantially equal to the thickness of the stock *s*. The forming members 51 are secured at their upper ends to a cross-head 54 having a stud 55 which is engaged by the bifurcated end of a lever 56 fulcrumed on a stud 49 similar to the stud 491 and carrying intermediate its ends a cam roller 57 which cooperates with a groove in a cam 58 on the shaft 42, whereby said forming members are reciprocated vertically in their guides in the head 41.

Within the chamber 15 adjacent the opening 22 is a fixed cutter 85 over which the strip *s* is fed into said chamber. The lower end of the adjacent forming member 51 constitutes a movable cutter which cooperates with the fixed cutter 85 to sever from the strip *s* a staple blank *b* (Figure 5). The cooperating cutting edges of said fixed and movable cutters are preferably disposed at an inclination to the length of the strip so as to cut a blank with pointed ends which constitute the points 14 of the completed staple.

Splined to the anvil 5, and received in a recess 59 in the head 41, is a pinion 60 which cooperates with a rack bar 61 guided for vertical movement in a groove in said head, whereby said anvil may be oscillated upon its axis. The upper end of the rack bar 61 is connected by a link 63 with the free end of a lever 64 (Figs. 1 and 17) fulcrumed at its opposite end on a stud 65 and carrying intermediate its ends a cam roller 66 which is received in a groove 88 in a cam 67 on the shaft 42. In order to permit an accurate adjustment of the parts, the stud 65 is preferably carried by a slide 68 which is vertically adjustable in a bracket 69 secured to the frame 40, said bracket having a vertical slot 89 to receive the stud 65 which, together with the slide 68, is clamped in adjusted position by means of a nut 70 thereon.

The operation of forming the staples is illustrated in Figures 4 to 8 when viewed in connection with Figures 1 and 2. As the slide 26 moves forwardly or toward the right from the position shown in Figure 1, the end of the strip *s* is fed across the cham-

ber 15 and through the slot 4 in the anvil 5. The forming members 51 then descend, the end of that shown at the left in Figures 1, 4 and 5, cooperating with the fixed cutter 85 to sever a blank *b* from the strip. As said forming members continue to descend, the ends of said blank are bent downwardly about the anvil, as shown in Figure 4. The rack bar 61 thereupon rises from its normal or intermediate position shown in Figures 1 and 8, causing the anvil 5 to be turned in a counter-clockwise direction, as shown in Figure 6. The blank *b*, being held by the slot 4, is caused to turn with the anvil, so that the end of said blank shown at the right in Figure 6 is wiped against the adjacent forming member 51 and thereby bent about the adjacent shank forming surface 53 of said anvil, causing the same to conform in shape to the latter. The rack bar 61 then descends to a point below its normal or intermediate position, causing the anvil to be oscillated in the opposite direction and the staple shank at the left to be similarly shaped, as shown in Figure 7. Thereafter the rack bar 61 returns to its normal or intermediate position, restoring the anvil to the position shown in Figure 8, and completing the staple forming operation.

The slide 45 then rises, causing the end of the anvil 5 to be retracted from the chamber 15, leaving the completed staple held by friction between the inner wall of said chamber and a projection 86 formed on the cover plate 16 and spaced from said inner wall a distance substantially equal to the width of the head of said staple.

The staples formed as above described are driven into the work *W*, shown in Figures 12 to 15 as comprising two superimposed layers of leather  $w^1$  and  $w^2$ , by the mechanism hereinafter described and in accordance with the method disclosed and claimed in another application, filed February 2, 1923, Serial No. 616,621. Said mechanism as herein shown comprises a plunger 71 located in the chamber 15 between the forming members 51, guided between the ribs 52, and having secured to its lower end a driver 72. The plunger 71 extends through the cross-head 54 and is connected at its upper end by a link 73 to the free end of a lever 74 pivoted at its opposite end to a stud 75 and carrying intermediate its ends a cam roller 76 working in a groove 87 in a cam 77 on the shaft 42 (see particularly Fig. 16). The stud 75 is preferably carried by a slide 78 (Figs. 1 and 3) vertically adjustable in a bracket 79 on the frame 40, said stud extending through a slot 80 in said bracket and being, together with the slide 78, clamped in adjusted position by means of a nut 81 thereon in the same manner as the stud 65 and slide 68. The driver 72 comprises two driving members 6 which are laterally movable

toward and from each other. To this end the driver 72 is preferably composed of resilient material and is slit to form the members 6 which may therefore be forced toward each other by lateral pressure applied thereto, but which will automatically resume their initial relative positions when said pressure is removed. Said driving members are so shaped at their lower ends as substantially to fit respectively the opposite end portions of a staple head 10 and the adjacent portions 12 of the staple shanks, said driving members having projections 7 which engage said shank portions 12 laterally for a short distance.

Cooperating with the plunger 71, to cause the driver 72 to strike a percussive or hammer blow upon the staple, is a lever 90 fulcrumed on a stud 91 projecting laterally from the bracket 79 and acted upon by a torsion spring 92 surrounding said stud and engaging at its end a stud 93 projecting laterally from said lever. The lever 90 is provided at its free end with a laterally offset head 94 (see Figures 2 and 3) which constitutes a hammer and overlies an impact plate 95 secured to the top of the free end of the lever 74. The stud 93 cooperates with a cam 96 on the shaft 42, said cam acting through said stud to lift the lever 90 and having an abrupt shoulder 97 which, when said cam is turned in a clockwise direction from the position shown in Figure 16, suddenly releases the stud 93, permitting the spring 92 to cause the hammer head 94 of the lever 90 to strike a sharp blow upon the plate 95. The arrangement is such that when the plunger 71 and driver 72, acting under the influence of the cam 77, have descended to a sufficient extent to cause the points of the staple to enter the work, as shown in Figure 16, the further movement of said plunger and driver to complete the driving operation takes place under the influence of the blow struck by the lever 90, the cam path 87 being suitably enlarged, as shown at 98, to permit the necessary movement of the cam roller 76 at this time.

The driving operation is illustrated in Figures 12 to 14. As the driver 72 descends from the position shown in Figures 8 and 11, the staple held between the walls of the chamber 15 is disengaged therefrom and carried by said driver down into the throat 17, as shown in Figure 12, the anvil 5 having previously been moved out of the path of movement of said driver by the cam slide 45, as above explained. As the driving members descend further, the pointed ends 14 of the staple are caused to enter the work, as shown in Figure 16, being however simultaneously deflected laterally toward each other by the curved converging portions 2 of said throat. As the operation continues, as illustrated in Figure 13, caus-

ing the portions 13 of the shanks 11 beyond the ends 14 to be forced into the work, said shanks will also be progressively deflected inwardly toward each other as they enter the work. The arrangement is such as to cause the pointed ends 14 and the adjacent portions of the shanks to pass into the work along or parallel to the curved lines generally indicated by the arrows in Figure 9, the portions 12 of the shanks adjacent the head 10 being gradually bent to form smaller angles with the head as this movement continues. The desired movement and bending of the shanks on the curved lines indicated is insured, and buckling of said shanks is prevented, by the portions 7 of the driving members 6, which portions engage the curved portions of the walls of the throat so as to give said driving members a progressive movement in a lateral direction toward each other and thus contract the driver as a whole. This operation causes the staple to be compressed laterally, the shanks 11 being forced toward each other, so as to enable the staple to pass through the contracted open end 18 of the throat, and supplies a progressively increased lateral component to the driving force which is thereby applied to the shanks in directions substantially parallel to the directions of movement of the pointed ends 14 during their penetration of the work. As the driver reaches the lower or forward limit of its movement, as shown in Figure 14, the head 10 of the staple passes through the open end of the throat, the portions 13 of the shanks 11 thereof having been brought into positions substantially parallel with the head 10, being therefore clinched in the work although spaced from the side thereof opposite that from which the staple was driven, and the portions 12 of said shanks having been brought into positions of substantial parallelism substantially perpendicular to the head 10, as shown in Figure 15. The latter part of the driving operation, after the staple points have entered the work, takes place under the impact of the lever 90, causing the final driving of the staple to be accomplished percussively, it being found in practice that the clinching action described is most satisfactorily accomplished in this manner.

It will therefore be seen that, by the use of a machine embodying the invention, a staple may be driven part way only through the work but nevertheless be securely clinched within the latter by means of a clinching member (namely, the portions 2 of the throat 17) located on the same side of the work as the driver. The necessity of a clinching anvil at the opposite side of the work from the driver is therefore obviated, and said last named side of the work left unmarred by the anvil and unbroken

by the points of the staples which are thoroughly sheathed within the body of the material so as to be incapable of working out and doing damage. It will also be seen that the machine described is further capable of advantageous use in connection with work of greater thickness than the length of the staple shanks, or with work whose side opposite that from which the staples are driven is inaccessible, so as to prevent the clinching of the shanks by ordinary means, said shanks being securely clinched within the body of the work by engaging them at the side thereof from which they are driven.

The machine, while capable of many other uses, is particularly well adapted for the purpose of stapling shoes of the type shown and described in Letters Patent No. 1,512,041, granted upon my application on Oct. 21, 1924, in which the upper, after lasting, is secured to the insole by staples of the character above described, said staples being preferably disposed transversely of the edge of the upper and crossing the same. When the machine is used for this purpose, the throat 17 is preferably provided with a point projecting below the open lower end 18 thereof, which point, after the removal of the lasting tacks or other temporary fasteners, if such be employed, may be engaged with the upper adjacent the edge thereof to draw the same tightly over the insole when the staples are driven, thereby insuring the driving of said staples in the proper positions and the tight fitting of the upper to the last. Such a point is shown at 99 in Figs. 18 and 19, said point being received in a recess in the cover plate 21 at one side of the opening in the throat and being secured in place in said recess by screws 100.

Having thus described my invention, I claim:

1. A machine for driving fasteners having a driver and a clinching member located at the same side of the work.

2. In a machine for driving fasteners, in combination, means for deflecting the point and shank of a fastener as it is driven, a driver having a portion adapted to engage said shank laterally, and mechanism for operating said driver to drive said fastener and for simultaneously forcing said shank in a lateral direction.

3. In a stapling machine, the combination with means for driving staples and simultaneously forcing the shanks thereof toward each other, of means for deflecting the ends of said shanks toward each other as they enter the work.

4. In a stapling machine, a driving throat having an open end and interior walls which converge toward said open end, in combination with a driver adapted to compress

the staples laterally as they are driven by bending their shanks relatively to their heads.

5. In a stapling machine, the combination with a laterally expansible and contractible driver having means to engage the shanks of the staples adjacent the heads thereof, of mechanism for operating said driver to drive said staples and for simultaneously contracting the same to force said shanks toward each other.

6. In a stapling machine, in combination, a driving throat having interior walls which converge toward the work, a laterally expansible and contractible driver having means to engage the shanks of the staples adjacent the heads thereof, and mechanism for operating said driver to drive said staples through said throat, said machine having provision for contracting said driver as the staples are driven.

7. In a stapling machine, in combination, a plunger, means for reciprocating the same, a pair of driving members laterally movable on said plunger and each having a face shaped to engage a portion of the head of a staple and a portion of the adjacent shank, and a throat through which the staples are driven by said driving members, said throat having adjacent the work inwardly curved walls to deflect the points of the staples toward each other as they are driven, said walls being engaged by said driving members to force the latter toward each other when said plunger is moved in the direction to drive the staple.

8. In a stapling machine, the combination with means for forming staples having converging shanks, of means for driving said staples, and means located at the same side of the work as said driving means for deflecting said shanks toward each other as they are driven.

9. A stapling machine comprising means for forming staples having heads and shanks which diverge adjacent said heads and converge toward their ends, means for driving said staples, and means for guiding said staples as they are driven, said machine having provision for forcing the shanks of a staple toward each other as said staple is driven.

10. In a stapling machine, the combination with means for forming staples having heads and shanks which diverge adjacent said heads and converge toward their ends, of means for engaging the head of a staple and the portions of the shanks adjacent thereto for driving said staple and simultaneously forcing said shanks toward each other, and means adjacent the work at the same side thereof as said driving means for deflecting said shanks toward each other as they are driven.

11. In a stapling machine, the combination with means for forming staples having

converging shanks, of a throat having converging interior walls, and a driver for driving said staples through said throat.

12. In a stapling machine, the combination with means for forming staples having heads and shanks which diverge adjacent said heads and converge toward their ends, of a throat having an open end of a width substantially equal to the width of the heads of the staples and interior walls which converge toward said open end, and means for driving said staples through said throat.

13. In a stapling machine, the combination with means for forming staples having heads and shanks which diverge adjacent said heads and converge toward their ends, of a throat having an open end of a width substantially equal to the width of the heads of the staples and interior walls which converge toward said open end, a driver in said throat, said driver having portions to engage the heads of said staples and portions to engage the shanks thereof adjacent the heads, and means for reciprocating said driver to drive said staples through said throat, the shank engaging portions of said driver being movable toward each other in response to engagement with the converging walls of the throat as each staple is driven.

14. In a stapling machine, the combination with means for forming staples having heads and curved shanks which are concaved toward each other, diverge adjacent said heads, and converge at their ends, of a throat having an open end of a width substantially equal to the width of the heads of the staples and oppositely disposed interior walls adjacent said open end curved substantially to correspond to the curvature of the converging ends of the staple shanks, and a driver for driving the staples through said throat.

15. In a stapling machine, the combination with means for forming staples having heads and curved shanks which are concaved toward each other, diverge adjacent said heads, and converge at their ends, of a throat having an open end of a width substantially equal to the width of the heads of the staples and oppositely disposed interior walls adjacent said open end curved substantially to correspond to the curvature of the converging ends of the staple shanks, a driver operating in said throat and comprising two relatively movable driving members respectively engaging said opposite walls of the throat and shaped respectively to engage opposite end portions of the staple heads and adjacent portions of the staple shanks, and means for reciprocating said driver.

16. In a stapling machine, in combination, staple stock feeding means, staple forming mechanism including an anvil having forming surfaces shaped to form a staple whose

shanks converge toward their free ends and means cooperating with said anvil to sever a blank from the staple stock and bend the same about said anvil, and staple driving mechanism including means for deflecting the ends of the staple shanks toward each other as the staple is driven.

17. Staple forming mechanism comprising an anvil having a substantially flat surface to form the head of the staple and converging shank forming surfaces, and means cooperating with said anvil to bend the ends of a staple blank about said shank forming surfaces to form shanks which are concave on their inner sides.

18. Staple forming mechanism comprising an anvil having a substantially flat surface to form the head of the staple and shank forming surfaces which diverge adjacent said head forming surface and converge at points removed therefrom, and means cooperating with said anvil to bend the ends of a staple blank about said shank forming surfaces.

19. Staple forming mechanism comprising a substantially cylindrical anvil having in its end a transverse slot disposed at one side of the axis of said anvil and adapted to receive a staple blank, and means cooperating with said anvil to curve the end of said blank about the cylindrical surfaces thereof.

20. Staple forming mechanism comprising an oscillating anvil provided with means for holding a staple blank, and members disposed at opposite sides of said anvil against which the ends of said blank are wiped as said anvil is oscillated to bend the same thereabout.

21. Staple forming mechanism comprising a substantially cylindrical anvil, means for oscillating said anvil upon its axis, said anvil having in one end a transverse slot disposed at one side of said axis and adapted to receive a staple blank, and members disposed substantially tangential to said anvil at opposite sides thereof and against which the ends of said blank are wiped as said anvil is oscillated to bend the same thereabout.

22. Staple forming mechanism comprising an anvil having a substantially flat surface to receive a staple blank and form the head of the staple and curved, substantially coaxial shank forming surfaces at opposite sides thereof, means for oscillating said anvil upon the axis of said surfaces, and members disposed substantially tangential to said surfaces respectively against which the ends of said blank are wiped as said anvil is oscillated to bend the same about said surfaces.

23. In a stapling machine, in combination, an anvil having a substantially flat surface to receive a staple blank and form the head of a staple, said anvil having also shank

forming surfaces at opposite ends of said head forming surfaces and converging away therefrom, means for oscillating said anvil, bending members disposed at opposite sides of said anvil against which the ends of said blank are wiped as said anvil is oscillated to bend the same against said surfaces, and staple driving means including a driver and having provision for deflecting the ends of the staple shanks toward each other as the staple is driven.

24. In a stapling machine, in combination, an anvil having a substantially flat surface to receive a staple blank and form the head of a staple, said anvil having also shank forming surfaces at opposite ends of said head forming surface and converging away therefrom, means for oscillating said anvil, bending members disposed at opposite sides of said anvil against which the ends of said blank are wiped as said anvil is oscillated to bend the same against said surfaces, staple driving means including a driver operating between said bending members, said driving means having provision for deflecting the ends of the staple shanks toward each other as the staple is driven, and means for moving said anvil laterally into and out of operative position.

25. Staple forming mechanism comprising an anvil provided with means for holding a staple blank with its ends projecting therefrom, a pair of parallel bending members movable transversely of said anvil at opposite sides thereof to bend said ends, and means for oscillating said anvil between said members.

26. Staple forming mechanism comprising, in combination, an anvil, means for feeding a strip of staple stock across said anvil, a fixed cutter, a pair of parallel bending members movable transversely of said anvil at opposite sides thereof, one of said members having a movable cutter cooperating with said fixed cutter to sever a staple blank from said strip, and means for oscillating said anvil between said members.

27. In a stapling machine, in combination, a substantially cylindrical anvil having in one end a transverse slot disposed at one side of its axis, means for feeding the end of a strip of staple stock into said slot, a fixed cutter, a pair of parallel bending members movable transversely of said anvil at opposite sides thereof, one of said members having a movable cutter cooperating with said fixed cutter, means for oscillating said anvil upon its axis between said members, staple driving means including a driver operating between said bending members, said driving means having provision for deflecting the ends of the shanks of a staple toward each other as said staple is driven, and means for moving said anvil in an axial direction into and out of operative position.

28. In a stapling machine, the combination with a driver and a clinching member located at the same side of the work, of percussive means comprising members one of which is arranged to strike another for causing said driver to deliver a hammer blow upon the staple.

29. In a stapling machine, in combination, a driver, means for reciprocating said driver to cause the staple points to enter the work, means for deflecting said points toward each other and for progressively bending the staple shanks toward each other as the staple is driven, and means for striking a percussive blow on said driver during the latter part of the driving operation.

30. In a fastener driving machine, in combination, a driver, means for moving said driver to cause a fastener to enter the work, and means for thereafter delivering a hammer blow on said driver.

31. In a fastener inserting machine, in combination, a plunger, a driver carried thereby, a cam for reciprocating said plunger, a spring impelled hammer for imparting a percussive blow to said plunger, and a cam for lifting and releasing said hammer, said first-named cam being constructed and arranged to permit said plunger to move under the impulse of said hammer.

32. A stapling machine having a throat through which the staples are driven, said throat having projecting beyond its end at one side of the opening therein a point to engage the upper of a shoe and by which said upper may be drawn inward tightly over the bottom of the insole as the staples are driven.

33. In a stapling machine, the combination with staple driving mechanism comprising a driver and a clinching member located at the same side of the work, of means associated with said driving mechanism for engaging the upper of a shoe and by which said upper may be drawn tightly over the insole of said shoe as the staples are driven.

34. In a machine of the character described, the combination with means for engaging the upper of a shoe and by which said upper may be drawn tightly over the bottom of an insole, of means for driving fasteners through said upper and into the bottom of said insole and for clinching the same within the body of said insole between the surfaces thereof.

35. In a machine for fastening a shoe upper to a sole, the combination with means for driving a fastener through the upper and the adjacent face of the sole, of deflecting means arranged to act on different portions of the fastener successively while it is being driven into the work, before the different respective portions enter the work, to deflect them relatively to the line of drive.

36. In a machine for fastening a shoe upper to a sole, the combination with means for driving a staple through the upper and into the sole in a direction transverse to the plane of the sole, of means for engaging different portions of the shanks of the staple successively in the staple driving operation before the different respective portions enter the work to deflect the shanks positively in such degree as to anchor them in the sole without penetrating entirely through the thickness of the sole.

37. In a machine for driving fasteners, the combination with driving means, of deflecting means for bending the fastener as it is driven to anchor it in the work, said deflecting means being located entirely on that side of the work from which the fastener is driven and arranged to act substantially throughout the driving operation to bend portions of the fastener before they enter the work.

38. A machine of the class described having, in combination, staple driving means, and a staple guiding throat having opposite converging walls arranged to deflect the shanks of the staple toward each other relatively to the head substantially throughout the staple driving operation to cause said shanks to enter the work in predetermined

paths inclined at substantial angles to the surface of the work to anchor the staple in the work.

39. A machine of the class described having, in combination, means for forming a staple with shanks that diverge from each other adjacent to the head of the staple and converge at their ends, means for driving the staple thus formed comprising a driver having oppositely disposed members constructed to engage the diverging portions of the staple shanks, said members being relatively movable to bend the diverging portions of the shanks toward each other in the staple driving operation, and means for engaging the converging portions of the staple shanks to deflect them toward each other as they enter the work.

40. In a machine of the class described, staple forming means comprising an anvil of generally cylindrical contour having a substantially straight surface at one side of its axis for forming the head of the staple, and means for bending portions of the staple material about the curved sides of the anvil toward the other side of its axis to form staple shanks which are concave on their inner sides.

In testimony whereof I affix my signature.  
JAMES H. REED.