W. H. BORDEN.

MACHINE FOR MAKING AND DRIVING STAPLES.

APPLICATION FILED JAN. 16, 1905. RENEWED NOV. 4, 1911.

1,016,930. Patented Feb. 13, 1912.

4 SHEETS—SHEET 1.

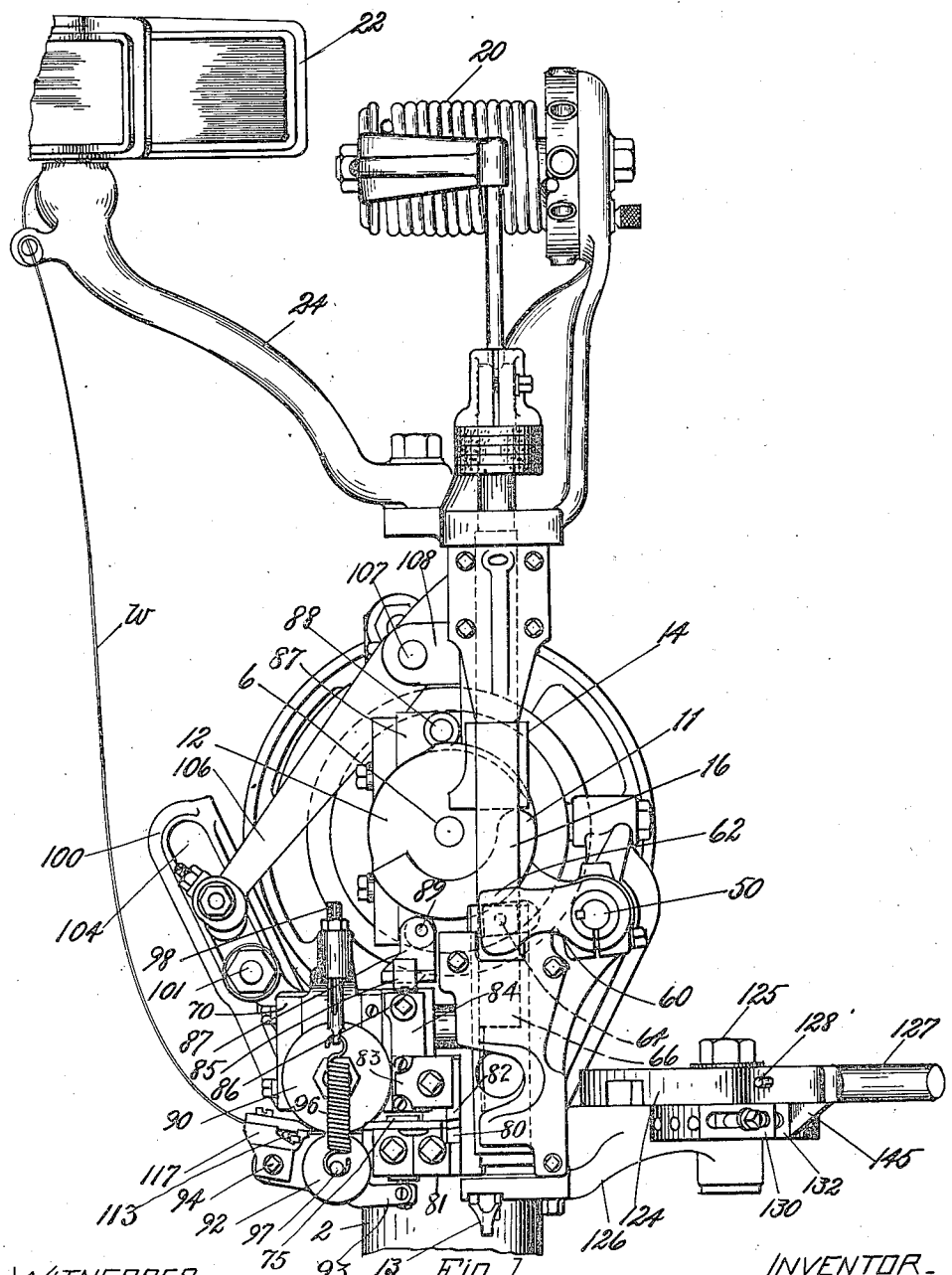

Fig. 1.

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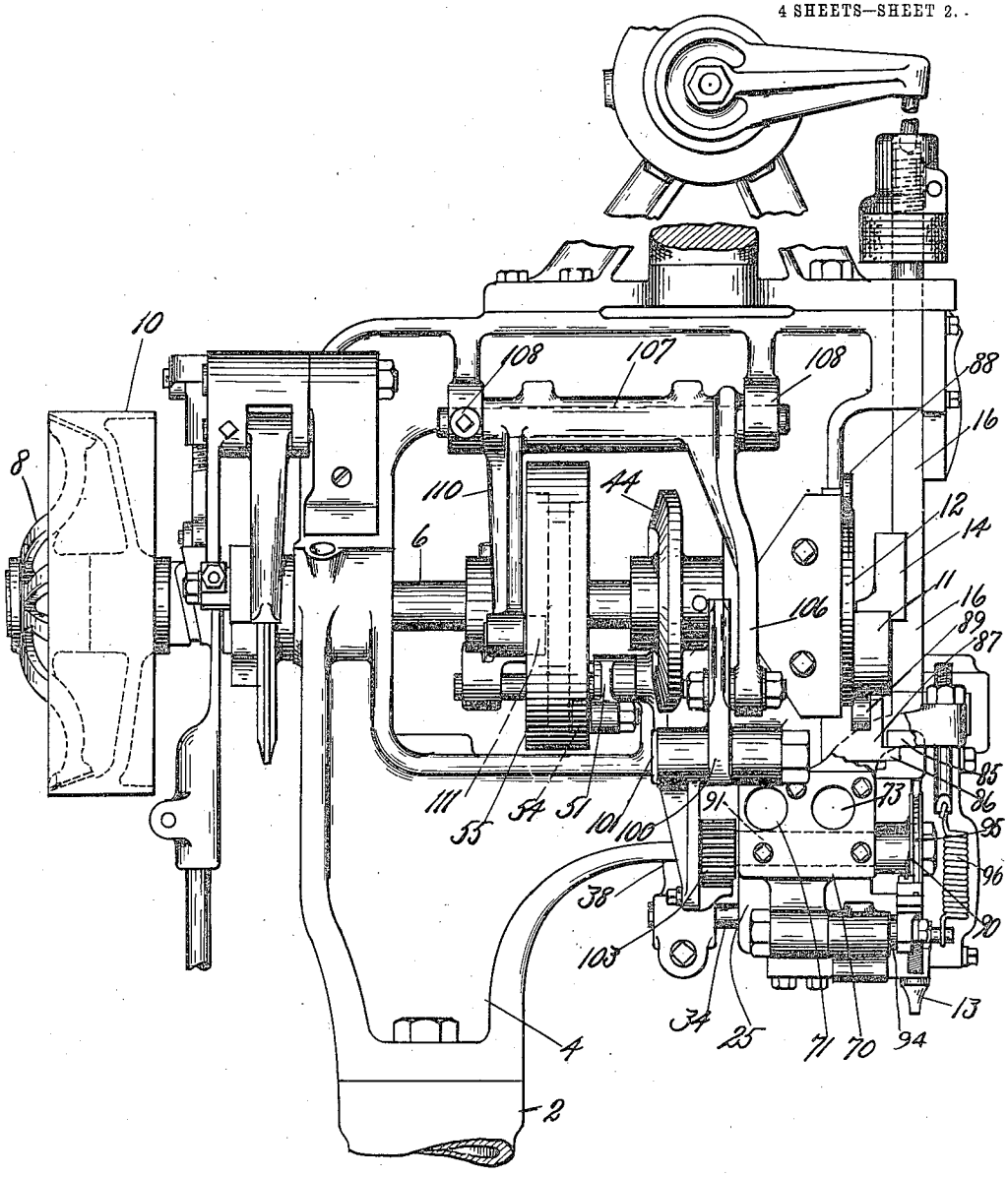

Fig. 2.

WITNESSES.

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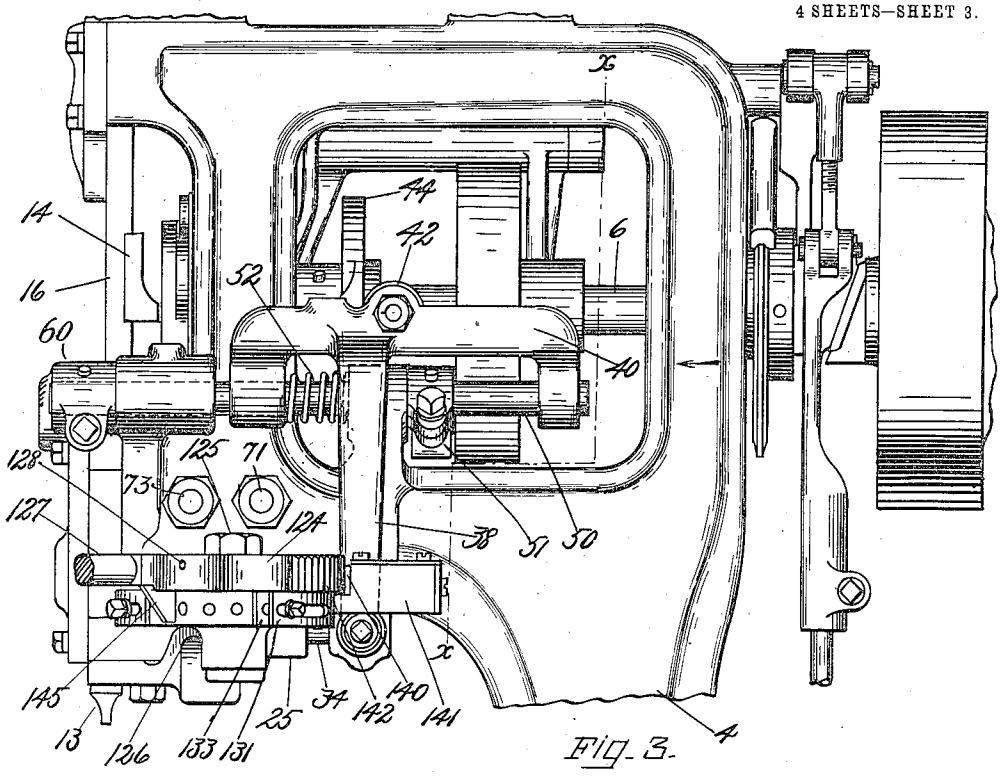

Fig. 3.

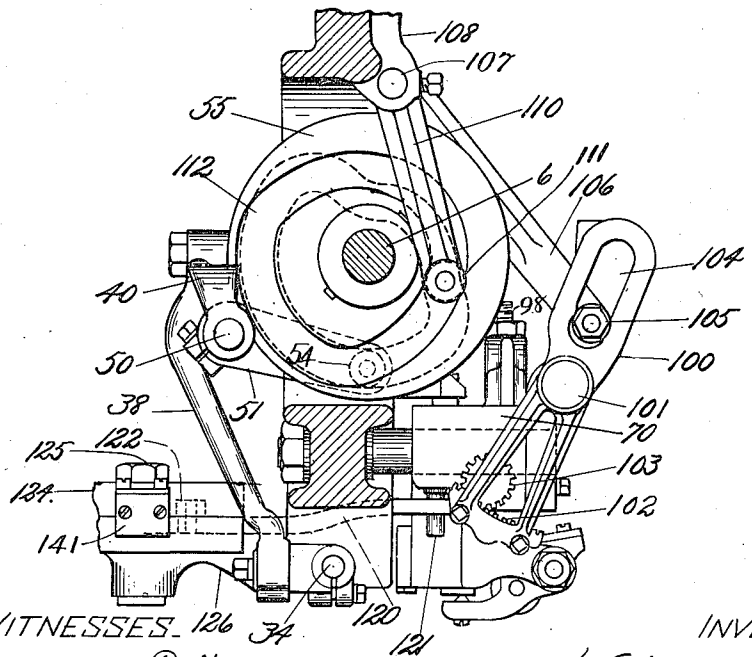

Fig. 4.

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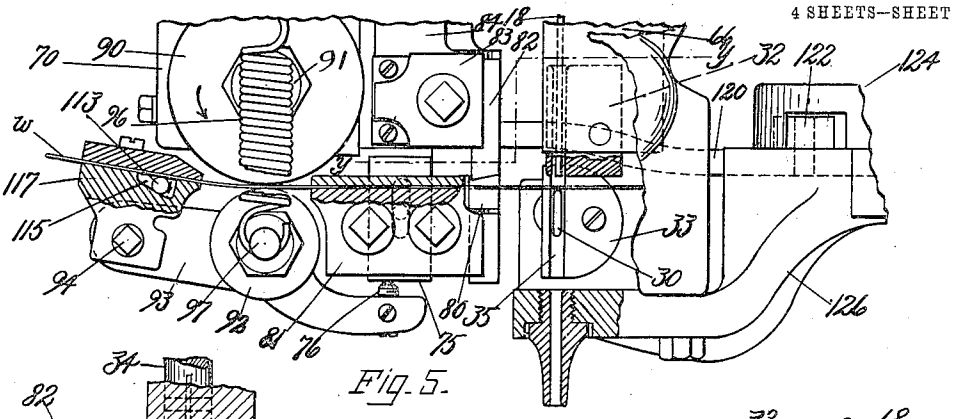

Fig. 5.

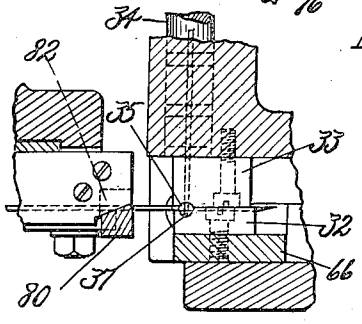

Fig. 6.

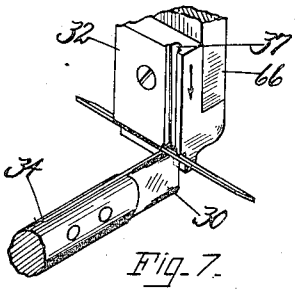

Fig. 7.

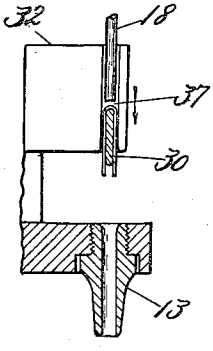

Fig. 8.

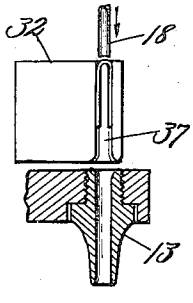

Fig. 9.

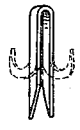

Fig. 11.

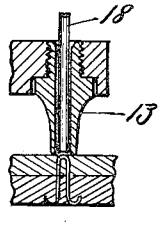

Fig. 10.

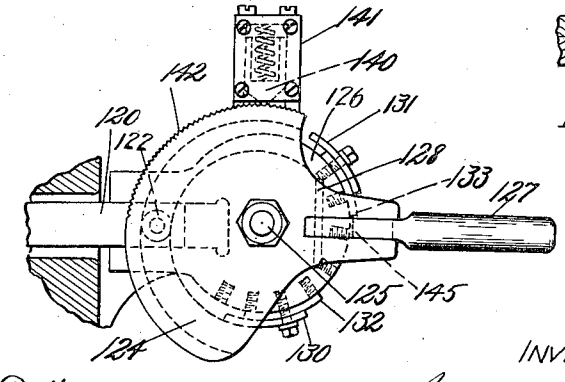

Fig. 12.

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UNITED STATES PATENT OFFICE.

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MACHINE FOR MAKING AND DRIVING STAPLES.

1,016,930. Specification of Letters Patent. Patented Feb. 13, 1912.

Application filed January 16, 1905, Serial No. 241,293. Renewed November 4, 1911. Serial No. 658,620.

To all whom it may concern:

Be it known that I, WILLIAM H. BORDEN, a citizen of the United States, residing at Winchester, in the county of Middlesex and Commonwealth of Massachusetts, have invented certain Improvements in Machines for Making and Driving Staples, 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 and particularly to machines which form staples from continuous material, such, for example, as wire, and drive them into stock.

More specifically, my invention relates to that type of machines in which wire is fed into position to be severed and bent to form a staple which is then driven into the stock.

In a commercial type of staple forming and inserting machine, herein illustrated, the wire-severing mechanism is mounted on a carrier which is adapted to be moved horizontally toward and from the staple forming dies to cause the severing mechanism to cut off pieces of wire of different lengths and thereby vary the length of the staples which are formed, and the extent of movement of the wire-feeding mechanism is governed by the position of said carrier relatively to the staple forming dies, so that said feeding mechanism will feed the wire for varying distances to cause the center of the severed pieces of wire to rest upon the inner die comprising one of the members of the staple forming dies.

One of the objects of my invention is to provide means for insuring that staples which are formed successively will be of uniform length and also that both legs of each staple will be of the same length, and to this end I have provided a wire-feeding mechanism which is not affected in its operation by the vibration of the machine and which is moved positively forwardly and backwardly to feed the wire accurately and uniformly. Improved means are also provided for governing the position with relation to the staple forming means, of the carrier on which the severing mechanism is mounted.

Another object of my invention is to provide improved means for actuating the cutter which severs the wire. As herein shown the wire-feeding mechanism is mounted on the movable carrier with the wire-severing mechanism. This feeding mechanism includes a rotatable feed roll which is operatively connected with a lever also mounted on the carrier, which lever is in turn connected to and actuated from a cam on the main shaft. This cam, or actuator, comprises a groove of uniform width throughout its length, thus providing a single means for moving the operating means positively in two directions, thereby oscillating the feeding mechanism forwardly and backwardly uniformly.

Other advantages of my invention will be hereinafter pointed out.

In the drawings, Figure 1 is a front elevation of the head of a staple forming machine embodying features of my invention; Figs. 2 and 3 are, respectively, elevations of the left and right hand sides of the head of the machine shown in Fig. 1; Fig. 4 is an elevation, partly in section, taken on the line *x*—*x* of Fig. 3 looking in the direction of the arrow; Fig. 5 is an enlarged detail, in front elevation, showing the severing mechanism and the dies which bend the wire into staple form; Fig. 6 is a horizontal sectional view taken on the line *y*—*y* of Fig. 5; Fig. 7 is a detail perspective view of the staple forming dies looking from the rear of the machine; Fig. 8 is a detail view in front elevation of the staple forming dies, the driver, and the throat block; Fig. 9 is a view similar to Fig. 8 but with the outer die at the end of its downward movement and with the inner die retracted; Fig. 10 is a detail view showing a staple driven into a piece of stock; Fig. 11 is a perspective view of a staple such as is formed in the machine herein shown; and Fig. 12 is a plan view of the mechanism which governs the position of the carrier on which the wire-feeding mechanism and the severing mechanism are mounted.

Referring to the drawings, which show a machine embodying the preferred form of my invention, 2 designates a base or standard which supports the head 4, having mounted therein a main shaft 6 provided with fast and loose pulleys 8 and 10. A lug 11 on a cam 12 on the front end of the main shaft coöperates with a block 14 on the driver bar 16 for elevating said bar and

the driver 18 connected thereto after they have been depressed by the spring 20, such as is commonly used in machines of this type.

The wire *w* from which the staples are formed is supported in a reel 22 carried by an arm 24 fastened to the head of the machine, and said wire is drawn from the reel by feeding mechanism hereinafter described and fed into position to be severed and bent into the form of a staple. The mechanism for bending the wire comprises an inner die or mandrel 30 over which the wire is fed, as shown in Fig. 7, and an outer die or former 32 that moves downwardly after the wire has been severed and bends the severed pieces of wire down over the inner die 30, as shown in Figs. 8 and 9. Said inner die is fastened on the end of a rod 34 which is movably mounted in a stationary guide 25 depending from the head of the machine, and adjustably fastened to said rod is an arm 38 which projects downwardly from a carriage 40. The carriage 40 is slidingly mounted on a rockshaft 50 supported in bearings on the head of the machine, and said carriage is provided with a roller 42 that coöperates with a face cam 44 on the main shaft, said cam operating to move the carriage and the inner die or mandrel 30 rearwardly after the staple has been formed, so as to carry said die out of alinement with the driver 18, as shown in Fig. 9, said driver then descending and driving the staple through the outer die 32 and throat block 13 into the stock, which is held against the bottom of said throat block, as shown in Fig. 10. A block 33, see Figs. 5 and 6, is fastened to the head of the machine and is provided with a groove 35 which coöperates with a groove 37 in the outer die to form a passageway for the driver 18. The carriage 40 is moved forwardly, to place the inner die 30 in operative position in alinement with the outer die 32, by means of a coiled spring 52 that surrounds the shaft 50 between a stationary abutment on the head and a portion of said carriage, see Fig. 3.

The outer die 32 is mounted in a guideway formed in the head of the machine, and any suitable actuating means therefor may be employed. A convenient means comprises an arm 60 fastened to rockshaft 50 and having a bifurcated end 62 which embraces a block 64 pivotally connected to the slide 66 which carries the outer die, see dotted lines in Fig. 1. A second arm 51 is attached to said rockshaft and is provided with a roller 54 which enters a groove formed in a cam block 55 on the main shaft, whereby the shaft 50 will be rocked positively in both directions for causing the arm 60 to elevate and depress the slide 66 which carries the outer die. With mechanism of this description only a small degree of power is expended in actuating the outer die, as there is a direct connection between the slide 66 and the arm 60.

In order that staples of different lengths may be formed, the cutting mechanism is mounted on a carrier 70 which is movable horizontally toward and from the inner die 30 over which the wire is bent to form a staple, and for insuring that both legs of the staple will be of the same length the degree of movement of the wire-feeding mechanism is governed by the position of said carrier relatively to the staple-forming dies so that the wire will be fed for varying distances to cause the center of the severed piece of wire to rest upon the inner die. The carrier is slidingly mounted on stationary rods 71 and 73 fastened to the head, and when said carrier is moved to the left, viewing Fig. 1, the cutting mechanism will be carried away from the inner die and a longer piece of wire will be severed, the degree of movement of the feeding mechanism being simultaneously automatically increased to feed more wire, so that the center of the piece of wire which is severed will rest upon the inner die and thus insure both legs of the staple being of the same length. When the carrier is moved to the right, viewing Fig. 1, the severing mechanism will be brought nearer to the inner die and a shorter piece of wire will be severed, the degree of movement of the feeding mechanism being simultaneously automatically decreased to feed less wire.

The severing mechanism comprises a stationary cutter 80 fastened to the carrier by a clamping plate 81, and a movable cutter 82 fastened by a clamp 83 to a cutter carrier bar 84 which is provided with a hook-shaped end 85 that engages an L-shaped piece 86 on the actuator bar 87. Said actuator bar is slidingly mounted in a guideway in the head and is provided with rollers 88 and 89 which coöperate with the cam 12 on the main shaft, said cam operating to move the actuator bar, and consequently the cutter bar, positively in both directions, the connection formed by the L-shaped piece and the hook-shaped end on the cutter bar permitting said cutter bar to move laterally with the carrier 70 in which it is mounted. This forms a very efficient method of actuating the movable cutter as the actuator bar and the cutter-carrier bar both move in the same direction, so that very little power is required for moving the cutter-carrier bar.

The mechanism for feeding the wire comprises a roll 90 mounted on the end of an oscillating shaft 91 supported in the carrier 70 and an idle roll 92 mounted on a stud 97 in a bearing 93 which is pivotally connected by a bolt 94 to the carrier. The feed roll 90 is provided with a corrugated groove 95

for receiving the wire, and the idle roll is held yieldingly in engagement with said feed roll, so as to hold the wire in the groove therein by means of a spring 96 which is fastened at its lower end to the stud 97 and at its upper end to an adjustable bolt 98 in the carrier. After the feed roll 90 has been moved forwardly in the direction of the arrow in Fig. 5 to feed the wire it is then moved backwardly preparatory to the next feeding operation, and during the backward movement of said roll the idle roll 92 is separated from the feed roll to release the wire, this being effected by a plunger 75 movably mounted in the carrier 70, as shown in Fig. 5, and adapted to be engaged by the lower end of the cutter carrier bar and moved into contact with an adjustable stop 76 in the bearing 93, so as to rock said bearing on its pivot to carry the idle roll out of engagement with the feed roll. For preventing the wire from moving during the backward movement of the feed roll, a check roller 113 is freely mounted in a tapered slot 115 formed in a wire guide 117, so that any backward movement of the wire will cause said roller to move to the narrow portion of said slot and firmly grip the wire.

The means for operating the feed roll shaft comprises a lever 100 fulcrumed on a stud 101 in the carrier 70 and having at its lower end a segment 102 which meshes with a gear 103 fastened to the feed roll shaft. Said lever is provided at its upper end with a slot 104 which receives a roller 105 fastened to an arm 106 that is connected to a rock-shaft 107 mounted in bearings 108 on the head of the machine, and fastened to said shaft is a second arm 110 provided with a roller 111 which travels in a groove 112 in the cam block 55 on the main shaft, forming an actuator. With this mechanism rotary movement of the main shaft imparts through the use of a simple means an oscillating movement to the arm 106 for causing lever 100 to rock the feed roll shaft positively forwardly and backwardly. The positive movement in both directions which is imparted to the feed roll prevents it from overthrowing, and thereby feeding more wire than is required, and also insures a feeding mechanism which will not be affected in its operation by the vibration of the machine.

As the rockshaft 107 is mounted in the head of the machine, the extent of movement of arm 106 will be uniform at each cycle of operations of the machine, and as the lever 100 is fulcrumed on the carrier, movement of said carrier will change the relation of pivotal point 101 to the path of movement of roller 105 so that the full extent of the oscillation of arm 106 will be transmitted more or less directly to lever 100. It is obvious that if pin 101 be placed in alinement with rock-shaft 107 and roller 105 the end of lever 100 which carries segment 102 will receive the greatest possible oscillation from the movement of arm 106. Also if pin 101 be placed in such position that a line passed through it and roller 105 is at right angles to arm 106, segment 102 will be given its least possible oscillation from the movement of arm 106. Consequently when carrier 70 is moved to the right, viewing Fig. 4, the three points mentioned will be brought more nearly into alinement, segment 102 will be moved through a greater arc and feed roll 90 will be actuated to feed the wire through a greater distance. If the carrier be moved in the opposite direction, the three points will be brought more nearly into their right angular position and the wire will be fed through a shorter distance.

The means herein shown for actuating the carrier 70 comprises a link 120 fastened to a downwardly projecting pin 121 on the carrier, see Fig. 4, said link being provided at its other end with a roller 122 which enters a cam groove formed in a controlling plate 124 (Fig. 12). The controlling plate is fulcrumed on a stud 125 in a bracket 126 projecting from the right-hand side of the head of the machine, and a handle 127 which is pivotally connected at 128 to said plate provides a means for moving said plate to cause the cam groove therein to impart movement to the link for actuating the carrier 70. The controlling plate and carrier are prevented from accidental movement by means of a spring-pressed dog 140 mounted in an extension 141 of the bracket 126 and adapted to engage teeth 142 formed in the edge of the controlling plate. Stops are provided for limiting the movement of the controlling plate so that the carrier may be quickly moved into the correct position for producing staples of a predetermined length without calculation by the operator. The machine herein shown is provided with four stops, which enable the operator to quickly move the carrier into position for producing four different lengths of staples, said stops comprising plates 130, 131, 132 and 133 which are adjustably fastened to the bracket 126. The stops 130 and 131 are superimposed upon the stops 132 and 133 respectively and limit the movement of the controlling plate for positioning the carrier to produce the longest and shortest staples to be formed. The handle is provided with a toe 145, and when said handle is in its normal position said toe will coöperate with the stops 132 and 133, but by swinging said handle upwardly on its pivot the toe 145 will be moved out of alinement with the stops 132 and 133 and will then coöperate with stops 130 and 131 when the controlling plate is oscillated. As the controlling plate is locked in any position to which it may be

adjusted there is no liability of its moving accidentally so as to move the carrier and thus change the length of the staples which are being formed, and as said plate imparts a positive movement to the carrier its position relatively to the staple-forming dies is accurately governed.

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

1. In a machine for inserting fastenings, the combination with means for severing fastenings from a wire, of means for feeding a proper length of wire to form the fastening comprising a rotatable wire feeding roll, operating means connected therewith, and means to insure feeding of a predetermined length of wire comprising means to oscillate said feeding roll through said operating means positively forwardly and backwardly said wire feeding means having provision for varying the amount of the positive oscillation.

2. In a machine for inserting fastenings, the combination with means for severing fastenings from a wire, of means for feeding a proper length of wire to form a fastening comprising a rotatable wire feeding roll, operating means connected therewith, and means to insure feeding of a predetermined length of wire comprising an actuator for said operating means constructed and arranged to oscillate said means positively forwardly and backwardly said wire feeding means having provision for varying the amount of the positive oscillation.

3. In a machine of the class described, wire-feeding mechanism including a rotatable feed roll, operating means connected therewith, an actuator for said operating means constructed and arranged to oscillate said means positively forwardly, and backwardly, and means for varying the extent of movement imparted to said mechanism.

4. In a machine of the class described, staple forming means, wire feeding wheels, means for causing said wheels to move in unison, operating means for moving positively in both directions one of said feeding wheels, forwardlly with the wire and backwardly over the wire, and actuating means for said operating means constructed to hold and lock positively said operating means at the end of its forward stroke to prevent any excess of feeding movement of said feeding wheels said actuating means and said operating means being connected with provision for varying the amount of the positive movement.

5. In a machine of the class described, staple forming mechanism, wire feeding mechanism, a single means for actuating said wire feeding mechanism positively in one direction to feed the wire and positively in the reverse direction preparatory to each feeding operation, wire cutting means, and means for effecting simultaneously both an adjustment of said wire feeding mechanism and its positive actuating means to cause a different length of wire to be fed and a corresponding relative adjustment of the cutting means and the staple forming mechanism to keep the legs of the staple equal.

6. In a machine of the class described, staple-forming mechanism, a carrier movable relatively to said mechanism, wire-feeding mechanism mounted on said carrier, a lever mounted on said carrier and operatively connected with the feeding mechanism, and a single means for actuating said lever positively in two directions.

7. In a machine of the class described, a movable carrier, a shaft sustained by said carrier and provided with a feed roll, a lever mounted on said carrier, a connection between one end of said lever and said shaft, means for actuating said lever and a loose pivotal connection between the other end of said lever and its actuating means, said connection affording provision for nonpivotal relative movement of the connected parts when in predetermined positions and being so arranged with respect to the direction of movement of said actuating means that a movement of the carrier varies the extent of movement imparted to the lever.

8. In a machine of the class described, a movable carrier, a shaft sustained by said carrier and provided with a feed roll, a lever mounted on said carrier, a connection between one end of said lever and said shaft, means for actuating said lever, and a pin-and-slot connection between the other end of said lever and its actuating means so arranged with respect to the direction of movement of said actuating means that a movement of the carrier varies the extent of movement imparted to the lever.

9. In a machine of the class described, staple-forming mechanism, a carrier, a shaft mounted in said carrier and provided with a pinion and a feed roll, a slotted feed-actuating lever mounted on said carrier and having rack teeth at one end which coöperate with said pinion, a positively-actuated lever mounted on a stationary fulcrum and provided at its lower end with means for engaging the slot in the feed-actuating lever, and means for moving said carrier toward and from the staple-forming mechanism to vary the extent of movement which is imparted to said feed-actuating lever.

10. In a machine of the class described, staple-forming dies, a movable carrier provided with wire-feeding and wire-severing mechanism, and means for controlling the position of said carrier relatively to said dies comprising a movable member, a connection between said carrier and movable member, a plurality of sets of stops for

limiting the movement of said movable member, and a device carried by said movable member and movable independently thereof, constructed to engage with any one of said stops at the will of the operator.

11. In a machine of the class described, staple-forming dies, a movable carrier provided with wire-feeding and wire-severing mechanism, and means for controlling the position of said carrier relatively to said dies comprising a movable member, a connection between said carrier and movable member, a plurality of sets of stops for limiting the movement of said movable member, and a movable handle carried by said movable member and adapted to cooperate with one set of stops when the handle is in one position and with a different set of stops when the handle is in a different position.

12. In a machine of the class described, staple-forming dies, a movable carrier provided with wire-feeding and wire-severing mechanism, an oscillating controlling plate provided with a cam for governing the position of said carrier relatively to said dies, a connection between said cam and carrier, a plurality of sets of adjustable stops for limiting the movement of said controlling plate, and a handle for moving said controlling plate constructed and arranged to coöperate with any one of said stops at the will of the operator.

13. In a machine of the class described, staple-forming dies mounted in the head of the machine, a carrier provided with wire-feeding and severing mechanism, a controlling plate provided with a cam and pivotally mounted on a bracket on the head, a connection between said cam and carrier, a plurality of sets of stops adjustably fastened to said bracket for limiting the movement of said controlling plate, and a movable handle carried by said controlling plate and adapted to coöperate with one set of stops when the handle is in one position and with a different set of stops when the handle is in a different position.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM H. BORDEN.

Witnesses:
WELLS L. CHURCH,
ARTHUR L. RUSSELL.