F. L. MACKENZIE.

MACHINE FOR INSERTING FASTENINGS.

APPLICATION FILED DEC. 15, 1916. RENEWED JUNE 23, 1921.

1,410,694.

Patented Mar. 28, 1922.

4 SHEETS—SHEET 1.

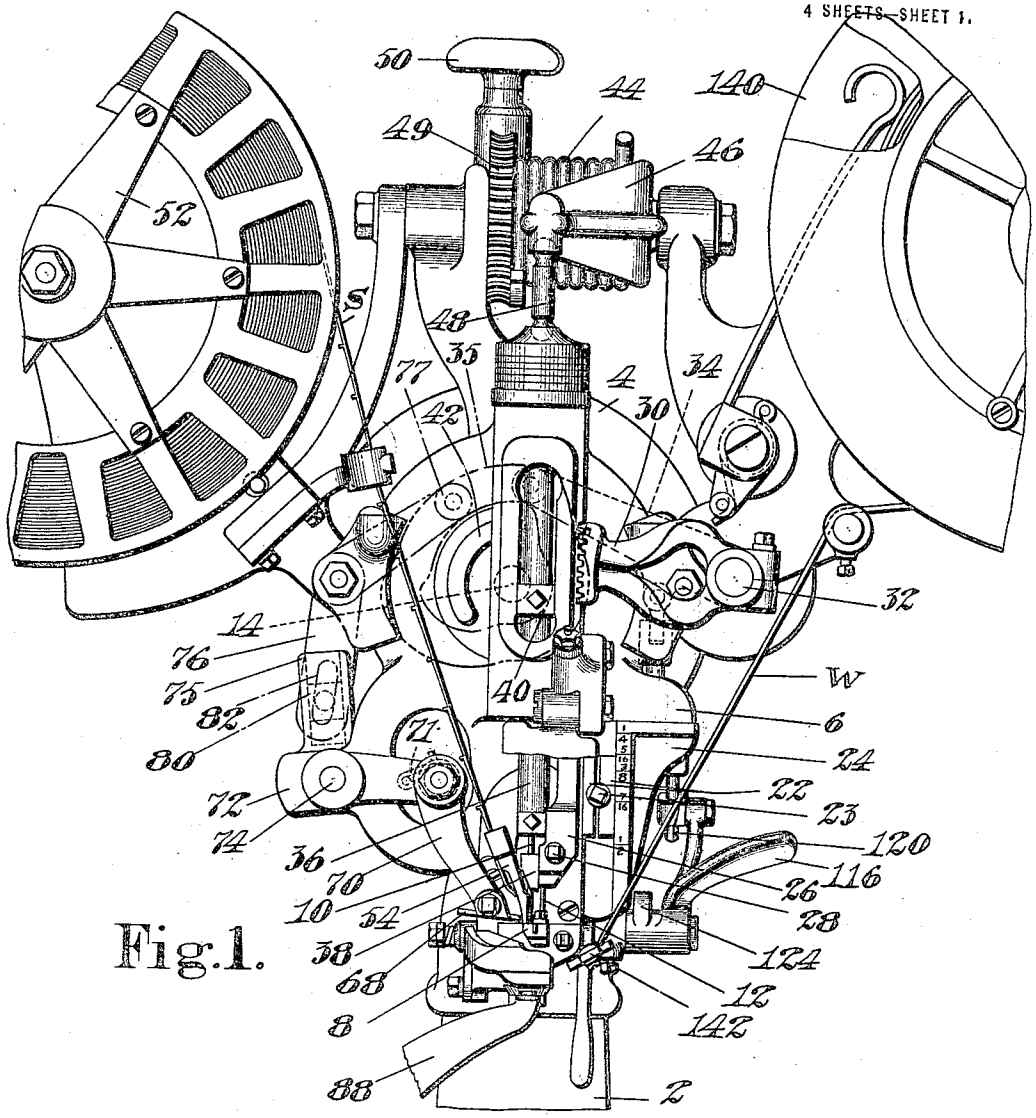


Fig. 1.

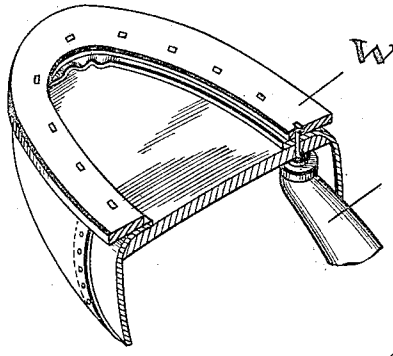


Fig. 2.

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4 SHEETS—SHEET 2.

Fig. 3.

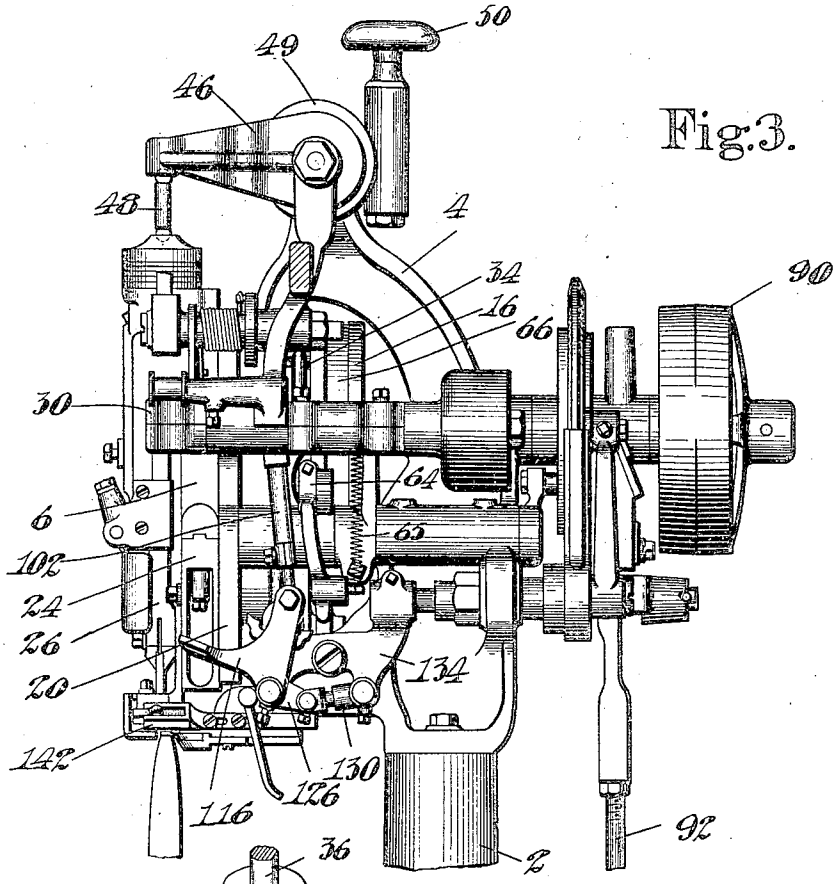
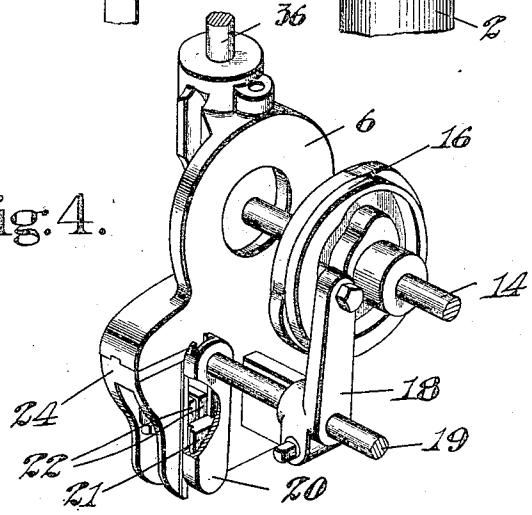


Fig. 4.



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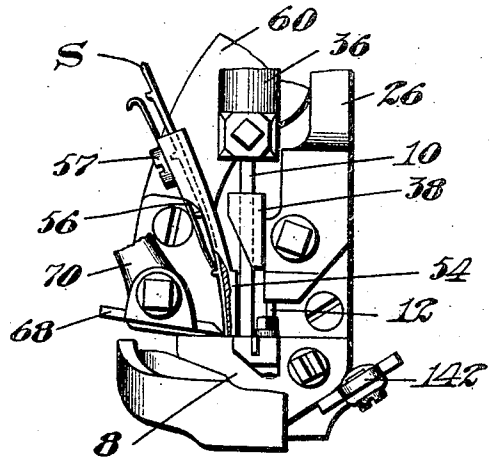


Fig. 5.

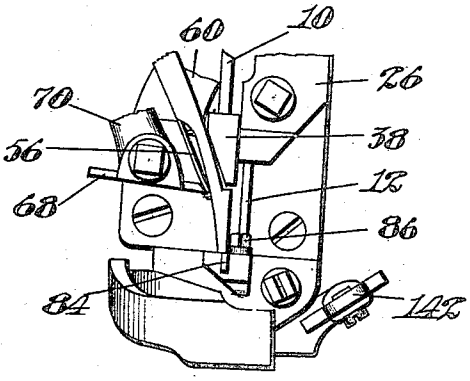


Fig. 6.

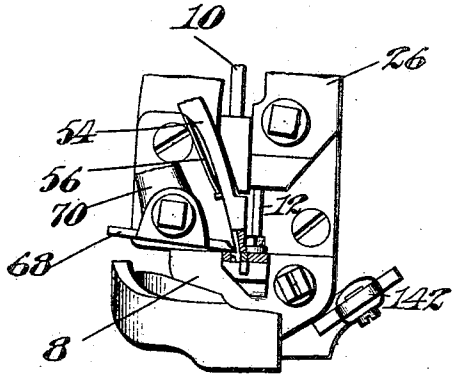


Fig. 7.

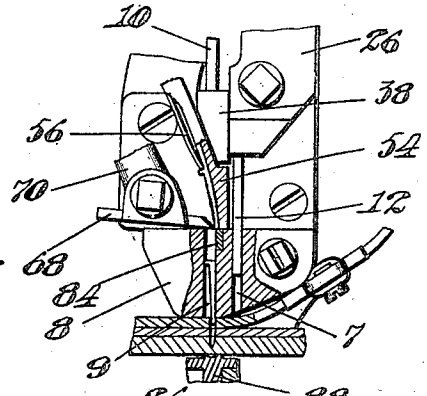


Fig. 8.

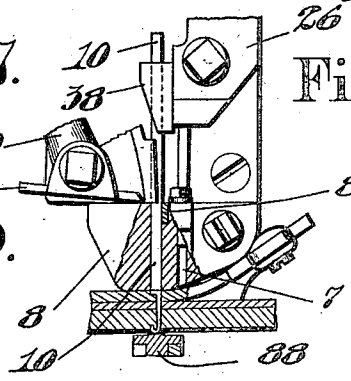


Fig. 9.

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4 SHEETS—SHEET 4.

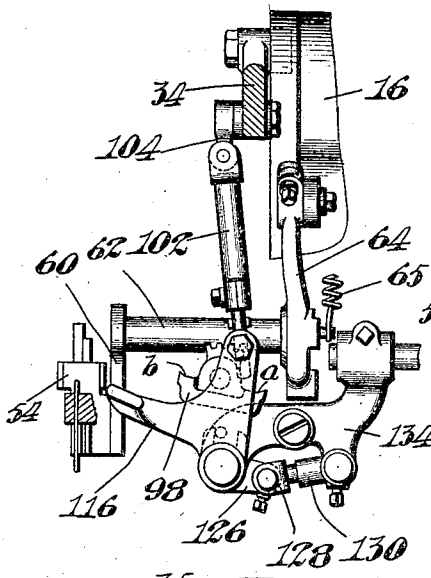


Fig. 10.

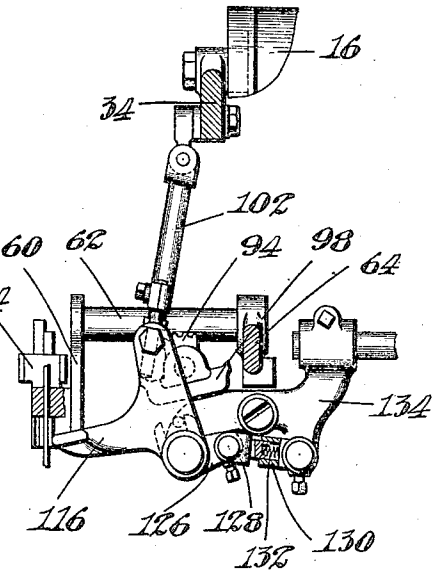


Fig. 11.

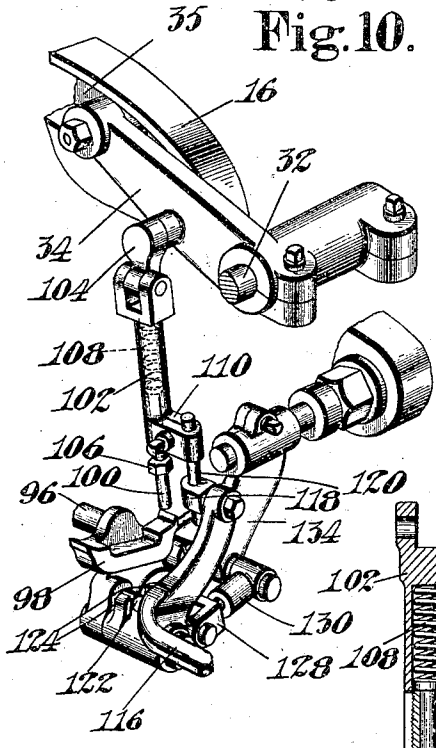


Fig. 12.

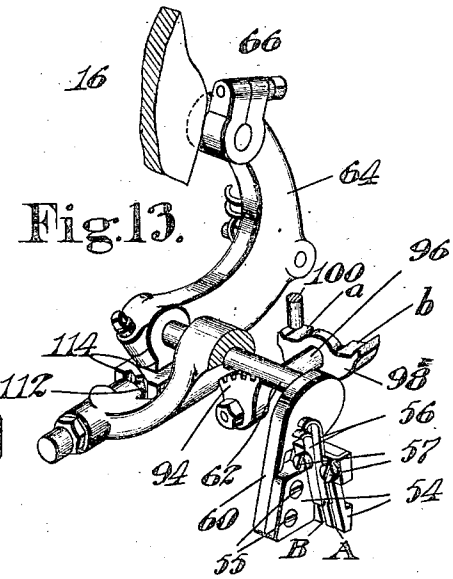


Fig. 13.

Fig. 14.

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UNITED STATES PATENT OFFICE.

FRED L. MACKENZIE, OF BEVERLY, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

MACHINE FOR INSERTING FASTENINGS.

1,410,694. Specification of Letters Patent. Patented Mar. 28, 1922.

Application filed December 15, 1916, Serial No. 137,152. Renewed June 23, 1921. Serial No. 479,961.

To all whom it may concern:

Be it known that I, FRED L. MACKENZIE, a citizen of the United States, residing at Beverly, in the county of Essex and State of Massachusetts, have invented certain Improvements in Machines for Inserting Fastenings, of which the following description, in connection with the accompanying drawings, is a specification, like reference characters on the drawings indicating like parts in the several figures.

This invention relates to machines for inserting fastenings in boots and shoes. The invention is herein illustrated and described with particular reference to its application to machines of the type commonly known as string nailing machines, in the operation of which machines nails are successively cut from a strip or string of connected nails and delivered to the fastening inserting mechanism.

While machines for inserting string nails have been used for many years in the manufacture of boots and shoes, the use of such machines has been confined heretofore principally to miscellaneous tacking operations in which relatively short nails are employed which do not require to be clinched and in which operations it is not necessary to employ an awl to form nail receiving openings in the work. The general object of the present invention is to provide an improved string nail inserting machine of the type in which an awl is employed for forming successive nail receiving openings in the work, the awl serving also to feed the work between successive fastening inserting operations, which machine shall be organized and adapted in this and other respects to perform economically and satisfactorily a wide range of boot and shoe nailing operations including, for example, sole and welt attaching operations, and the invention relates especially to string nailing machines of this class, although the applicability of various features of the invention to other uses is recognized.

In the machine herein illustrated as incorporating a preferred embodiment of the invention, the awl and a nail receiving throat move together into and out of the line of drive to penetrate and then feed the work and thereafter to aline the throat with the nail receiving opening just formed by the awl, and the successive nails after being fed into the throat, which is stationary relatively to the nail feeding and cutting mechanism, are carried by the throat on its return movement into the line of drive in position for the operation of the nail driver, the illustrated organization being particularly adapted to insure positive and accurate feeding of the work and providing especially reliable and accurate mechanism for supplying nails in position to be inserted in the work.

Since it is often desirable in the use of machines of this character to employ in different parts of a shoe fastenings of different kinds, for example, fastenings of different lengths, it is important that mechanism be provided to enable a shift to be made from one kind or length of fastening to another without interrupting the operation of the machine and as quickly as possible, as well as with a minimum of effort on the part of the operator, in order that the capacity of the machine may be substantially unimpaired by frequent changes from one kind of fastening to another. At the same time it is important to insure that the shift from one kind of fastening to another shall take place at a proper time only in the cycle of operations of the machine. Accordingly, another object of the invention is to provide a satisfactory and reliable shifting mechanism which may be operated without interrupting the operation of the machine. In accordance with this object of the invention, the illustrated machine includes novel shifting mechanism under the control of the operator which may be set by the operator at any time in the cycle of operations of the machine, the shifting mechanism thereafter operating automatically at a predetermined and proper time only in the machine cycle regardless of the time in the cycle when the operator manipulates the manual controlling means.

These and other objects and features of the invention, including certain features residing in the organization and sequence of operations of the machine, will be apparent from the following description read in connection with the appended drawings and are set forth in the claims.

Referring now to the accompanying drawings,

Fig. 1 is a view in front elevation showing

those parts of a fastening inserting machine, constructed in accordance with this invention, which are necessary for the purpose of explaining this invention;

Fig. 2 is an angular view of a part of a shoe showing the way in which fastenings are inserted by this machine;

Fig. 3 is a side elevation of the parts of the machine shown in Fig. 1, the wire and welt reels, however, being omitted;

Fig. 4 is an angular view showing certain details of construction;

Figs. 5, 6 and 7 are views in front elevation showing particularly the devices for feeding the nail string, cutting fastenings therefrom and inserting the fastenings;

Figs. 8 and 9 are views similar to Figs. 6 and 7, but show some of the parts in cross section for the purpose of better illustrating the steps of the fastening inserting operation;

Figs. 10 and 11 are views in side elevation showing different positions of the mechanism that shifts the nail string guide;

Figs. 12 and 13 are angular views of this mechanism; and

Fig. 14 is a cross sectional view of a part of this mechanism.

The machine shown in the drawings includes a column 2, a head 4 fixed on the top of this post and an auxiliary swinging head 6 supported by the stationary head 4. The swinging head has fixed to it a throat 8 provided with a nail guiding passage 9 into which the string nails are positioned one at a time by a feeding and cutting mechanism, and a driver 10 which is also carried by the swinging head 6 is mounted to have a driving stroke through the throat for the purpose of inserting in the work the fastening positioned in the nail passage 9. An awl 12 is also carried by the swinging head and is mounted to reciprocate through an awl passage 7 formed in the throat 8 into and out of the work. The swinging movement of the head in one direction takes place while the awl is in the work, the awl thus feeding the work into the line of drive and positioning the awl hole properly for the reception of the nail which is driven into it at a later point in the cycle of operations of the machine, this subsequent positioning of the driver and throat in the line of drive being effected by a return swing of the head after the awl has been withdrawn from the work.

For the purpose of producing the swinging movement of the head 6 it is mounted on a boss formed on the stationary head 4 concentric with the main driving shaft 14. This shaft carries a cam 16 (see Figs. 3, 4 and 12) provided with a cam path in which travels a roll mounted on the end of an arm 18 that is fixed to a rock shaft 19 lying parallel with the main shaft 14. On the forward end of this shaft an arm 20 is fixed which has a dove tailed groove formed longitudinally therein to receive a slide carrying a stud that projects forward into suitable recesses formed for it in a pair of blocks or shoes 22 (see Fig. 1) that are positioned side by side and are secured on the stud by a cap screw 23. These blocks 22 slide in a vertical guideway formed between a part of the swinging head 6 and a bracket 24 fixed to said head 6, this guideway being substantially parallel, in certain positions of the head, to the guideway on the arm 20. The oscillating movement imparted by the cam 16 to the arm 18 is thus transmitted through the connections just described to the swinging head 6 and oscillates this head about the axis of the main shaft 14. The length of this oscillating movement can be varied by adjusting the blocks 22 vertically in the guideway in which they travel and the spacing of the fastenings in the work can thus be controlled.

As above stated, the awl 12 while mounted to swing with the head 6 is arranged to have a reciprocating movement in the head. For this purpose the awl is clamped in the lower end of an awl bar 26 which slides in a vertical guideway formed in the head 6, the lower end of this bar being split to form a clamp in which the awl can be adjusted relatively to the bar 26 in a direction parallel to the direction of the swinging movement of the head. The bolt 28 clamps the awl in its adjusted position. The upper portion of the bar 26 is toothed to mesh with the teeth of a segment formed on an arm 30 (see Fig. 1) that is clamped to a rock shaft 32 (see Fig. 12) lying parallel to the main shaft 14 and having secured to it an arm 34 (see Fig. 3) which carries a roll that runs in a cam path 35 formed in the forward end of the rotatable cam 16. These connections thus are operative to lower the awl 12 and force it into the work and lift it out of the work again at the proper points in the cycle of operations.

The driver 10 is clamped in the lower end of a driver bar 36 and is guided through a guideblock 38 mounted on the head 6 just above the throat 8. The driver thus is constantly maintained in alinement with the nail passage in the throat. This driver is of the spring actuated type and for this purpose the driver bar 36 (see Fig. 1) is mounted in vertical guideways formed in the swinging head 6 and has fixed to it a driver block 40 which is arranged to be raised by a cam 42 mounted fast on the forward end of the main shaft 14. A driver spring 44 acting through a swinging arm 46 and a ball ended strut 48 opposes the lifting movement thus produced by a cam 42 and operates, when the cam moves out of engagement with the block 40, to give the driver its operative or driving stroke. For the purpose of adjusting the tension of the spring 44, and

thus varying the intensity of the driver stroke, one end of the spring is secured to a worm wheel 49 which is arranged to be set by a worm operated by a handle 50.

The nail string S from which the fastenings are to be severed and positioned in the throat 8, is supported on a reel 52 which may be of any suitable construction. This nail string is led into a nail string guide 54 which is mounted just above the throat 8 and has a groove formed in it of the proper shape to guide the nail string. If the machine is to handle a plurality of kinds of fastenings then the guide is provided with a corresponding number of grooves or guideways. The construction of this guide is best shown in Fig. 13 from which it will be seen that this member is provided with two grooves or guideways indicated at A and B, respectively, designed to receive nail strings in which the nails are of different lengths or different in other respects. Two springs 56, each secured adjustably to the guide 54 by screws 57 have their lower ends positioned for engagement with the heads of the nails in the string as they are advanced past the springs and thus act as pawls to prevent any backward movement of the nail strings.

It is necessary to move the string nail guide 54 into alinement with the throat 8, that is, into such a position that one of its guideways A or B, as desired, will be in alinement with the nail receiving passage 9 in the throat 8, in order to feed the endmost nail in the string into this passage, and then to move this guide out of alinement with the throat again to permit the driver 10 to descend through the throat and drive the nail positioned therein. In order to effect this movement, the guide 54 is clamped rigidly to an arm 60 which is fixed to the forward end of a rock shaft 62 (see Figs. 10 to 13) that is supported in the swinging head 6. To rock this shaft 62 it has slidably secured to its rearward end an arm 64 carrying a roll that travels on a peripheral cam face 66 on the cam. A spring 65 acts through the arm 64 to hold the roll in contact with the cam. As clearly shown in Fig. 13 the guide 54 is clamped to the arm 60 by screws 55 and the part 54 has a tongue entering a vertical groove formed in the arm 60. The screws 55 project through slots formed in the guide so that this construction permits the adjustment of the guide 54 vertically with reference to the top of the throat 8.

For the purpose of feeding the nail string through the guide 54 into the throat passage 9, a reciprocating feeding mechanism is employed which comprises a chisel shaped feeder 68 clamped for longitudinal adjustment in a grooved holder formed in the lower end of the feeder arm 70. This arm is pivoted on the end of one arm of a bell crank lever 72 which is fulcrumed at 74 on the frame 6 and has another arm 75 which overlaps one arm 76 of a second lever that carries a roll 77 running in the cam path 35 in the cam 16. A slide 80 mounted in a guideway formed longitudinally in the arm 75 carries a stud which projects through a slot 82 formed in the lever arm 76. This stud may be clamped at any point in the slot 82 and this construction, therefore, enables the operative to adjust the length of stroke of the feeder 68. A coiled spring 71 acts between the forward arm of the lever 72 and the feeder arm 70 to swing the feeder 68 constantly toward the string nail guide 54.

Referring now particularly to Figs. 1 and 5 to 9 inclusive, it will be evident that as the cam 16 rotates, the connections just described will raise the feeder 68 from the position in which it appears in Fig. 5 to that in which it is shown in Fig. 6. During this movement the spring 71 yieldingly holds the edge of the feeder 68 against the nail string S but permits the feeder to yield when it strikes the head of the endmost nail in the string S and of course moves the feeder end over the head as soon as the feeder is lifted above it. The bevel on the upper side of the edge of the feeder obviously facilitates this action. In the meantime the head 6 is swung to the left to feed the work. Fig. 6 shows the positions of the parts at this time. The movements of the feeder and the nail string guide 54 are so timed that as soon as the guide has been moved by its connection with the cam face 66 into alinement with the throat 8, the feeder 68 will be moved downwardly by its cam connections and will force the lowermost nail in the string S into the throat passage 9 in the throat 8. The parts at this time occupy positions in which they are shown in Fig. 7, the head 6 of the machine having meanwhile been swung to the right. A further downward movement of the feeder arm 70 produced by the cam path 35 will force the feeder 68 to slide across the top of the throat passage 9, the guide 54 moving with the feeder and will thus cause the feeder to shear off the endmost nail in the string at a point just above the head of this nail. The head 6 is swung to the right during the operation of the feeder 68 in cutting the nail string, the movement of the head terminating practically simultaneously with the completion of the severance of the nail so that the severed nail falls into the opening made by the awl. Fig. 8 shows the parts just after they have completed this operation. It will be noted that a stationary shearing bar 84 is clamped in the upper end of the throat by means of a bolt 86 so that the feeder 68 cuts against this bar or shearing member. Immediately after this operation is completed the feeder 68 and the guide 54 are moved toward the left, as the parts are

seen in Fig. 8, far enough to clear the driver 10 which immediately descends and drives the nail positioned in the throat passage 9 into the work.

Since the swinging movements of the head are effected positively in both directions, it is obvious that a very accurate feeding movement of the work is produced by the construction above described. It will also be evident that this construction provides for fine adjustment in the spacing of the fastenings. The shoe feeding mechanism and the mechanisms for feeding and severing the fastenings and driving them in the work are ruggedly constructed and are not subject to rapid wear or deterioration. Furthermore, these mechanisms are so constructed that only severe wear is at all liable to interfere with the fastening inserting operations.

The character of the support employed to sustain the work while the fastenings are being inserted in it, will, of course, vary somewhat with the nature of the work. In the machine shown the work is supported on a horn 88 and a suitable horn operating mechanism (not shown) is driven from the main shaft 14 to cause the horn to clamp the work against the throat 8 and the work abutment beside it and to release the work again to permit it to be fed over the horn at the proper points in the cycle of operations of the machine. The details of this mechanism are not shown since they are well understood by those skilled in this art.

Power may be applied to the machine by means of a belt running over a loose pulley 90 on the main shaft 14, the connection between this pulley and the shaft being controlled by a suitable clutch. The clutch is manually controlled by treadle connections including a rod 92 (see Fig. 3).

As above stated, the nail string guide 54 is provided with two guideways either one of which is adapted to direct a nail string into the throat 8. The two nail strings are, of course, unwound from coils supported for independent motion. Usually the nails of one string are longer than those in the other string, and it is of course desirable to change from one length to the other while the machine is operating on a shoe. For instance, in nailing all around the bottom of a shoe provided with a tap sole, it is obvious that longer nails will be required around the fore part than in the shank of the shoe where the stock is thinner, and consequently it is necessary on such work to change the nail supply twice in operating on each shoe.

The mechanism by which this change is effected is best shown in Figures 10 and 13. This mechanism is arranged to move the nail string guide 54 forward or backward far enough to bring either the guideway A or B, as desired, into the plane of movement of the throat passage 9 and into cooperative relationship to the feeder 68. For the purpose of effecting this movement, the rock shaft 62, which supports the guide 54, is toothed on its lower side to mesh with the teeth of a segment 94 that is secured fast on the inner end of a rock shaft 96′ mounted in bearings in the swinging head 6. A shifter 98 is mounted fast on the outer end of this rock shaft and is provided with two seats *a* and *b* on opposite sides of its axis of oscillation. A reciprocating shifter operating member 100 is mounted to engage either one of these seats. This member consists of a rod plunger tip mounted in a plunger 102 which is pivotally connected by a short link 104 to the cam operated lever 34, which drives the awl bar 26. These connections reciprocate the plunger vertically once during each cycle of operations of the machine. The rocking shifter 98, of course, is always tipped so that either the seat *a* or *b* is in an elevated position, and if the plunger tip 100 is allowed to strike the uppermost seat while it is making its down stroke, it will tip the shifter 98 into its opposite position and, through the connection between this shifter and the guide 54, will move the guide forward or backward and thus effect the desired change in the delivery of the fastenings to the throat. The plunger member 100 is yieldingly mounted in a plunger 102, so that breakage of the parts is avoided in case any unusual obstruction to the shifting movement of the string nail guide is encountered. For this purpose the part 100, as shown in Fig. 14, is mounted to slide through a collar 106, which is threaded into the lower end of the plunger 102, and a spring 108 acts on the upper end of the plunger tip 100 to hold it in its lowermost position. The lower end of the plunger 102 is split to form a clamp, and a bolt 110 extending through the split portion serves to clamp the collar 106 in its adjusted position. This construction also provides for the vertical adjustment of the plunger tip 100 with reference to the shifter 98. The nail string guide is maintained in its shifted position by means of a spring pressed plunger 112 mounted in a relatively stationary part of the frame and arranged to enter either one of two notches 114 formed in a part of the lever arm 64, which, of course, moves forward and backward with the guide 54.

It will be noted that the plunger 102 is so connected with the lever 34 from which it derives its motion, that it can swing back and forth across the axis of oscillation of the shifter 98 into position to engage either one of the seats *a* or *b*. This swinging movement of the plunger is effected by a manually operated mechanism which includes a bell crank lever 116 having a forwardly projecting arm shaped and posi-

tioned for movement by the operative, and another arm carrying a pivoted block 118, (see Fig. 12). A rod 120 clamped in the lower end of the plunger 102 slides through a hole in the block 118. It will be evident from an inspection of Figs. 10 and 11 that the fulcrum point for the lever 116 is so located with reference to the path of movement of the plunger 102, that a clockwise movement of the lever 116 will swing the plunger tip 100 into position to engage the seat *a* on the shifter 98, while a counter-clockwise movement of the lever will swing the plunger tip into position to engage the seat *b*. This movement of the lever is limited by the stationary pin 122 (see Fig. 12,) arranged to be engaged by either one of two arms or lugs 124 integral with the lever 116 and located on opposite sides of the pin. The fulcruming of the block 118 to the bell crank lever 116 permits the co-acting guiding surfaces of the block 118 and rod 120 to move relatively to the bell crank lever 116, when the lever is shifted to align the plunger 102 with the seat *a* or *b*, to a position such that the plunger 102 will reciprocate freely relatively to the lever 116 and will exert no force tending to move the lever 116 from set position. Consequently, the bell crank lever 116 is adapted to remain in alignment with either of the seats *a* or *b* undisturbed by the reciprocation of the plunger 102 and rod 120. The successive downward movements of the plunger 102 supplement the action of the spring pressed plunger 112 in retaining the guide 54 in position, it being understood that if the guide 54 were to be moved accidentally, the seat engaged by the plunger 102 to position the guide 54 would be raised into the path of movement of the plunger which would engage the seat and thereby return the guide to its proper position. In order to maintain the lever 116, and consequently the plunger 102, in either position to which it is moved, a toggle mechanism is provided which consists of a short arm 126 projecting rearwardly from a part of the lever 116 adjacent to its fulcrum, to a link comprising two sections 128 and 130, arranged to telescope with each other and urged apart by a spring 132, the former of these members being pivoted to the arm 126 and the latter to a stationary bracket 134, which also supports the lever 116. This toggle mechanism thus acts yieldingly to maintain the lever 116 at either extremity of its swinging movement.

Assuming now that the machine is inserting fastenings and that the parts are in the positions in which they are shown in Fig. 10 if the operative wishes to change to the other kind of fastening which his machine is adapted to handle, he merely depresses the forward end of the lever 116, thus swinging the plunger 102 across the axis of oscillation of the shifter 98 in a direction transverse to the direction of its reciprocating movement from the position in which it is shown in Fig. 10 to that in which it appears in Fig. 11. The spring 132 in the toggle mechanism maintains the parts in these positions. When the plunger 102 makes its next downward stroke, the tip 100 strikes the seat *b* of the shifter 98, thus acting through the parts 96, 94 and 60 to move the guide 54 forward and bring the guideway B into co-operative relationship to the throat 8 and the feeder 68. It will now be clear that the manually operated mechanism is a setting mechanism for the power driven parts that operate the shifter, and that its control of the power driven mechanism is affected by changing the path of movement of the power driven device that engages the shifter. It will also be clear that while the setting mechanism may be operated at any time while the machine is running, the shifting movement of the string nail guide will take place thereafter only at a predetermined point in the cycle of operations of the machine. The workman thus is relieved of any responsibility in effecting this shifting movement other than to move the lever 116 in one direction or the other when he desires to change fastenings, and the automatic mechanism thereafter completes the shifting operation without any further attension on his part.

To obviate the necessity of changing the length of the stroke of the feeder when a change is made from one kind of fastening to another in the manner just described, the length of stroke of the feeder may be and as shown is made long enough to feed the longer of the two kinds of fastenings used, in which case it will also feed the shorter fastenings accurately.

The operation of the various mechanisms in the machine has been so completely described in connection with the foregoing description of construction that any further statement of operation is believed to be unnecessary.

Machines of this type are often used in the manufacture of what is known as nailed welt shoes to nail the welt to the shoe bottom after the shoe has been lasted. The machine shown in the accompanying drawing is equipped for work of this character and Fig. 2 shows a shoe of this type with the welt W secured by nails inserted by this machine. To enable the machine to handle this kind of work it is equipped with a welt reel or holder 140 and devices for guiding the strip of welting W, Fig. 1, from the coil on the reel to the point of insertion of the fastenings. The guiding means includes a welt guide 142 located adjacent to the point at which the fastenings are inserted. It is obvious, however, that the equipment and

attachments used with the machine will vary with the nature of the work on which the machine is to operate, and that the specific construction of these attachments has no bearing on the present invention.

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

1. A machine for inserting fastenings, having in combination, a fastening receiving member, mechanism for feeding a plurality of kinds of fastenings to said member, said mechanism including guiding means having a plurality of guideways for the fastenings and said member and said guiding means being relatively shiftable to enable any one of said guideways to guide a fastening into said receiving member, and instrumentalities for effecting a relative shifting movement of said guiding means and said member constructed and arranged normally to retain said parts during subsequent operations of the machine in the relation established thereby, said instrumentalities comprising an actuating device, positively operated means for moving said device through an entire cycle of its movement, means for changing the path of movement of said device, and connections through which a predetermined change in said path effects the relative shifting movement of said guiding means and said member.

2. A machine for inserting fastenings, having in combination, a fastening receiving throat, mechanism for feeding a plurality of kinds of fastenings to said throat, said mechanism including guiding means having a plurality of guideways for the fastenings and mounted to have a shifting movement to bring any one of said guideways into position to guide a fastening into said throat, and instrumentalities for shifting the guiding means relatively to said throat constructed and arranged normally to retain said guiding means during subsequent operations of the machine in the position to which it is shifted, said instrumentalities comprising a power driven member, manually controlled means operative at any time in the cycle of operations of the machine to shift said member so as to change the path of movement of the member, stationary means for limiting the shifting movement of said member, and connections through which a change in said path is effective to shift said guiding means, said connections and said member being constructed and arranged to render said member inoperative on said connections except at or near the limit of its shifting movement, and means tending to move said member to the limit of its shifting movement as determined by said stationary means after it has been moved past the center of its shifting movement toward the limit of such movement.

3. A machine for inserting fastenings, having, in combination, a fastening receiving throat, mechanism for feeding a plurality of kinds of fastenings to said throat, said mechanism including guiding means having a plurality of guideways for the fastenings and mounted to have a shifting movement to bring any one of said guideways into position to guide a fastening into said throat, a power driven member, positively operated means for imparting a to and fro movement to said member, connections through which said member is operative to effect a shifting movement of said guiding means at a predetermined point in the cycle of operations of the machine, and manually operated controlling means for said member operable at any time in the cycle of operations of the machine to a position which will cause said member to become operative to shift the guiding means, said controlling means and said member being constructed and arranged to cause the controlling means to remain in said position during subsequent cycles of operation of the machine so as to retain the guiding means in the position to which it is shifted.

4. A machine for inserting fastenings, having in combination, a fastening receiving throat, mechanism for feeding a plurality of kinds of fastenings to said throat, said mechanism including guiding means having a plurality of guideways for the fastenings and mounted to have a shifting movement to bring any one of said guideways into position to guide a fastening into said throat, a rotatable shifter for said guiding means constructed to present impact surfaces on opposite sides of its axis, a power driven impact member, and means for changing the path of movement of said member constructed to cause a portion of its surface selectively to engage either of said impact surfaces to shift said guiding means in either of two opposite directions to move one of said guideways out of and another into alinement with said throat.

5. A machine for inserting fastenings, having in combination, a fastening receiving member, mechanism for feeding a plurality of kinds of fastenings to said member, said mechanism including guiding means having a plurality of guideways for the fastenings and said member and said guiding means being relatively shiftable to enable any one of said guideways to guide a fastening into said receiving member, an actuating member, positively operated means for moving said member through an entire cycle of its movement, connections through which said means is operative upon movement of said member to effect said relative shifting movement in either of two opposite directions, manually controlled means operable while the machine is run-

ning, without interrupting the normal operation of the machine, for moving said member to modify the action of said positively operated means and thereby to determine the time and direction of said shifting movement, and means for retaining said manually controlled means during subsequent operations of the machine in the position to which it was operated so as normally to retain said guiding means and said receiving member in the relation established by said shifting movement.

6. A machine for inserting fastenings, having in combination, a fastening receiving throat, mechanism for feeding a plurality of kinds of fastenings to said throat, said mechanism including guiding means having a plurality of guideways for the fastenings and mounted to have a shifting movement to bring any one of said guideways into position to guide a fastening into said throat, a shifter for said guiding means constructed to present impact surfaces on opposite sides thereof, a power-driven impact member operable to shift said guiding means by a blow on one or the other of said impact surfaces, positively operated means for moving said impact member through an entire cycle of its movement, and normally stationary manually operated setting mechanism operable while the machine is running, without interrupting the normal operation of the machine, for controlling the shifting of said guiding means by said impact member, said setting mechanism being constructed and arranged to remain normally in the position in which it may be set during subsequent cycles of operation of the machine.

7. A machine for inserting fastenings, having in combination, a nail receiving member, mechanism for feeding a plurality of nail strings selectively to said member, said mechanism including a nail string guide having a plurality of guideways for the nail strings and mounted to have a shifting movement to bring any one of said guideways into position to guide the endmost nail of the respective nail string into said member, a shifter for said guiding means, continuously operated power driven means constructed and arranged to give said shifter its operative movement at a predetermined point in the cycle of operations of the machine, and a normally stationary manually operated setting mechanism for said power driven means having a part co-acting with said power driven means.

8. A machine for inserting fastenings, having in combination, a fastening receiving throat, mechanism for feeding a plurality of kinds of fastenings to said throat, said mechanism including guiding means having a plurality of guideways for the fastenings and mounted to have a shifting movement to bring any one of said guideways into position to guide a fastening into said throat, an impact member, positively operated means for driving said member through an entire cycle of its movement, normally stationary manually operated means for moving said member transversely of the direction of its driven movement, mechanism through which said impact member when moved transversely in either of two directions is effective to shift said guiding means relatively to said throat, and connections between said impact member and said manually operated means constructed to permit angular movement of the impact member relatively to said manually operated means upon transverse movement of said member.

9. A machine for inserting fastenings, having in combination, a fastening receiving throat, mechanism for feeding a plurality of kinds of fastenings to said throat, said mechanism including guiding means having a plurality of guideways for the fastenings and mounted to have a shifting movement to bring any one of said guideways into position to guide a fastening into said throat, a member mounted to have a reciprocating movement and a swinging movement transversely of its reciprocating movement, power operated mechanism for reciprocating said member in each cycle of operations of the machine, manually operated means movable between certain positions to swing said member, connections through which said member is operative when swung by movement of the manually operative means to shift said guiding means relatively to said throat, and guiding connections between said member and said manually operated means having co-acting guiding surfaces movable relatively to the manually operated means to permit free reciprocating movement of said member relatively to the manually operated means when said manually operated means is in either of such positions without the exertion of any force tending to move the manually operated means from such position.

10. A machine for inserting fastenings, having in combination, a fastening receiving throat, mechanism for feeding a plurality of kinds of fastenings to said throat, said mechanism including guiding means having a plurality of guideways for the fastenings and mounted to have a shifting movement to bring any one of said guideways into position to guide a fastening into said throat, a member mounted to have a reciprocating movement and a swinging movement transversely of its reciprocating movement, power operated mechanism arranged to reciprocate said member in each cycle of operations of the machine, a rocking shifter

connected with said guiding means to shift it in either direction relatively to said throat and arranged to be operated by the reciprocating movement of said member, manually operated means movable between certain positions to swing said member across the axis of movement of said shifter and thereby determine the direction of the movement that it gives to said shifter, and guiding connections between said member and said manually operated means having co-acting guiding surfaces movable relatively to the manually operated means to permit free reciprocating movement of said member relatively to the manually operated means when said manually operated means is in either of such positions without the exertion of any force tending to move the manually operated means from such position, said connections comprising a block pivoted to the manually operated means.

11. A machine for inserting fastenings, having in combination, a nail receiving throat, mechanism for feeding a plurality of nail strings selectively to said throat, said mechanism including a nail string guide having a plurality of guideways for the nail strings and mounted to have a shifting movement to bring any one of said guideways into position to guide the endmost nail of the respective nail string into said throat, a power driven mechanism operative in each cycle of operations of the machine to swing said nail string guide into and out of alinement with said throat in a direction transverse to the direction of said shifting movement, a rocking shifter connected with said mechanism to shift said guide in either direction, a reciprocating plunger arranged to actuate said shifter and mounted to be swung to enable it to rock the shifter in either direction, power driven means for constantly reciprocating said plunger, and normally stationary manually operated means operable while the machine is running without interrupting the operation of the machine for swinging said plunger relatively to said shifter.

12. A machine for inserting fastenings, having in combination, a fastening receiving throat, mechanism for feeding a plurality of kinds of fastenings to said throat, said mechanism including guiding means having a plurality of guideways for the fastenings and mounted to have a shifting movement to bring any one of said guideways into position to guide a fastening into said throat, a power driven member mounted to have a reciprocating movement and a swinging movement transverse to its reciprocating movement, connections through which said member is operative to effect the shifting movement of said guiding means at a predetermined point only in the cycle of operations of the machine, a manually controlled member operable to swing the power driven member from one position to another to cause said member to shift said guiding means, said member having an arm, and guiding connections between said arm and said power driven member comprising a block fulcrumed in said arm and a part connected to said power driven member and arranged in guiding engagement with said block.

13. A machine for inserting fastenings having, in combination, a fastening receiving member, mechanism for feeding a plurality of kinds of fastenings to said member, said mechanism including guiding means having a plurality of guideways for the fastenings and said member and said guiding means being relatively shiftable to enable any one of said guideways to guide a fastening into said receiving member, a power driven element, connections through which said element is operative to effect a shifting movement of said guiding means, means for retaining said guiding means in position with any one of said guideways in alignment with said fastening receiving member, manually operative means for controlling the shifting of said guiding means by said element, connections between said controlling means and said element constructed to permit angular movement of said element relatively to the controlling means, and means independent of the power driven element for maintaining said controlling means in position to cause the guiding means to be shifted to aline any one of said guideways with said receiving member.

14. In a machine of the class described, a frame, a head mounted for movement on said frame, fastening inserting instrumentalities carried by said head comprising a fastening receiving member and mechanism for feeding a plurality of kinds of fastenings to said member, said mechanism including guiding means having a plurality of guideways for the fastenings and said member and said guiding means being relatively shiftable to enable any one of said guideways to guide a fastening into said receiving member, means carried by said head for effecting relative shifting movement of the guiding means and said member, and means on said frame for operating said shifting means.

15. In a machine of the class described, a frame, a head mounted to swing on said frame, fastening inserting instrumentalities carried by said head comprising a fastening receiving member and mechanism for feeding a plurality of kinds of fastenings to said member, said mechanism including guiding means having a plurality of guideways for the fastenings and said member and said guiding means being relatively shiftable to enable any one of said guideways to guide a fastening into said receiving member, a ro-

tatable shifter for said guiding means journalled in said head for movement therewith, and power operated means on said frame for actuating said shifter.

16. A string nailing machine, having in combination, a throat, a driver movable through said throat, and feeding and cutting mechanism constructed and organized to feed a nail string into said throat and sever the endmost nail from said string, said mechanism including a nail string guide operative to direct a nail into said throat, a reciprocating feeder cooperating with said guide to force the nail into said throat, a lever on one arm of which said feeder is pivoted, a cam operated lever having an arm overlapping the other arm of the first lever, a sliding connection between said two overlapping arms adjustable to vary the throw of said feeder, and a spring acting on said feeder to swing it about its pivot toward said guide.

17. A string nailing machine, having in combination a throat, a driver movable through a passage in the throat, feeding and cutting means constructed and arranged to engage the head of a nail on the string and feed the string into said passage and cooperating with said throat to cut the string, thereby to position a nail in said throat, a work feeding awl, a movable head carrying the throat and awl, and means for moving said head to locate the throat passage and awl alternately in the line of drive.

18. A string nailing machine, having in combination a throat adapted to receive the endmost nail of a nail string, a driver movable through said throat, means for moving said throat into and out of the line of drive of the nails, feeding and cutting means constructed and arranged to engage the head of a nail on the string and feed the string into said throat and cooperating with the throat during movement of the throat toward the line of drive to cut the string and thereby to position a nail in said throat, said means including a guide for a nail string movable into and out of line with said throat, and an awl arranged to have a work penetrating movement and a work feeding movement into and out of the line of drive.

19. A string nailing machine having, in combination, an awl movable to penetrate the work and to feed it laterally, a throat, a driver movable through a passage in said throat, means for moving said throat into and out of the line of drive, and a nail feeding and cutting mechanism operable on the nail string during movement of the throat passage toward the line of drive and constructed and arranged to feed a nail string into said passage by engagement with the head of the nail in the string and to complete the cutting off of the end-most nail of the string when the throat passage is substantially in the line of drive.

20. A string nailing machine having, in combination, an awl movable to penetrate the work and to feed it laterally, a throat, a driver movable through a passage in said throat, means for moving the throat and awl alternately into and out of the line of drive whereby the opening made by the awl is moved into the line of drive and the throat passage then returned to the line of drive, and a feeding and cutting mechanism operable on the nail string during movement of the throat passage toward the line of drive and constructed and arranged to feed a nail string into said throat by engagement with the head of a nail in the nail string and to be moved across the line of drive to complete the severance of the endmost nail of the nail string in the throat when said throat is positioned substantially in the line of drive to cause the cut-off nail to fall into the opening previously made by the awl.

21. A string nailing machine having, in combination, an awl movable to penetrate the work and to feed it laterally, a throat, a driver movable through said throat, means for moving said throat and awl alternately into and out of the line of drive whereby the opening made by the awl is moved into the line of drive upon movement of the throat out of the line of drive, and nail feeding and cutting mechanism constructed and organized to feed a nail string into said throat by engagement with the head of the nail in the string when the throat is positioned out of the line of drive and further constructed and arranged to complete the severance of the end-most nail from the nail string at a time when the throat has been moved back substantially into the line of drive so that the cut-off nail falls into the opening made by the awl.

22. A string nailing machine having, in combination, an awl movable to penetrate the work and to feed it laterally, a driver, a throat having a driver passage and an awl passage respectively aligned with the awl and driver, means for moving the awl passage and the driver passage alternately into and out of the line of drive, and a nail feeding and cutting mechanism constructed and arranged to feed the nail string into the driver passage when said passage is positioned out of the line of drive and operative to complete the severance of the nail string when the throat has been returned substantially to the line of drive.

23. A string nailing machine, having in combination, an awl, means for imparting work penetrating and work feeding movements to the awl, a nail throat, a driver movable through said throat, means for moving the throat into and out of the line of drive, and nail feeding and cutting mechanism operable on the nail string during movement of the throat toward the line of drive and

constructed and organized to feed a nail string into said throat by engagement with the head of a nail in the string and to cut off the endmost nail length, said mechanism comprising a nail string guide and means cooperating therewith to direct the endmost nail into the throat passage by movement of the nail guide from nail receiving position to a position in line with the throat and substantially in the line of drive of the nails.

24. A string nailing machine, having in combination, an awl movable to penetrate the work and to feed it laterally, a throat, a driver movable through said throat and fixed in alinement with the throat, means for moving said driver and throat into and out of the line of drive, and a nail feeding and cutting mechanism constructed and organized to feed a nail string into said throat by engagement with the head of a nail in the string and to cut off the endmost nail length.

25. A string nailing machine, having in combination, an awl, means for giving said awl work penetrating and work feeding movements, a nail throat, a driver mounted for movement through said throat and movable with said awl while the awl makes its work feeding movement, and a nail feeding and cutting mechanism constructed and organized to feed a nail string into said throat by engagement with the head of a nail in the string and to cut off the endmost nail length.

26. A string nailing machine, having in combination, a swinging head, a throat movable with said head, means for feeding a nail string into said throat by engagement with the head of a nail in the string and cutting off the endmost nail of the string after it is positioned in said throat, a driver mounted for movement through said throat to drive a nail positioned therein, an awl mounted to swing with said head to feed the work, and mechanism for reciprocating said awl into and out of the work.

27. In a string nailing machine, the combination with a frame and a driver thereon, of a guide for a string of connected nails, a movable nail guiding throat, feeding and cutting means constructed and arranged to feed the string by engagement with the head of a nail on the string, and constructed and arranged to cut a nail from the string, to position a cut nail in said throat, a work feeding awl, and means for moving said awl and for moving said throat with said driver alternately into and out of the line of drive.

28. In a string nailing machine, the combination with a frame, of a head mounted for movement thereon, a throat and a work feeding awl mounted on said head, a guide for a string of connected nails, feeding and cutting means, constructed and arranged to feed the string into said throat by engagement with the head of a nail on the string, and constructed and arranged to cut the end nail from the string, adapted to position a cut nail in said throat, and means for moving said head, adapted to move said awl and throat alternately into and out of the line of drive.

29. In a string nailing machine, the combination with a frame, of a head mounted for movement thereon, a throat, a driver, and a work feeding awl mounted on said head, a guide for a string of connected nails, feeding and cutting means, constructed and arranged to feed the string into said throat by engagement with the head of a nail on the string, and constructed and arranged to cut the end nail from the string, adapted to position a cut nail in said throat, and means for moving said head, adapted to move said awl and to move said throat with said driver alternately into and out of the line of drive.

30. In a string nailing machine, the combination with a frame, of a work feeding awl, a driver, a nail guiding throat, means for guiding a string of connected nails into said throat, a feeding and cutting member constructed and arranged to feed the string by engagement with the head of a nail on the string and then cut the string to position a cut nail in said throat, and means for moving said awl and for moving said throat with said driver alternately into and out of the line of drive.

31. In a string nailing machine, the combination with a frame, of a work feeding awl, a driver, a nail guiding throat, all mounted on said frame for movement into and out of the line of drive, means for guiding a string of connected nails into said throat, a feeding and cutting member constructed and arranged to feed the string by engagement with the head of a nail on the string and then cut the string to position a cut nail in said throat, and means for moving said awl and for moving said throat with said driver alternately into and out of the line of drive.

32. In a string nailing machine, the combination with a frame, of a work feeding awl, a driver, a nail guiding throat, means for guiding a string of connected nails into said throat, a feeding and cutting member constructed and arranged to feed the string by engagement with the head of a nail and then cut the string to position a cut nail in said throat, and means for positively insuring the movement of said awl and the movement of said throat with said driver alternately into and out of the line of drive.

33. In a string nailing machine, the combination with a frame, of a head mounted for

movement thereon, a throat and a co-operating driver mounted on said head, a work feeding awl, means for guiding a string of connected nails into said throat, a feeding and cutting member constructed and arranged to feed the string by engagement with the head of a nail on the string and then cut the string to position a cut nail in said throat, and means for moving said head and said awl, adapted to move said awl and throat alternately into and out of the line of drive.

34. In a string nailing machine, the combination with a frame, of a head mounted for movement thereon, a throat, a co-operating driver and an awl mounted on said head, means for guiding a string of connected nails into said throat, a feeding and cutting member constructed and arranged to feed the string by engagement with the head of a nail on the string and then cut the string to position a cut nail in said throat, and means for moving said head and said awl, adapted to move said awl and to move said throat with said driver alternately into and out of the line of drive.

35. A fastening inserting machine having means for feeding a plurality of nail strings selectively to fastening inserting mechanism, said means including a nail string guide having a plurality of guideways for the nail strings and mounted to have a shifting movement to bring any one of said guideways into position to guide the endmost nail of the respective nail string into operative position, a shifter for said nail string guide pivoted for movement from one position to another correspondingly to shift said guide, a continuously reciprocating plunger and a manually movable controller operable at any time during the operation of the machine to cause the plunger to rock the shifter at a predetermined point in the cycle of operation of the machine to shift the nail string guide from one operative position to another.

36. A machine for inserting fastenings having, in combination, a drive shaft, fastening inserting mechanism, a multiple fastening stock guide, a two-armed shifter constructed and arranged for operation to shift said guide from one to another operative position, an actuating plunger reciprocated by said shaft, and a controlling member movable at will to render said plunger operative upon an arm of the shifter to cause the shifter to shift the stock guide.

37. In a fastening inserting machine, a drive shaft, fastening inserting mechanism, a movable fastening stock guide, a shifter operable to shift said guide from one to another operative position, a yieldable plunger connected for operation from said shaft, and a controller movable at will to render said plunger operable upon the shifter to cause the plunger to shift the stock guide.

38. A string nail inserting machine having, in combination, a drive shaft, fastening inserting mechanism, a nail string guide having a plurality of guideways for the nail strings, means for shifting the guide to bring any one of said guideways into operative position with respect to the fastening inserting mechanism, a plunger reciprocated by said drive shaft, and a manually operable controller for the plunger shiftable to render the plunger operative upon the guide shifting means to cause the plunger to shift the guide.

39. In a fastening inserting machine, a drive shaft, fastening inserting mechanism, a nail string guide provided with a plurality of guideways and shiftable to bring the nail strings carried by the different guideways into operative relation to the fastening inserting mechanism, a cam upon the drive shaft, a lever oscillated by said cam, and a guide shifting plunger reciprocated by said lever and operable under the control of a manually shiftable member to shift the guide at a predetermined point in the cycle of operation of the machine.

40. A string nail inserting machine having, in combination, a drive shaft, a nail string guide provided with a plurality of guideways for receiving nail strings and shiftable to bring the different nail strings into fastening inserting position, a shifter arranged by its movement to shift the guide, a plunger driven from the drive shaft operable to move the shifter, a manually movable controller arranged to control the operation of the plunger, and a toggle device arranged yieldingly to hold said manually movable controller in either of its operative positions to prevent accidental movement of the nail string guide.

In testimony whereof I have signed my name to this specification.

FRED L. MACKENZIE.