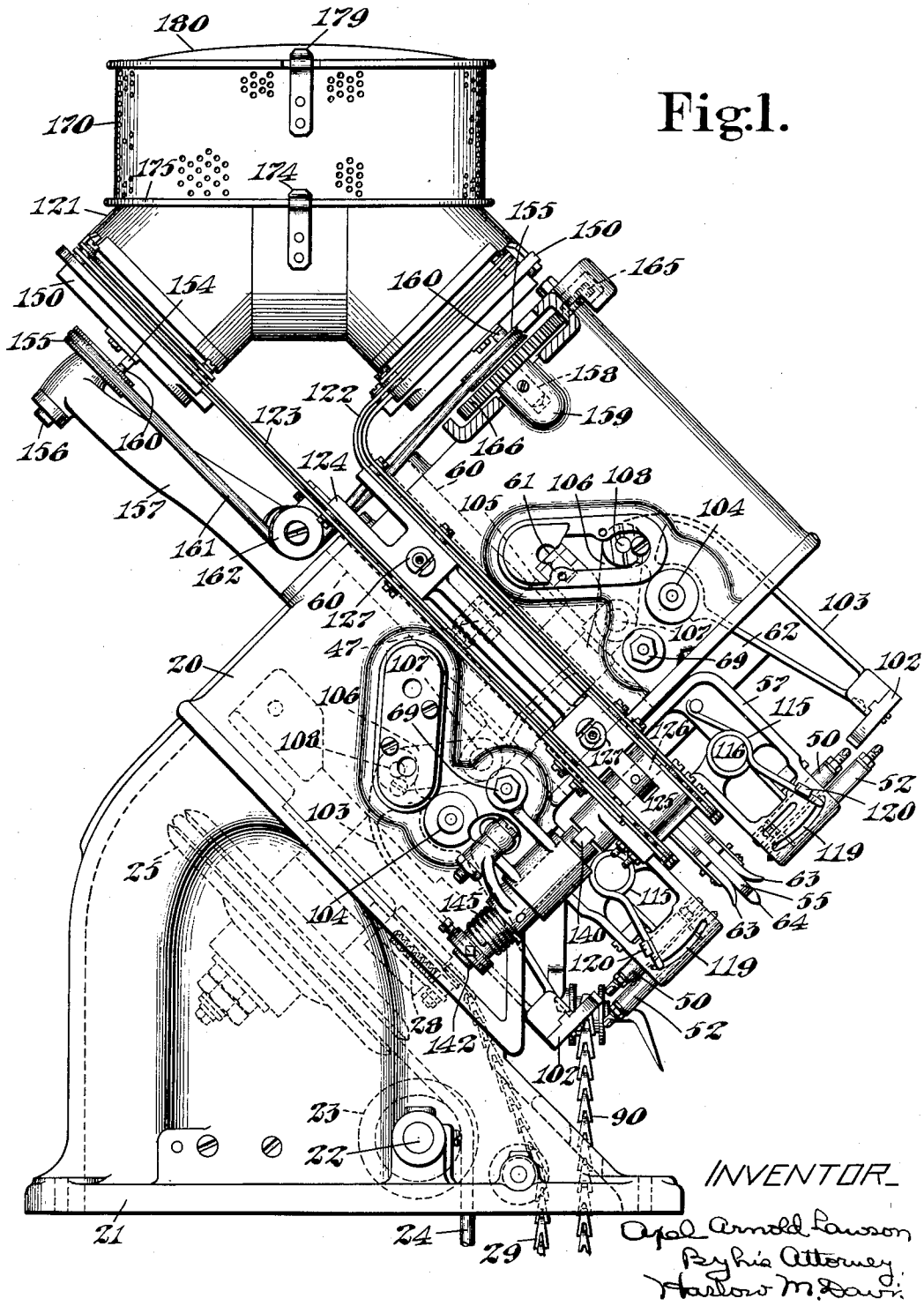
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FASTENER INSERTING MACHINE

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Fig.1.



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FASTENER INSERTING MACHINE

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Fig.2.

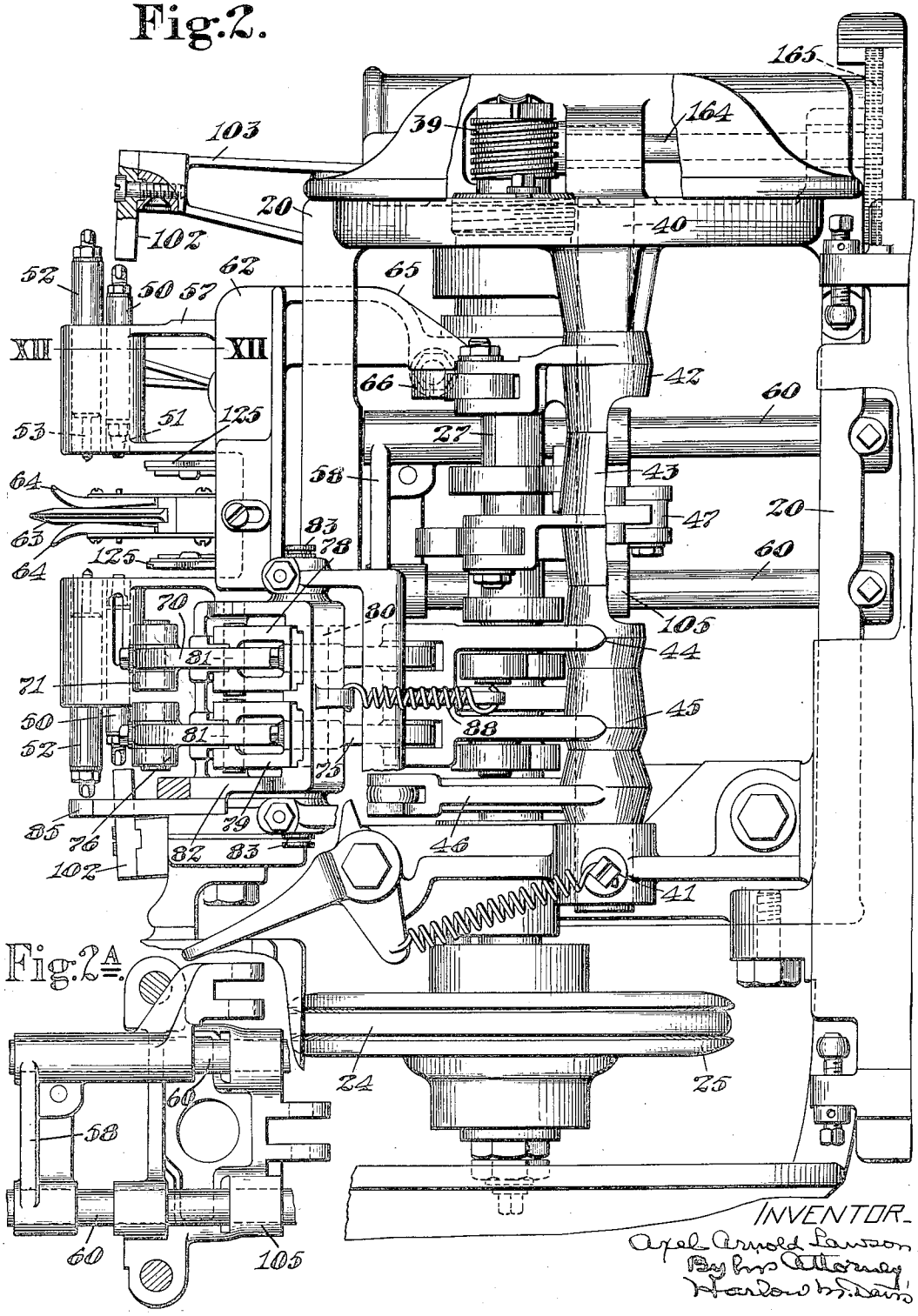


Fig.2A.

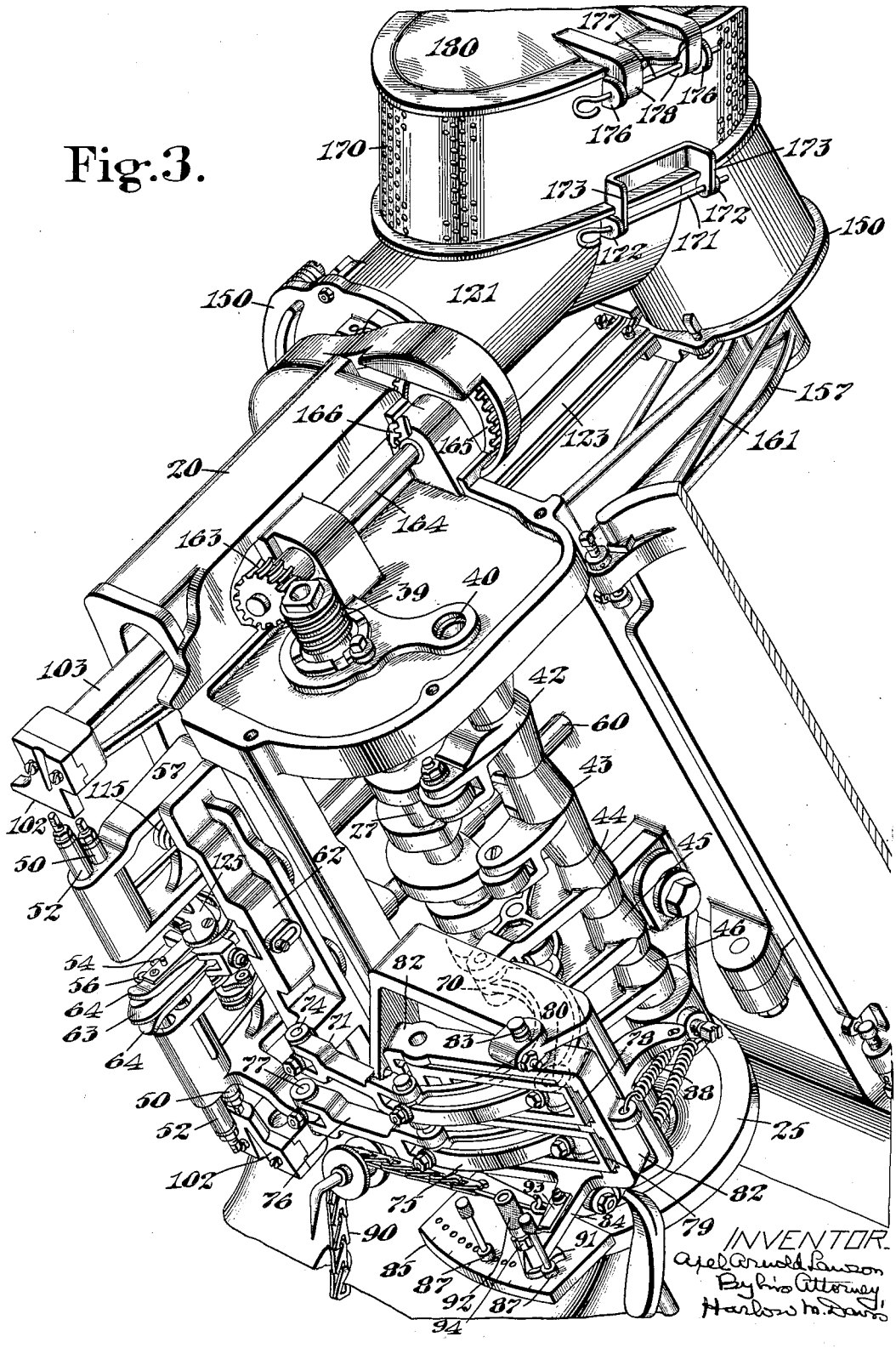
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FASTENER INSERTING MACHINE

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Fig. 3.



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FASTENER INSERTING MACHINE

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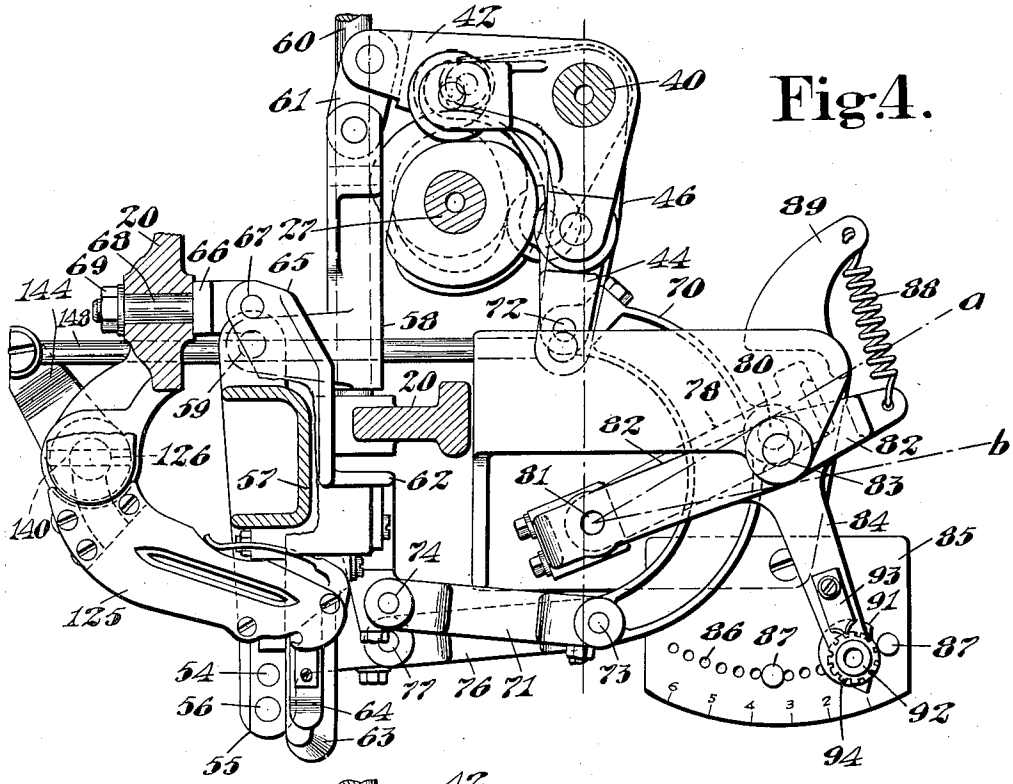


Fig.4.

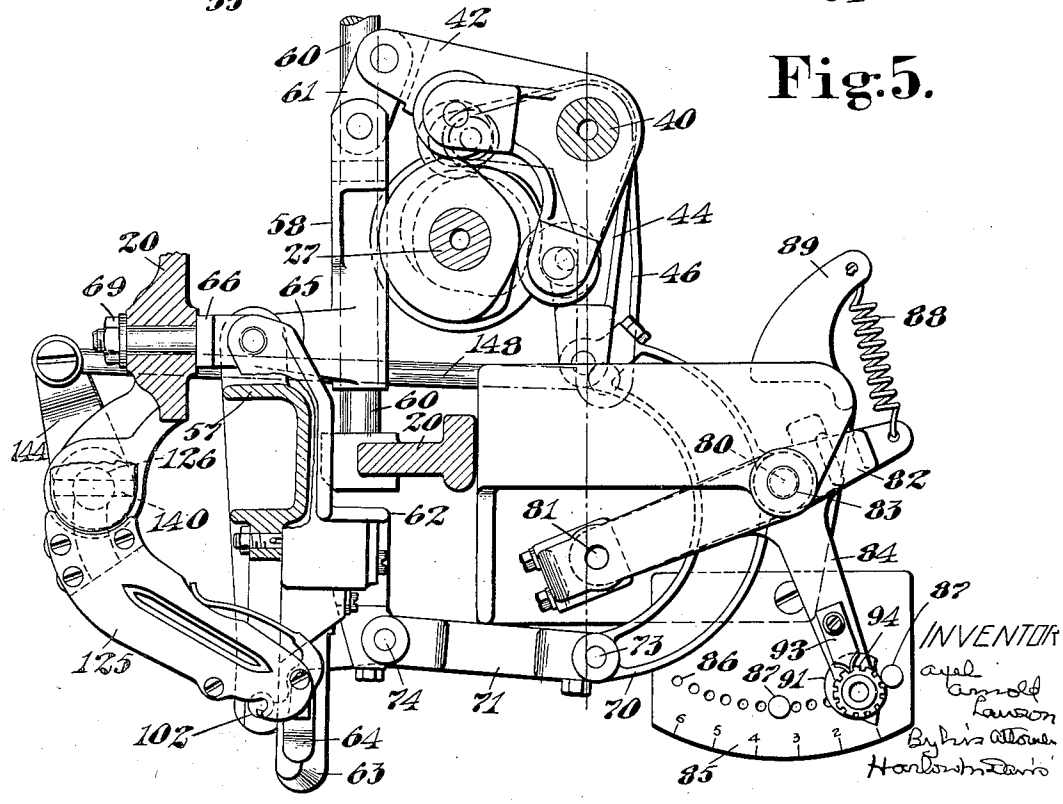


Fig.5.

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FASTENER INSERTING MACHINE

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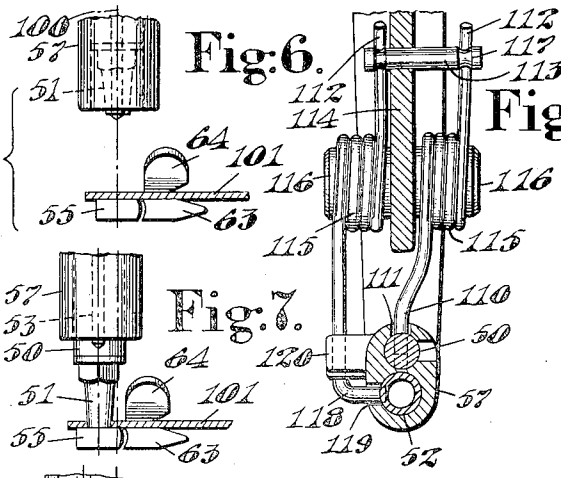


Fig:6.

Fig:7.

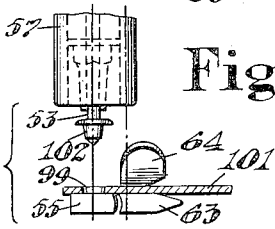


Fig:8.

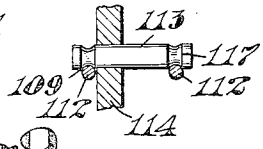


Fig:9.

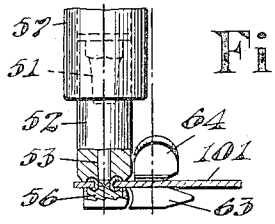


Fig.10.

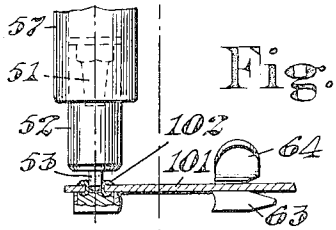


Fig.11.

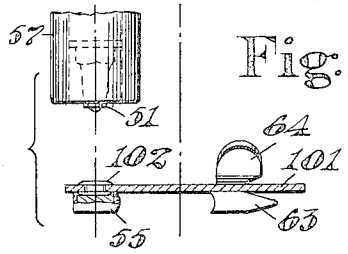


Fig:12.

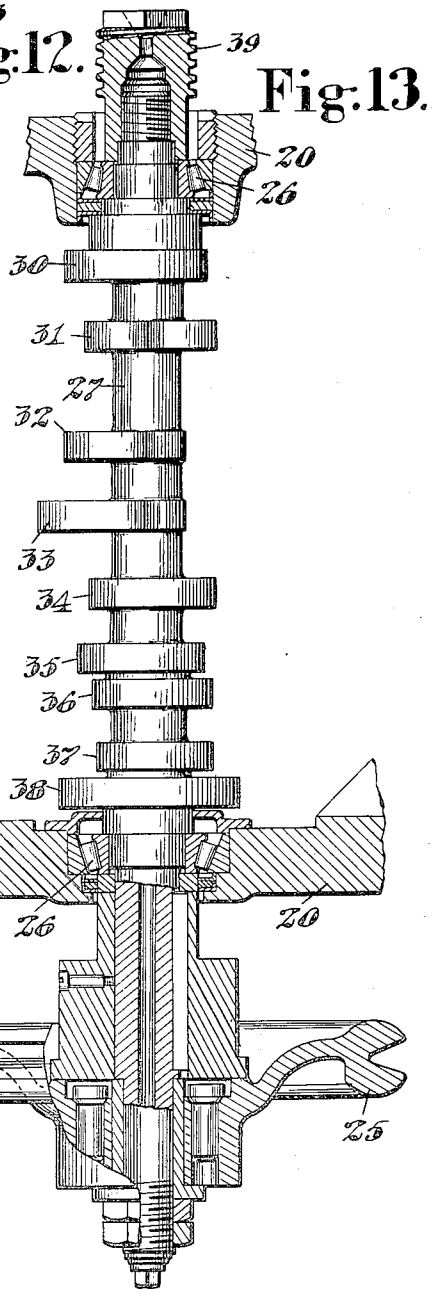


Fig:13.

Fig:12A.

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FASTENER INSERTING MACHINE

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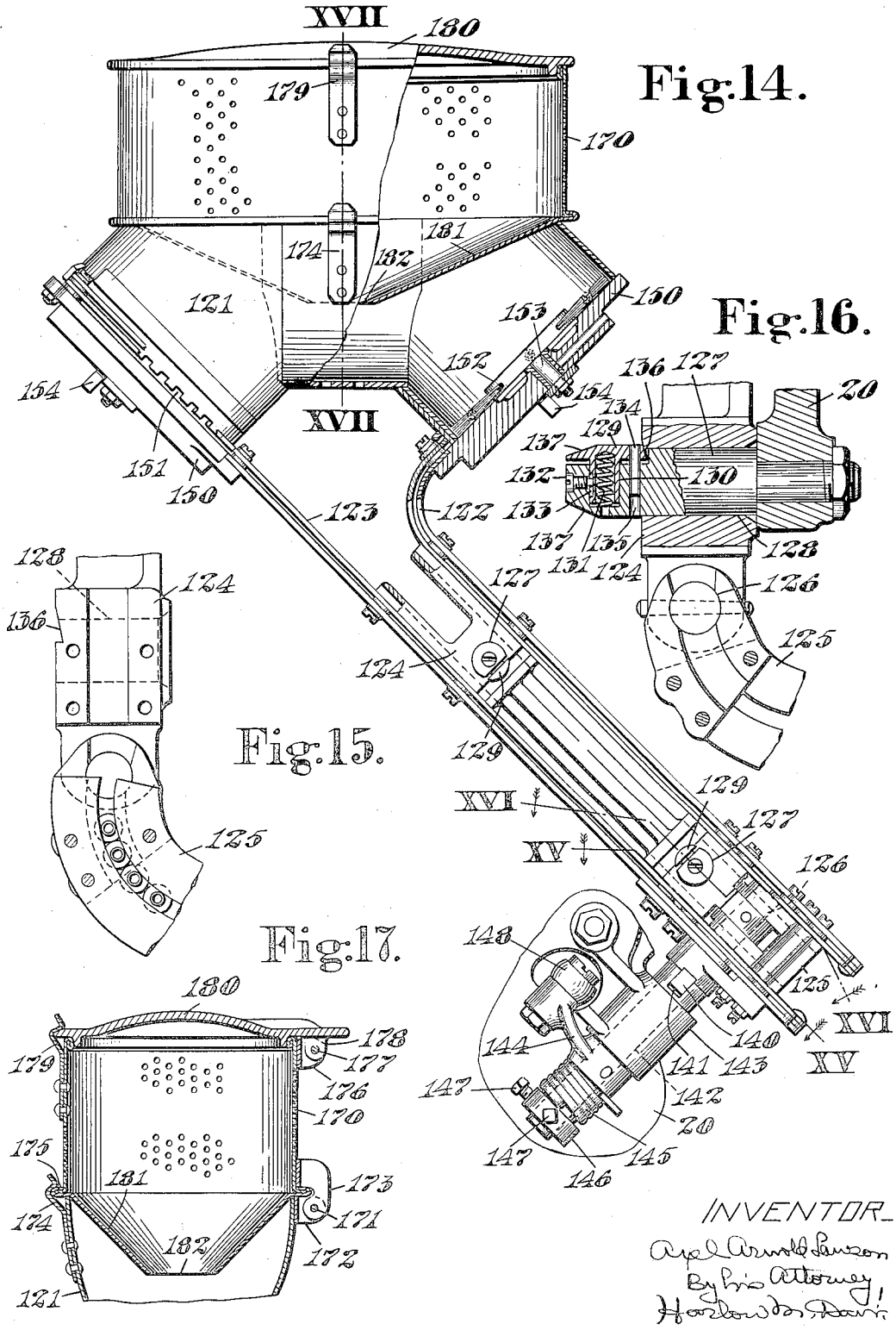


Fig.14.

Fig.16.

Fig.15.

Fig.17.

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Patented May 8, 1934 1,957,463

UNITED STATES PATENT OFFICE

1,957,463

FASTENER-INSERTING MACHINE

Axel Arnold Lawson, Beverly, Mass., assignor to United Shoe Machinery Corporation, Paterson, N. J., a corporation of New Jersey

Application September 20, 1932, Serial No. 633,973

32 Claims. (Cl. 218—15.2)

This invention relates to fastener-inserting machines of the type in which automatic mechanism feeds the work to space successive fasteners of a series one from another. The invention is herein illustrated as embodied in a duplex eyelet-inserting machine, so called because it is provided with two groups of tools arranged and operated to insert two eyelet simultaneously, for example, one in each of the quarters of a shoe-upper, but it is to be understood that the invention is not limited to machines of the duplex type nor to any specific type of fastener.

An object of the invention is to provide an improved fastener-inserting machine in which the work may be fed continuously, instead of intermittently as heretofore, to space successive fasteners one from another, to the end that the conditions of operation may be more favorable to accurate guiding of the work in consequence of eliminating jerking thereof.

In former machines provided with work-feeding mechanism in combination with mechanism for inserting and clenching the barrels of tubular fasteners such as eyelets, the work remains stationary through a period of about five-sixths of each cycle, during which the punching mechanism and the fastener-inserting mechanism are operated. The remainder of each cycle is devoted to feeding the work, but is so short that the work cannot be fed without a sudden jerk. From an operator's standpoint such conditions are disagreeable and militate against accurate control in the guidance of the work. Although many operators would like machines capable of operating at speeds as high as 500 R. P. M., few machines, if any, will operate satisfactorily at speeds above 350 R. P. M. Even when operating at a speed of only 300 R. P. M. one-sixth of a cycle occupies only 1/30 of a second of time and is not all that could be desired for work-feeding purposes. Nevertheless, when, as in former machines, the punching of the holes and the inserting and clenching of the fasteners must be done at other times than while the work is being fed, the period of time allotted to each operating motion must be limited accordingly, with the result that the punching mechanism and the fastener-inserting mechanism, as well as the work-feeding mechanism, must be operated very suddenly and rapidly.

In recognition of these conditions, another object of the present invention is to provide an improved fastener-inserting machine in which greater proportions of each cycle than formerly shall be available for punching fastener-receiving holes in the work and for inserting and clenching tubular fasteners.

Consistently with the objects above set forth, the machine herein illustrated comprises work-feeding mechanism constructed and arranged to impart continuous feeding movement to a work-piece through a series of consecutive cycles of operation, automatic means arranged to punch a series of fastener-receiving holes, one in each cycle, in the work-piece, and automatic means arranged to insert and clench a tubular fastener in each of said holes while the work-piece is being fed by said mechanism.

The general organization of the machine herein illustrated is similar to that shown and described in the pending application of S. L. Gookin, Serial No. 469,432, filed July 21, 1930, but the work-feeding mechanism in the present machine is organized to feed the work continuously through any desired number of machine cycles. On the other hand, the machine shown in the above-mentioned Gookin application is provided with mechanism that feeds the work intermittently with appreciable dwells between the feeding steps. Although, in many respects, the two machines are fundamentally of the same type, a brief preliminary outline of my present work-feeding mechanism will not only aid the detailed description that follows, but will also facilitate an understanding of the manner in which the elements cooperate.

The machine herein illustrated comprises two cooperatively related work-feeding units arranged in tandem relation with respect to the direction of feeding movement. These units are reciprocated in non-synchronized relation, that is, each executes a backward stroke while the other is executing a feeding stroke, but preferably each begins its feeding stroke before the feeding stroke of the other is quite finished, to the end that no interruption shall occur in the travel of the work-piece at any intermediate point in a series of cycles. One of the work-feeding units of the illustrated machine includes a punching device and a fastener-inserting device arranged side by side in a carrier by which they are reciprocated laterally and by which the fastener-inserting device is shifted into register with the fastener-receiving hole made in the work-piece by the punching device. These devices are operated successively during each feeding stroke of the feeding unit of which they are parts. The fasteners are picked from a raceway by the fastener-inserting device while the

latter is moving laterally, the raceway being stationary at that instant.

The other work-feeding unit of the illustrated machine includes a work-support and a presser-foot that clamp the work-piece with sufficient pressure to insure feeding the latter, but not sufficient to distort, disarrange or tear the work-piece when they move counter to the direction of feeding movement. These elements correspond, in one sense, to the stationary work-support and the presser-foot of the machine shown in said Gookin application, but because my present invention utilizes them to impart feeding movement to the work-piece they are instrumental in rendering the travel of the work continuous. Moreover, the motions of the work-feeding units are coordinated to maintain a constant rate of travel of the work.

The two work-feeding units, as illustrated herein, are operated by two individual trains of mechanism that provide not only for properly non-synchronized operation but also for regulation of the length of the individual feeding strokes of each, to the end that the spacing of the fasteners, one from another, may be varied as desired. In addition, these trains of mechanism are so organized that both may be regulated simultaneously by an adjustable regulator common to both, with the result that whenever a change of regulation is made it will affect both work-feeding units equally. Consequently, with every adjustment of the regulator, the speed of the work-piece will be constant.

The invention also comprises various other improvements that are hereinafter described and claimed. Such improvements as relate to the mechanism for supplying the fasteners form the subject-matter of a divisional application Serial No. 663,786, filed March 31, 1933.

Referring to the drawings,

Fig. 1 is a left side elevation of a duplex eyelet-inserting machine constructed in accordance with this invention;

Fig. 2 is a right side elevation on a larger scale of the principal operating mechanisms, the view being squared relatively to the sheet for convenience in making the drawing;

Fig. 2*a* is a side elevation of two individually movable slides the left-hand one of which carries the punching and fastener-inserting assemblage, and the other of which is an element of the mechanism for operating the punching devices and the fastener-inserting devices;

Fig. 3 is a frontal and right side perspective view of the mechanisms included in Fig. 2;

Fig. 4 is a sectional view in an inclined plane looking down on the work-feeding mechanism and the delivery end of the raceway, the parts occupying their initial positions;

Fig. 5 is a view similar to Fig. 4 except that some of the parts stand in different positions corresponding to that point in the machine cycle when eyelets are picked from the raceway;

Figs. 6 to 11, inclusive, are front views of the work-engaging elements of the work-feeding mechanism, the views in this series representing successive positions of the parts in the execution of a cycle of motions;

Fig. 12 is a sectional view, the plane of which is indicated by the line XII—XII on Fig. 2;

Fig. 12*a* is a front view of a pin shown in Fig. 12;

Fig. 13 is an elevation, partly in section, of the cam-shaft and clutch assembly;

Fig. 14 is a left side elevation, partly in section, of a detachable raceway and hopper unit in cooperative relation to a portion of the raceway-operating mechanism;

Fig. 15 is a plan view looking down on the articulated or jointed sections of the raceway, the plane of the view being indicated by line XV—XV on Fig. 14;

Fig. 16 is a sectional view looking down on one of the raceway-latching devices intersected by line XVI—XVI on Fig. 14; and

Fig. 17 is a vertical section through the hopper in the plane indicated by the line XVII—XVII on Fig. 14.

Referring first to Fig. 1, the machine comprises a hollow main frame 20 open at the front and formed with a flat base 21 adapted to stand on a bench (not shown). The frame 20 is provided with a stationary horizontal shaft 22 on which two idlers, one represented at 23, are mounted to guide a driving belt 24 to a receiving pulley 25 forming a part of a disconnectible driving clutch, the pulleys 23 and 25 being enclosed in the frame 20, and the base 21 having an opening through which the belt extends.

As shown in Fig. 13, the frame 20 is provided with bearings 26 in which a cam-shaft 27 is journaled, the pulley 25 and the disconnectible clutch being mounted on the lower end of this shaft. Although any suitable type of clutch may be used, that illustrated is of the type in which the pulley 25 is in continuous rotation but is initially disconnected from the cam-shaft and may drive the cam-shaft through one or more cycles at the will of the operator. Control of the clutch is afforded by a spring-pressed controlling pin 28 (Fig. 1) and a flexible connection, such as a chain 29, leading therefrom to a treadle (not shown). The controlling pin 28 also serves to arrest rotation of the cam-shaft at a predetermined point in its cycle following release of the treadle.

Again referring to Fig. 13, the cam-shaft 27 is provided with a pair of companion cams 30 and 31 for shifting the punching devices and the fastener-inserting devices to the front and rear; a pair of companion cams 32 and 33 for operating the punching devices and the fastener-inserting devices alternately; a pair of companion cams 34 and 35 for operating one of the two cooperative work-feeding units; a pair of companion cams 36 and 37 for operating the other one of the cooperative work-feeding units; and a single cam 38 for operating the raceway. In addition, a worm 39 in the form of a nut is screwed on the upper end of the cam-shaft to operate a train of mechanism by which brushes, hereinafter described, are driven to discharge fasteners from a supply hopper.

Referring to Figs. 2, 3, 4, and 5, a rod or shaft 40 is arranged parallel to the cam-shaft 27, its upper and lower ends being inserted into sockets formed in the frame 20 and a set-screw 41 being screwed into the lower socket to secure the rod rigidly to the frame. This rod serves as a fulcrum for a series of operating levers strung thereon as follows: a bell-crank lever 42 provided with rollers that engage the cams 30 and 31 respectively; a bell-crank lever 43 provided with rollers that engage the cams 32 and 33 respectively; a bell-crank lever 44 provided with rollers that engage the cams 34 and 35 respectively; a bell-crank lever 45 provided with rollers that engage the cams 36 and 37 respectively; and a one-arm lever 46 provided with a roller that engages the raceway-operating cam 38. The roller of the lever 46 is maintained in contact with the

cam 38 by a spring 145 hereinafter described, but the bell-crank levers 42, 43, 44, and 45 are each operated positively in opposite directions by the companion cams with which they cooperate.

In accordance with the requirements of duplex eyelet-inserting machines, the machine herein illustrated is provided with two opposed coaxial punching devices and with two opposed coaxial fastener-inserting devices, these two pairs of devices being arranged side by side. Each punching device comprises a plunger 50 and a tubular punch 51 carried thereby, while each fastener-inserting device comprises a plunger 52 and a spring-pressed spindle 53 carried thereby, the function of the spindle being to pick eyelets presented thereto by a raceway through which the eyelets gravitate from a supply hopper. The punches cooperate with an intermediate punch-bed 54 (Fig. 4) which may be an integral area of a tongue 55 or, if preferred, a disk carried by the tongue and arranged in a socket formed therein. Likewise, the fastener-inserting devices 52 cooperate with an intermediate anvil or clenching element 56 which may be an integral portion of the tongue 55 or, if preferred, the disk carried thereby and inserted into a socket formed therein. In either event, the punch-bed 54 remains always in register with the punches, and the anvil 56 remains always in register with the devices 52.

Work-feeding mechanism

The punching device 50 and the fastener-inserting devices 52 are guided toward and from each other and are shifted laterally by a duplex head or carrier 57 to which the tongue 55 is affixed. Moreover, this movable assemblage consisting of the head 57 and the parts carried thereby constitutes one of the two cooperative work-feeding units by which continuous or uninterrupted feeding movement may be imparted to a work-piece. As shown in Figs. 4 and 5, the head or carrier 57 is carried by a slide 58 to which it is connected by a pivot pin 59, the axis of the pivot pin being parallel to the axes of the punching devices 50 and the fastener-inserting devices 52 and being behind those devices to provide for swinging movement of the head from side to side to feed the work. The slide 58 is supported and guided by two parallel rods 60 the ends of which are arranged in sockets formed in the frame 20. The slide initially occupies its forward position (Figs. 2 and 4) to maintain the punching devices in the desired position for punching, but immediately after the punches have been operated and retracted from the work the slide is shifted to the rear (Fig. 5) to place the fastener-inserting devices 52 in register with the holes that have just been formed in the work by the punches. Reciprocation of the slide 58 lengthwise of the rods 60 is derived from the bell-crank lever 42 to which it is connected by a link 61.

The other one of the aforesaid work-feeding units comprises a swinging head 62, a tongue 63 rigidly secured thereto, and a pair of spring-stressed work-clamping jaws 64 between which the tongue extends, one of the jaws 64 being arranged to cooperate with the tongue to clamp a quarter of a closed shoe-upper while the other one of the jaws cooperates with the tongue to clamp the other one of the quarters. A work-piece inserted between the jaws 64 and the intermediate tongue 63 is clamped continuously and without any relaxation of the clamping pressure. The head 62 of this unit is provided with upper and lower arms, the upper one of which is indicated at 65 in Figs. 2, 4, and 5, the lower one being obscured by other structure. These two arms are arranged, respectively, above and below the connection between the swinging head 57 and the slide 58. As shown in Figs. 4 and 5, the upper arm 65 is connected to a supporting stud 66 by a pivot-pin 67. The lower arm of this head is likewise connected to a supporting stud corresponding to that indicated at 66, the two connecting pivots being coaxial. The supporting stud 66 and the lower stud corresponding thereto are affixed to the frame 20 through which their shanks 68 extend to be set up tightly by clamping nuts 69.

It is to be observed in Fig. 4 that the axis of the pivot-pin 67 is directly behind the axis of the pivot-pin 59 that connects the swinging head 57 to the slide 58, and that the distance between those two axes is exactly equal to the distance between the axes of the punching devices and the fastener-inserting devices as represented by the punch-bed 54 and the anvil 56. Consequently, when the slide 58 is shifted to the rear, as hereinbefore explained, to place the fastener-inserting devices in register with the punched holes in a work-piece the axis of the pivot pin 59 will coincide with the axis of the pivot-pins 67 as represented in Fig. 5, to the end that both of the work-feeding units may swing about a common axis. Before the pivot-pin 59 is placed in coaxial relation to the pivot-pins 67, the work-piece derives its feeding motion solely from the right-hand work-feeding unit to which the pivot-pins 67 belong, but after the pivot-pin 59 has been placed in coaxial relation to the pivot-pins 67 the work derives its feeding motion from the left-hand work-feeding unit through the medium of the fastener-inserting devices which are operated to insert and clench fasteners immediately prior to the final stage of feeding movement of the right-hand unit. Stated otherwise, the left-hand unit is instrumental in feeding the work only when its axis of swinging movement coincides with the axis of the right-hand unit. Nevertheless, the two groups of work-engaging elements of the work-feeding units are moved laterally toward and from each other in consequence of being reciprocated in non-synchronized relation by mechanism now to be described.

Two individual trains of mechanism are provided for operating the work-feeding units respectively, the two trains being, to all intents and purposes, duplicates except the throws and timing of the cams that operate them. Moreover, both trains of mechanism are under control of a common regulator by which the amplitudes of motion of the two units may be simultaneously and proportionately altered to vary the distance between consecutive fasteners.

The motion for reciprocating the right-hand work-feeding unit comprising the work-clamping members 63 and 64 is derived from the bell-crank lever 44 (Figs. 2, 3, 4, and 5), while that for reciprocating the left-hand unit comprising the fastener-inserting devices is derived from the bell-crank lever 45. The operating parts that connect the lever 44 and the swinging head 62 comprise a floating lever 70 and a link 71, the levers 44 and 70 being connected by a pivot 72, the lever 70 and the link 71 being connected by a pivot-pin 73, and the link and the swinging head 62 being connected by a pivot-pin 74. In like manner, the operating parts connecting the bell-crank lever 45 and the swinging head 57 comprise

a floating lever 75 and a link 76 (Figs. 2 and 3), duplicates of the lever 70 and the link 71, the pivot-pin 77 connecting the link 76 and the head 57 being clearly shown in Figs. 3 and 4. The floating lever 75 of this train is omitted from Figs. 4 and 5 to avoid confusion, but its arrangement is shown in Figs. 2 and 3 and its pivotal connections are duplicates of those provided for the corresponding lever 70.

To provide for regulating the feeding motions of the swinging heads 62 and 57, the floating levers 70 and 75 are arranged to extend through hollow guiding links 78 and 79 respectively, the intermediate portions of the levers being connected to the links by individual pivot-pins, one of which is clearly shown in Fig. 4 and indicated at 80. These pivot-pins and the hollow links 78 and 79 by which they are carried are movable in operation about coaxial pins 81 that connect the hollow links to a hollow support and guide 82 that constitutes an adjustable feed-regulator. Under normal operating conditions, the feed-regulator 82 and the pivot-pins 81 remain stationary while the links 78 and 79 swing back and forth through an arc of variable limits indicated in Fig. 4 by dot-and-dash lines, *a* and *b*. These variable limits are determined by the position of the regulator 82.

The regulator 82 is connected to the stationary frame 20 by trunnions 83 which constitute a fixed anchoring pivot, the axis of which is parallel to the axes of the floating pivots 80 and so located that at an intermediate point in each cycle these axes all coincide as represented in Fig. 5. Therefore, although both limits of movement of the work-feeding units are variable to regulate the amplitude of travel of the work, this axial coincidence of the floating pivots 80 with the stationary pivots 83 occurs, under all conditions of regulation, at a constant focal point in every cycle. Moreover, the operation of the fastener-inserting devices 52 is so timed as to cause the tips of the spindles 53 to enter the eyelets at the delivery end of the raceway exactly at this focal point. The significance of this coordination is that it insures register of the spindles with the eyelets about to be picked thereby, irrespective of changes of adjustment of the feed-regulator 82.

The feed-regulator 82 is provided with an arm 84 arranged to swing from side to side over a fixed gage-plate 85 in which a series of holes 86 are formed to receive two stop-pins 87, the pins being located respectively at the right and at the left of the arm. The arm is normally maintained against the right-hand pin 87 by a tension spring 88, one end of which is attached to the regulator and the other end to a fixture 89. When the pins 87 are apart to permit movement of the regulator, the latter may be shifted against the force of the spring 88 by a treadle (not shown) to which the arm 84 is connected by suitable means, such as a chain 90 (Figs. 1 and 3), relatively slow feeding movement of the work being the result of leaving the arm 84 against the right-hand pin 87 and relatively rapid feeding movement being the result of swinging the arm toward the left-hand pin. The pins are thus effective to establish two predetermined rates of feeding movement, both of which may be obtained alternately while the machine is running, as for example when it is desired to insert a predetermined number of fasteners of a series a relatively short distance apart and one or more subsequent fasteners of the series a greater distance apart.

To provide for increments of regulation finer than those afforded by the spacing of the holes 86, the arm 84 is provided with an eccentric cam 91 the periphery of which is arranged to abut against the pins 87. This cam is formed on or affixed to a spindle journaled in the arm 84, the upper end of the spindle being provided with a knob such as a knurled sleeve 92 by which the cam may be turned manually. A leaf-spring 93 secured to the arm 84 cooperates with a notched collar 94 to prevent accidental turning of the cam, the collar being affixed to the spindle to turn with the cam. The spring 93 is adapted to yield and to click over the teeth of the collar when the spindle is turned manually. The range of adjustment afforded by the cam 91 is about equal to the distance between the centers of the holes 86.

In the operation of the work-feeding mechanism, the pivot 72 connecting the levers 44 and 70 has an invariable length of reciprocatory motion, but the pivot 73 connecting the lever 70 and the link 71 has a variable length of motion according to the position of the regulator 82. The same is true also of the corresponding pivots of the lever 75. Although the levers 70 and 75 float with the hollow links 78 and 79, the actual fulcrum thereof is the pin or pins 81. Consequently, when this fulcrum is adjusted toward the rear ends of the levers 70 and 75 the forward ends of these levers receive greater motions from their operating cams, and vice versa.

Work-feeding cycle

The manner of cooperation of the two work-feeding units is pictured in Figs. 6 to 11 inclusive, these figures representing successive stages in a cycle of operation. To save space on the drawings, only the upper punch 51 and the upper fastener-inserting device 52 are represented, but it is to be understood that in machines of the duplex type the corresponding lower punch and fastener-inserting device will stand below the tongue 55 and will operate against the lower surface thereof. Moreover, these figures include only the upper work-clamping member 64 of the right-hand work-feeding unit, the corresponding lower work-clamping member 64 being omitted for the reason above pointed out.

The initial positions of the parts are represented in Fig. 6 in which the right-hand limit of lateral movement of the punch 51 is represented by a vertical dot-and-dash line 100. This line is extended through Figures 7 to 11 and may be regarded as a constant for purposes of comparison of the various positions represented in this group of figures. The element 101 in these figures represents a work-piece, such as the left-hand quarter of a shoe-upper. In duplex work, the right-hand quarter of an upper would underlie the tongue 55 and the intermediate clamping member 63 and would be clamped against the latter by the lower clamping member 64. The description will proceed with regard to the operations pertaining to the element 101 which may be the left-hand quarter of an upper, and will suffice to explain how the operations are performed on duplex work.

As hereinbefore stated, the clamping members 63 and 64 maintain continuous clamping pressure upon a work-piece interposed between them, this clamping pressure being sufficient to feed the work-piece but not being sufficient to prevent the work-piece from being fed relatively to them by the left-hand work-feeding unit. At the beginning of each cycle, the parts being in the

positions represented in Figs. 4 and 6, the right-hand work-feeding unit, of which the intermediate clamping member 63 is a part, is at an intermediate point in its work-feeding stroke from right to left. Moreover, at this point the left-hand work-feeding unit stands in its forward position (Fig. 4), the punch 51 being in register with the area of the work-piece that is about to be perforated to provide a fastener-receiving hole 99.

Proceeding with the cycle, both work-feeding units move from right to left, the work now being fed solely by the right-hand unit. Meanwhile, the punch 51 is operated to punch a hole 99 in the work-piece in process of being fed, this operation being represented in Fig. 7. The punch 51 is retracted immediately after completing its punching stroke, and during such retraction the left-hand work-feeding unit is shifted to the rear to place the fastener-inserting device 52 in register with the hole 99 just punched. Referring to Fig. 5 for the moment, the pivot 59 of the left-hand work-feeding unit now stands in coaxial relation to the pivot 57 of the right-hand work-feeding unit with the result that both feeding units swing about a common axis. At the instant when these two pivots are brought into coaxial relation, the eyelet 102 at the delivery end of the raceway stands in register with the punched hole 99 and the spindle 53, the fastener-inserting device being immediately moved toward the work-piece to thrust its spindle into the eyelet as represented in Fig. 8. The insertion of the tip of the spindle 53 into the eyelet 102 occurs while both work-feeding units are moving from right to left, the delivery end of the raceway being stationary at that instant, although not included in the figure.

The movement of the fastener-inserting device toward the work is not interrupted but continues until the eyelet on the spindle 53 has been inserted into the work-piece and clenched as represented in Fig. 9. Up to this point in the cycle, the work-piece has received all its feeding motion from the right-hand feeding unit, although the left-hand feeding unit has also been moving from right to left. Now, the eyelet having been inserted and clenched, the work-piece is under positive control of the left-hand work-feeding unit, the clenched eyelet being gripped by the fastener-inserting device 52 and the anvil 56. At this point in the cycle, the right-hand work-feeding unit is at the left-hand limit of its feeding motion and is immediately moved in the reverse direction while the left-hand unit continues to feed the work-piece to the left. In moving from left to right, the clamping members 63 and 64 slip or slide relatively to the work-piece without affecting the feeding movement thereof, but they nevertheless tension the work-piece sufficiently to eliminate wrinkles and wavy portions and thereby insure accurate spacing of successive fasteners one from another.

At about the instant when the right-hand work-feeding unit reaches the right-hand limit of its lateral motion (Fig. 10), the retraction of the fastener-inserting device 52 begins, but the left-hand work-feeding unit still has a short distance to travel before reaching the left-hand limit of its feeding motion. Nevertheless, during the final stage of this feeding motion the spindle 53 remains in the clenched eyelet, and the right-hand feeding unit begins its next feeding stroke from right to left, whereby it is moved to the position represented in Fig. 11. The fastener-inserting device, having now fully released the work-piece, which is once more under control of and being fed by the right-hand unit, returns to its initial position represented in Figs. 4 and 6, the cycle being thus completed. It is to be observed that there are two brief periods in each cycle during which both feeding units impart feeding motion to the work-piece, viz., during the final stage of the feeding stroke of the right-hand unit when the parts are in the relation represented in Fig. 9, and during the latter stage of the feeding stroke of the left-hand unit when the parts are in the relation represented in Fig. 10, each of the feeding units taking control of the work-piece before the other unit relinquishes its control or quite finishes its feeding stroke. The work-piece is thus caused to progress continuously so long as the machine is in operation, and its rate of travel is constant so long as the feed regulator 82 remains in one position.

Operation of punching devices and fastener-inserting devices

Referring to Figs. 1, 2, and 3, the punching devices 50 and the fastener-inserting devices 52 are operated alternately by two strikers 102 with which they are registered alternately by the reciprocatory motions imparted to the slide 58 (Figs. 4 and 5) as hereinbefore described. Inasmuch as the mechanism for operating the strikers 102 is virtually the same as the corresponding mechanism fully illustrated and described in the aforesaid application Serial No. 469,432, a brief description thereof will suffice for present purposes. These strikers are affixed to the forward ends of levers 103 mounted on fulcrum pins 104 inserted into sockets in the frame 20. The rear ends of the levers 103 are operated by a duplex double-acting toggle mechanism (Fig. 1) comprising a slide 105 and toggle-links 106, each of the links being connected to the slide by a pivot-pin 107 and to one of the levers 103 by a pivot-pin 108. The slide 105 is arranged on and guided by the two parallel guide-rods 60 hereinbefore described, being arranged behind the slide 58. Motion for reciprocating the slide 105 is furnished by the companion cams 32 and 33 (Fig. 13) and is communicated to the slide by the bell-crank lever 43 and a link 47. The slide 105 stands initially in its forward position as represented in Fig. 1, its travel to the rear being sufficient not only to operate the punches but also to retract the strikers 102 far enough to clear the outer ends of the fastener-inserting devices 52. The subsequent movement of the slide 58 to the rear places the fastener-inserting devices 52 in register with the strikers 102. The forward travel of the slide 105 is interrupted at an intermediate point to arrest the pivots 107 at or near their dead-center position corresponding to the conditions represented in Fig. 9, the strikers 102 remaining stationary and thereby maintaining the fastener-inserting devices against the clenched eyelets during nearly all the remainder of the work-feeding stroke of the swinging head 57. As shown in Fig. 3 the strikers 102 are extended laterally to maintain contact with the fastener-inserting devices throughout their range of work-feeding movement. When such movement is nearly completed (see Fig. 10) the slide 105 resumes its return to its initial position thereby retracting the strikers 102.

Since the strikers 102 are not effective to retract the punching devices or the fastener-inserting devices, the illustrated machine is pro-

vided with two-armed torsion-springs for that purpose. It has heretofore been the practice in the manufacture of duplex fastener-inserting machines to provide levers in addition to springs for retracting these devices, a feature of construction that requires small detachable parts to mount the levers or to retain them on their support. On the other hand, the two-armed torsion springs herein illustrated not only do away with all such levers and small detachable parts, but they also effect a considerable reduction of the load carried by the reciprocatory head 57, as well as a considerable saving in the cost of construction. Moreover, the procedure incidental to exchanging punching devices and fastener-inserting devices for others is thereby simplified and facilitated.

As shown in Fig. 12, the punching device 50 is provided with a diametrically extending socket into which the extremity of one arm 110 of a length of spring-wire is inserted, the bearing for the punching device being provided with a slot 111 in which this arm may play up and down. The other arm 112 of the wire engages and is deflected by an abutment consisting of a pin 113 projecting from and tightly pressed into a web 114 forming a part of the swinging head 57. The intermediate portion 115 of the wire is coiled to provide one or more convolutions constituting a torsion spring. The coiled portion surrounds and is supported by a boss 116 formed on and projecting from the web 114. The construction is such that this spring device may be attached by first inserting the extremity of the arm 110 into the punching device, then sliding the coiled portion 115 over the boss 116, and finally deflecting the arm 112 sufficiently to engage it with the pin 113. When the spring device is thus attached, the coiled portion 115 is maintained on the boss 116 by a shoulder 117 formed on the pin 113.

A similar spring device differing merely in shape but also comprising two arms and an intermediate coiled portion 115, is bent to provide a laterally extending finger 118 at its forward end, the rear arm thereof being engaged and deflected by the pin 113 which is preferably provided with a shoulder 109 near its left-hand extremity to constrain the arm. See Fig. 12*a*. This shoulder prevents lateral displacement of the spring device and thereby maintains the coiled portion 115 on the left-hand boss 116. The finger 118 is arranged to extend through a slot 119 in the head 57 and normally projects into a socket bored for its reception in the fastener-inserting device 52. The flexibility of this spring device, afforded by the coiled portion 115, provides for withdrawing the finger 118 from the device 52 whenever it is desired to remove that device from its bearing, the parts being normally maintained in their cooperative relations by the shoulder 109 on the pin 113. A lug 120 formed on the head 57 is arranged to arrest the retractory movement of the finger 118 and the device 52.

Fastener-supplying means

The general organization of the fastener-supplying means herein illustrated is similar to the corresponding mechanism fully shown and described in the aforesaid application Serial No. 469,432, although the present invention provides certain improved features not heretofore disclosed. Two series of fasteners, such as eyelets, gravitate from a duplex supply hopper 121 to the fastener-inserting devices 52 through an inclined duplex raceway comprising two divisions 122 and 123, the two divisions being affixed respectively to the upper surface and the lower surface of an interposed block 124. Moreover, the raceway is divided at an intermediate point of its length to provide a stationary upper section and a movable lower section, the latter being indicated as a whole by the numeral 125. A pivot-pin 126 connects the two sections of the raceway to form an articulated joint, the lower end of the block 124 and the upper end of the section 125 being mortised one into the other to form the joint through which the pivot-pin extends. All these elements, including the entire raceway structure and the hopper 121 constitute a detachable unit to provide for a rapid exchange of similarly constructed units whenever it is desired to insert fasteners of a different color or size or some other different characteristic.

The fastener-supplying unit is supported in cooperative relation to the fastener-inserting mechanism by two parallel horizontal studs 127 affixed to and projecting from the left-hand side of the frame 20. The construction of one of these studs is shown best in Fig. 16. The body portions of the studs 127 are cylindrical and the raceway block 124 is provided with cylindrical sockets 128 to receive them. The studs project beyond the block when the latter is mounted thereon, the left-hand ends of the studs being cut away on one side to provide clearance for latching devices 129. These devices are in the form of segments of the studs and are provided with hollow shanks or stems 130 arranged to slide in radially extending sockets formed in the studs. Each hollow stem 130 encloses a compression spring 131 by which the latching device 129 is normally projected beyond the periphery of the stud and thereby maintained in latching position. The shanks 130 are retained in their sockets by screws 132 screwed into the ends of the studs, the inner ends of the screws projecting into slots 133 formed in the stems. Each latching device 129 is provided with a pin 134 by which it is prevented from turning, the studs 127 being provided with diametrically extending bores 135 in which the pins 134 may slide.

The construction is such that when the latching devices 129 are projected outwardly by the springs 131 they will not pass through the sockets 128 formed in the block 124, but a pressure of a thumb or finger against each of the latching devices is sufficient to force them into flush relation with the studs. The latching devices will then pass through the sockets 128 and thus permit attaching and detaching the fastener-supplying unit. Preferably, the block 124 and the latching devices 129 are provided with inclined contacting surfaces 136 arranged to cooperate with a wedging or camming effect to maintain the right-hand surface of the block seated against the frame 20, the springs 131 being thus utilized not only to prevent accidental detachment of the raceway unit but also to take up all end-play lengthwise of the supporting studs 127. The left-hand extremities of the studs 127 and of the latching devices 129 are preferably tapered as indicated at 137 to enable the block 124 to be forced over them when mounting a raceway unit, without requiring any special manipulation of the latching devices. Special manipulation of these devices is necessary only when a raceway unit is about to be demounted.

As in the former construction described in said pending application Serial No. 469,432, the movable section 125 of the raceway is provided with

a tongue 140 (Figs. 1, 5 and 14) formed and arranged to slide into a groove 141 as the raceway unit slides along the supporting studs 127, this groove being formed in the upper end of a rock-shaft 142 by which the section 125 is operated. The rock-shaft 142 is journaled in a boss 143 formed on the frame 20 and is provided with an arm 144 by which it may be operated. The arm may be pinned or otherwise affixed to the rock-shaft. A torsion-spring 145 coiled about the rock-shaft normally maintains the delivery end of the raceway in fastener-presenting position as represented in Fig. 5, the lower extremity of the spring being hooked into a socket in a collar 146 and the upper end being arranged to bear against the frame 20. The collar 146 is secured to the rock-shaft 142 by set-screws 147 and may be adjusted rotatively to put the spring under initial deflection. Retractory movement of the delivery end of the raceway is derived from the cam 38 (Fig. 13) and the cam lever 46 (Figs. 2, 3, 4, and 5). This motion is communicated from the lever 46 to the arm 144 by a link 148.

The hopper 121 is provided with two oppositely inclined bottom walls 150 on which eyelets that stand flange down may slide in process of being emitted through outlet ports 151 to the divisions 122 and 123, respectively, of the raceway. Emission of the eyelets is effected by rotary brushes, one of which is indicated at 152 in Fig. 14. These brushes are affixed to shafts 153 that extend through the walls 150 and are provided with eccentric lugs 154 by which they may be rotated.

The machine is also provided with improved brush-operating mechanism that requires no connecting, disconnecting, or other manipulation to establish driving connections, other than mounting a fastener-supplying unit on the two supporting studs 127. For this purpose, two pulleys 155 are mounted to lie under the walls 150 respectively, the left-hand pulley in Fig. 1 being affixed to a shaft 156 and the shaft being journaled in a bracket 157 affixed to the frame 20. The right-hand pulley in Fig. 1 is affixed to a shaft 158 journaled in a bearing 159 in the frame 20. The axes of the pulleys 155 are oppositely inclined and so located as to register respectively with the axes of the two brushes 152. Each pulley is provided with an eccentric lug 160 arranged to engage and drive one of the lugs 154. Rotation of the front pulley is communicated to the rear pulley by a belt 161 that runs under idler rolls 162, one of which appears in Fig. 1, the other roll being concealed by the intervening bracket 157.

Rotation for driving the pulleys 155 is derived from the worm 39 on the upper end of the cam-shaft (Figs. 2, 3, and 13) and is communicated from the worm to a worm-wheel 163, thence by a shaft 164 to a spur-gear 165, and finally to the shaft 158 by a spur-gear 166 affixed to the latter.

The hopper 121 may or may not be provided with a superposed section 170 designed to increase its capacity. If the section 170 is used it may be attached to the hopper by a hinge-pin 171 (Figs. 3 and 17), the hopper being provide with ears 172 and the section 170 being provided with complemental ears 173 through which the hinge-pin may be inserted. A spring-latch 174 secured to the opposite side of the hopper is arranged to snap over a flange 175 projecting from the base of the section 170 to maintain the base firmly seated upon the rim of the hopper. The spring-latch permits the section 170 to be raised and swung about the hinge-pin 171 to afford access to the interior of the hopper.

The section 170 is also provided with ears 176 near its upper edge to receive a hinge-pin 177 by which a lid or cover 180 may be attached thereto, the cover having complemental ears 178 through which this pin may extend. A spring-latch 179 secured to the opposite side of the section 170 is formed and arranged to snap over the edge of the cover 180 and thereby maintain the cover firmly seated on the upper edge of the section. This latch permits raising the cover to give access to the section 170. If the operating conditions do not require a capacity for fasteners greater than that afforded by the hopper 121 alone, the detachable section 170 may be omitted, and the cover 180 may be attached directly to the ears 172 by inserting one of the hinge-pins through the ears thus brought into cooperative relation, the location of the ears 172 corresponding to that of the ears 176 to render the section 170 and the cover 180 interchangeable for attachment directly to the hopper 121. Likewise, when the cover 180 is attached directly to the hopper 121 the spring-latch 174 will cooperate directly with the cover in exactly the same manner as with the flange 175 of the section 170.

Preferably, the upright wall of the upper section 170 is made of perforated sheet metal or other foraminous metal to afford observation of the contents without opening the cover. Moreover, the upper section 170 is preferably provided with a depressed or dished bottom wall 181 provided with a restrictive central opening 182 through which fasteners may drop into the hopper 121 between the brushes 152, the function of the wall being to support the greater part of the mass of fasteners remaining in the section 170 so that they will not cause congestion of the fasteners lying adjacent to the outlet ports 151 and the brushes.

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

1. A fastener-inserting machine comprising work-feeding mechanism constructed and arranged to impart continuous feeding movement to a work-piece through a series of consecutive cycles of operation, automatic means arranged to punch a series of fastener-receiving holes, one in each cycle, in the work-piece, and automatic means arranged to insert and clench a tubular fastener in each of said holes while the work-piece is being fed by said mechanism.

2. A fastener-inserting machine comprising a fastener-inserting device and another device arranged to engage a work-piece at separate points, automatic mechanism for operating said devices in non-synchronized relation to impart continuous feeding movement to the work-piece through a series of cycles of operation, means arranged to present individual fasteners to said fastener-inserting device, and mechanism for operating said fastener-inserting device to insert fasteners, one in each cycle of operation.

3. A fastener-inserting machine comprising a device constructed and arranged to insert and clench tubular fasteners, a work-clamping device, automatic mechanism arranged to operate said devices in non-synchronized relation to impart continuous feeding movement to a work-piece through a series of cycles of operation, means arranged to punch fastener-receiving holes in the work-piece, means arranged to present tubular fasteners to the first-named device, and means

arranged to operate the first-named device to insert and clench fasteners, one in each cycle of operation.

4. A fastener-inserting machine comprising a device constructed and arranged to insert and clench tubular fasteners, a punching device, a carrier in which said devices are arranged side by side, a raceway arranged to present tubular fasteners to the first-named device, mechanism arranged to operate said devices alternately, a work-clamping device, and automatic mechanism arranged to operate said work-clamping device and said carrier in non-synchronized relation to impart continuous feeding movement to a work-piece through a series of cycles of operation.

5. A fastener-inserting machine comprising a punching device and a device constructed and arranged to insert a tubular fastener, means by which said devices are shifted laterally to and fro to place them alternately in register with a common area of a work-piece, means arranged to present tubular fasteners to said fastener-inserting device, automatic mechanism arranged to feed a work-piece, and automatic mechanism arranged to operate said devices successively while said work-feeding mechanism is imparting feeding movement to the work-piece.

6. A fastener-inserting machine comprising a fastener-inserting tool provided with a central spindle adapted to enter an annular fastener, means arranged to present annular fasteners successively to said spindle, automatic mechanism arranged to reciprocate said tool laterally to feed a work-piece, and automatic mechanism by which said spindle is thrust into a presented fastener while said tool is moving laterally.

7. A fastener-inserting machine comprising a fastener-inserting tool provided with a central spindle adapted to enter an annular fastener, means arranged to present annular fasteners successively to said spindle, automatic mechanism by which a work-piece is fed, and automatic mechanism by which said tool is operated to pick a fastener from said presenting means and insert the fastener into the work-piece while said feeding mechanism is imparting feeding movement to the work-piece.

8. A fastener-inserting machine comprising a device for inserting tubular fasteners, means for presenting tubular fasteners thereto, a carrier by which said fastener-inserting device is reciprocated laterally past said fastener-presenting means, automatic machanism for operating said device to detach a fastener from said fastener-presenting means and insert the fastener into the work, and automatic mechanism arranged to operate said carrier to feed the work with a stroke begun before and ended after the fastener is detached from the fastener-presenting means.

9. A fastener-inserting machine comprising cooperative members arranged to clamp a work-piece of sheet-material such as a shoe-upper, cooperative members constructed and arranged to insert and clench tubular fasteners such as eyelets, automatic mechanism arranged to cause cooperation of said fastener-inserting members, automatic mechanism arranged to reciprocate said fastener-inserting members laterally while engaging a clenched fastener and thereby to feed the work-piece relatively to said work-clamping members, and automatic mechanism arranged to reciprocate said work-clamping members laterally to feed the work-piece relatively to said fastener-inserting members.

10. A fastener-inserting machine comprising a punching device, a device for inserting tubular fasteners, a carrier in which said devices are arranged side by side and by which they are reciprocated laterally, automatic mechanism arranged to operate said carrier to feed the work, automatic mechanism arranged to operate both of said devices successively during a stroke of said carrier, and means arranged to present a fastener to said fastener-inserting device during said stroke of the carrier.

11. A fastener-inserting machine comprising a raceway for presenting tubular fasteners, a reciprocatory carrier movable relatively to said raceway, a punching device and a fastener-inserting device arranged side by side in said carrier, automatic mechanism arranged to reciprocate said carrier to feed the work, and automatic mechanism arranged to operate both of said devices successively during a stroke of said carrier, the fastener-inserting device being constructed and arranged to detach a tubular fastener from the raceway during said stroke of the carrier.

12. A fastener-inserting machine comprising a raceway for presenting tubular fasteners, two reciprocatory work-feeding units both movable relatively to said raceway, one of said units including a punching device and a fastener-inserting device arranged side by side, automatic mechanism arranged to operate said units in non-synchronous relation to effect continuous feeding of the work, and automatic mechanism arranged to operate both of said devices successively during a single feeding stroke of the unit of which they are parts.

13. A fastener-inserting machine comprising two reciprocatory work-feeding units, two trains of regulatable mechanism arranged to operate them in non-synchronized relation so that each will feed a work-piece while the other is moving in the opposite direction, controlling means common to both of said trains for simultaneously regulating the amplitude of their respective work-feeding motions, means carried by one of said units for inserting and clenching tubular fasteners, and mechanism for operating said fastener-inserting means.

14. A fastener-inserting machine comprising two trains of reciprocatory work-feeding mechanism arranged to operate in non-synchronized relation to effect continuous feeding movement of a work-piece throughout one or more cycles of operation, controlling means common to both of said trains for simultaneously regulating their respective amplitudes of feeding motion, means carried by one of said work-feeding trains for inserting and clenching tubular fasteners, mechanism for operating said fastener-inserting means once in each cycle, and means arranged to supply tubular fasteners to said fastener-inserting means.

15. A fastener-inserting machine comprising a reciprocatory work-feeding mechanism provided with fastener-inserting means, a raceway arranged to present fasteners to said means, and mechanism arranged to operate said means while said mechanism is moving in the direction of its work-feeding movement to detach a fastener from the raceway and to insert and clench the fastener in a work-piece.

16. A fastener-inserting machine comprising two automatic work-feeding mechanisms operative in nonsynchronized relation to impart continuous feeding movement to a work-piece, punching means and fastener-inserting means carried by one of said mechanisms, a raceway ar-

ranged to present fasteners to said fastener-inserting means, and automatic mechanism arranged to operate said punching means and said fastener-inserting means successively while they are moving in the direction of work-feeding movement.

17. A fastener-inserting machine comprising a reciprocatory work-feeding member, fastener-inserting means carried thereby, a raceway, with respect to which said work-feeding member is movable, arranged to present fasteners to said means at an intermediate point in the range of reciprocation of said member, automatic mechanism arranged to operate said work-feeding member, and automatic mechanism arranged to operate said fastener-inserting means while said work-feeding member is in motion.

18. A fastener-inserting machine comprising a punching device and a fastener-inserting device, a carrier in which said devices are arranged side by side, automatic mechanism by which said carrier is shifted to place said devices alternately in register with a common area of a work-piece, a raceway arranged to present tubular fasteners to said fastener-inserting device, mechanism for operating said devices alternately to punch holes in a work-piece and to insert tubular fasteners into the holes, automatic mechanism by which said carrier is moved to feed the work-piece while the latter is engaged by one of said devices, and auxiliary work-feeding mechanism arranged to operate while both of said devices are disengaged from the work-piece.

19. A fastener-inserting machine comprising a punching device and a fastener-inserting device, a carrier in which said devices are arranged side by side, automatic mechanism by which said carrier is shifted to place said devices alternately in register with a common area of a work-piece, a raceway arranged to present tubular fasteners to said fastener-inserting device, automatic mechanism for operating said devices alternately to punch holes in a work-piece and to insert tubular fasteners into the holes, work-clamping means, and automatic mechanism by which said carrier and said work-clamping means are reciprocated in non-synchronized relation to feed the work-piece.

20. A fastener-inserting machine comprising two cooperatively related reciprocatory work-feeding units, two regulatable trains of automatic mechanism for operating them in non-synchronized relation to impart continuous feeding movement of variable length to a work-piece, adjustable means common to both of said trains of mechanism for simultaneously regulating the length of the strokes imparted to said units by said trains of mechanism, one of said units including a punching device and a fastener-inserting device arranged side by side, automatic mechanism arranged to operate said devices successively during a single feeding stroke of the unit of which they are parts, and means arranged to present fasteners successively to said fastener-inserting device.

21. A fastener-inserting machine comprising two cooperatively related reciprocatory work-feeding units one of which includes a device for inserting tubular fasteners, two trains of automatic mechanism arranged to operate said units in non-synchronized relation, a raceway arranged to present tubular fasteners successively to said device at an intermediate point in its strokes in the work-feeding direction, and mechanism arranged to operate said device as it passes said intermediate point.

22. A fastener-inserting machine comprising two cooperatively related reciprocatory work-feeding units one of which includes a device for inserting individual fasteners into a work-piece of sheet material and for feeding the work-piece by its engagement with the inserted fasteners, two trains of automatic mechanism arranged to operate said units in non-synchronized relation, the other one of said units being constructed and arranged to tension the work-piece while the latter is being fed by the unit first specified, means arranged to present fasteners to said fastener-inserting device, and mechanism arranged to operate said device to insert fasteners presented by said means.

23. A fastener-inserting machine comprising two cooperatively related work-feeding units arranged to swing to and fro about a common axis to feed a work-piece, mechanism arranged to operate said units in non-synchronized relation, one of said units including fastener-inserting means, means arranged to present fasteners to said fastener-inserting means, and mechanism arranged to operate said fastener-inserting means.

24. A fastener-inserting machine comprising two cooperatively related work-feeding units arranged to swing to and fro about a common axis to feed a work-piece, mechanism arranged to operate said units in non-synchronized relation, one of said units including a punching device and a fastener-inserting device arranged side by side, mechanism arranged to shift said devices laterally to place them alternately in register with a common area of the work-piece, means arranged to present fasteners successively to said fastener-inserting device, and mechanism arranged to operate said devices alternately.

25. A fastener-inserting machine comprising two carriers arranged to swing about a common axis, one of said carriers being provided with a fastener-inserting device and the other with resilient work-clamping means, means arranged to present fasteners to said fastener-inserting device, mechanism arranged to operate said device, and mechanism arranged to swing said carriers about said axis in non-synchronized relation to cause first one and then the other to feed a work-piece.

26. A machine for inserting eyelets comprising an eyelet-setting tool, a punch, a carrier in which the setting tool and the punch are mounted side by side, a raceway arranged to present eyelets to the setting tool, cams arranged to operate the punch and the setting tool alternately, a work-clamp, and cams arranged to move said work-clamp and said carrier in non-synchronized relation to give continuous feeding movement to a work-piece through a series of cycles of operation of the machine.

27. A fastener-inserting machine having a fastener-inserting tool provided with a central spindle adapted to enter an annular fastener, a raceway arranged to present annular fasteners successively to said spindle, cam-operated mechanism arranged to reciprocate the fastener-inserting tool laterally to feed a work-piece, and cam-operated mechanism arranged to thrust said spindle into a fastener presented by the raceway while said tool is moving laterally.

28. A fastener-inserting machine comprising a raceway for presenting tubular fasteners, a reciprocatory carrier movable relatively to said raceway, a punch and a fastener-inserting tool

arranged side by side in said carrier, mechanism arranged to reciprocate said carrier to feed the work, and mechanism arranged to operate the punch and the fastener-inserting tool successively both during the same stroke of said carrier thereby causing the fastener-inserting tool to detach a tubular fastener from the raceway and to present it in a hole previously formed by the punch in the work-piece.

29. A duplex eyelet-inserting machine comprising two cooperatively related reciprocatory work-feeding units, two trains of automatic mechanism for operating them in non-synchronized relation to impart continuous feeding movement to the work, one of said units including a pair of opposed punching devices and a pair of opposed eyelet-inserting devices arranged side by side, mechanism including a pair of opposed strikers by which said punching devices and said eyelet-inserting devices are operated alternately, and a raceway by which eyelets are presented to said fastener-inserting devices.

30. In a fastener-inserting machine of the type in which regulatable work-feeding mechanism is regulated by an adjustable member arranged to play over a gage-plate having a series of holes for the reception of a stop-pin, a cam carried by said adjustable member and arranged to abut against said pin, and means by which said cam may be adjusted relatively to said member.

31. In a fastener-inserting machine of the type in which a punching plunger and a fastener-inserting plunger are arranged side by side to slide in a guiding member, a two-armed torsion-spring the arms of which are connected by a resilient coiled portion, said guiding member having a spring-supporting boss on which said coiled portion is arranged and also having an abutment by which one of said arms is deflected to maintain a retractory force against one of said plungers, said one of said plungers having a socket into which the other one of said arms projects, and said abutment having a shoulder by which the arm first specified is constrained to maintain said coiled portion on said boss.

32. In a fastener-inserting machine of the type in which a punching plunger and a fastener-inserting plunger are arranged side by side to slide in a guiding member, a two-armed torsion-spring the arms of which are connected by a resilient coiled portion, said guiding member having a boss on which said coiled portion is arranged and also having an abutment by which one of the arms is deflected, the other arm having a bend near its outer end to provide a finger parallel to the axis of said coiled portion, and one of said plungers having a socket to receive said finger, said abutment having a shoulder by which said deflected arm is constrained to maintain said finger normally in said socket.

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