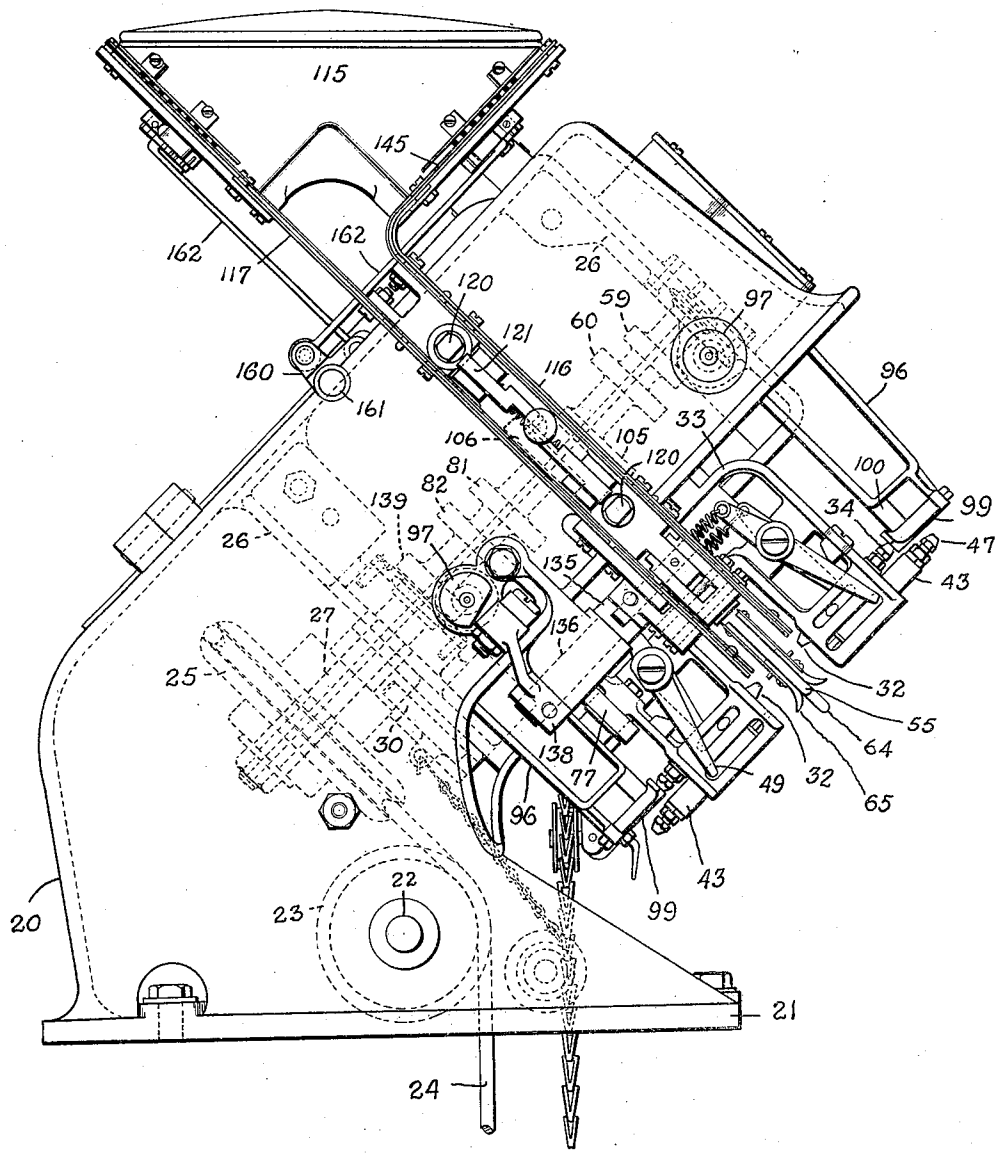
April 18, 1933. S. L. GOOKIN 1,904,306

FASTENER INSERTING MACHINE

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Fig. 1.



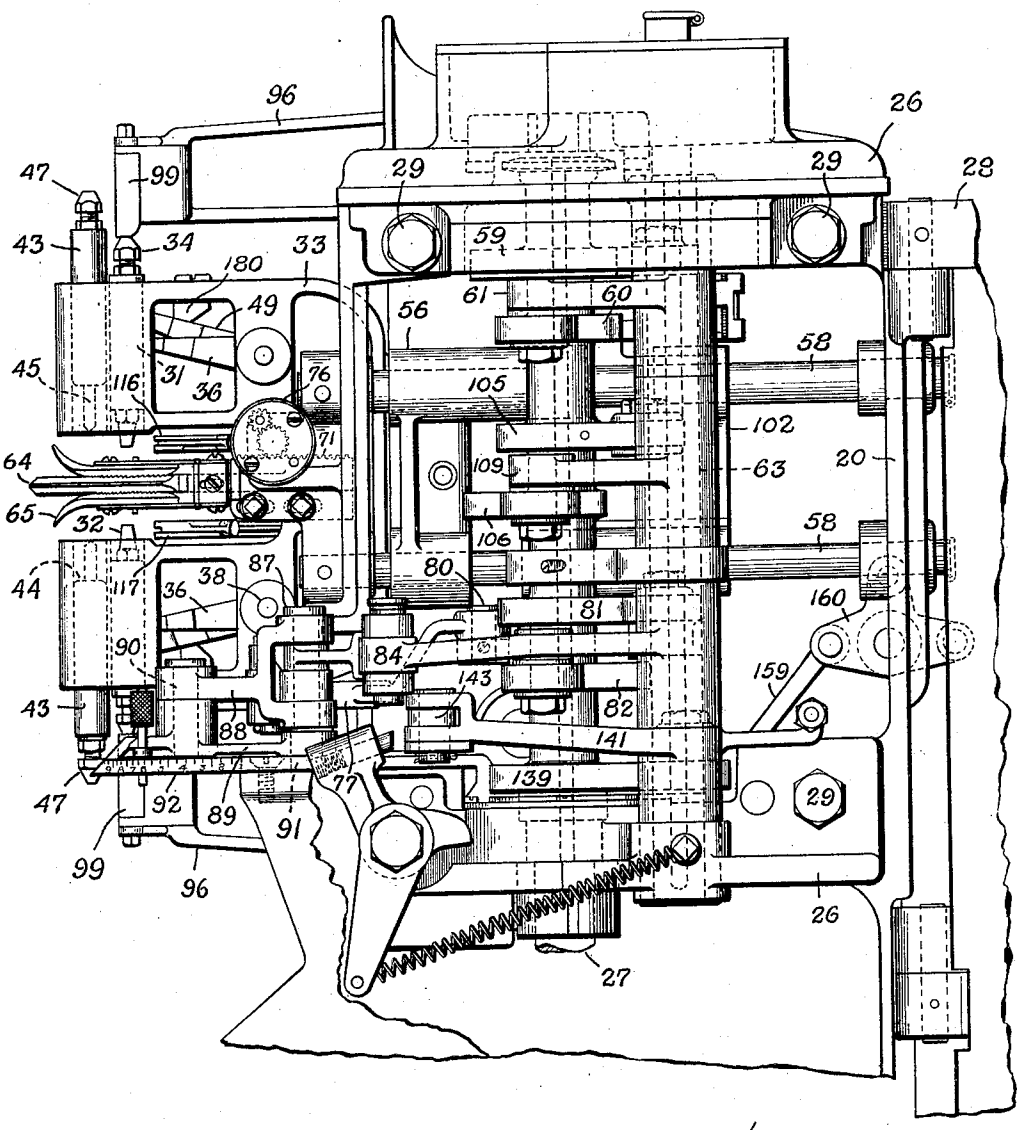
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FASTENER INSERTING MACHINE

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Fig: 2



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Fig. 4

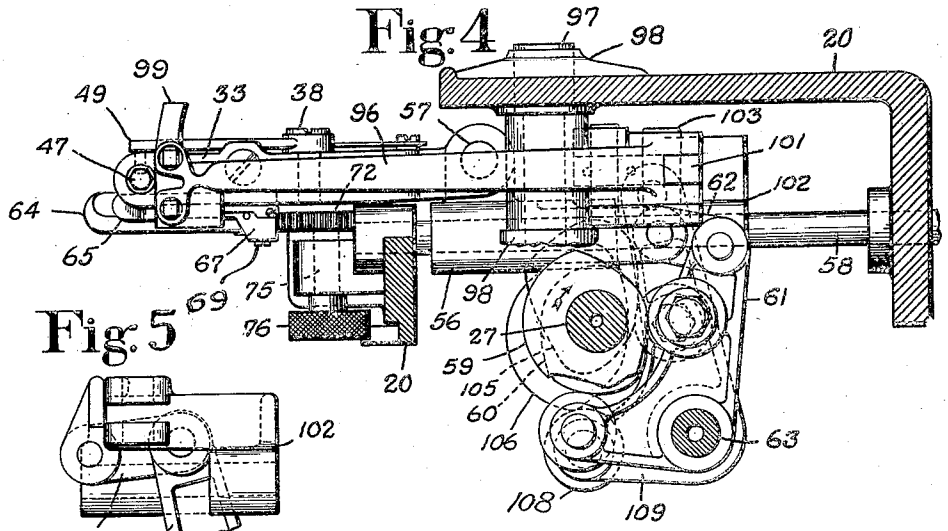
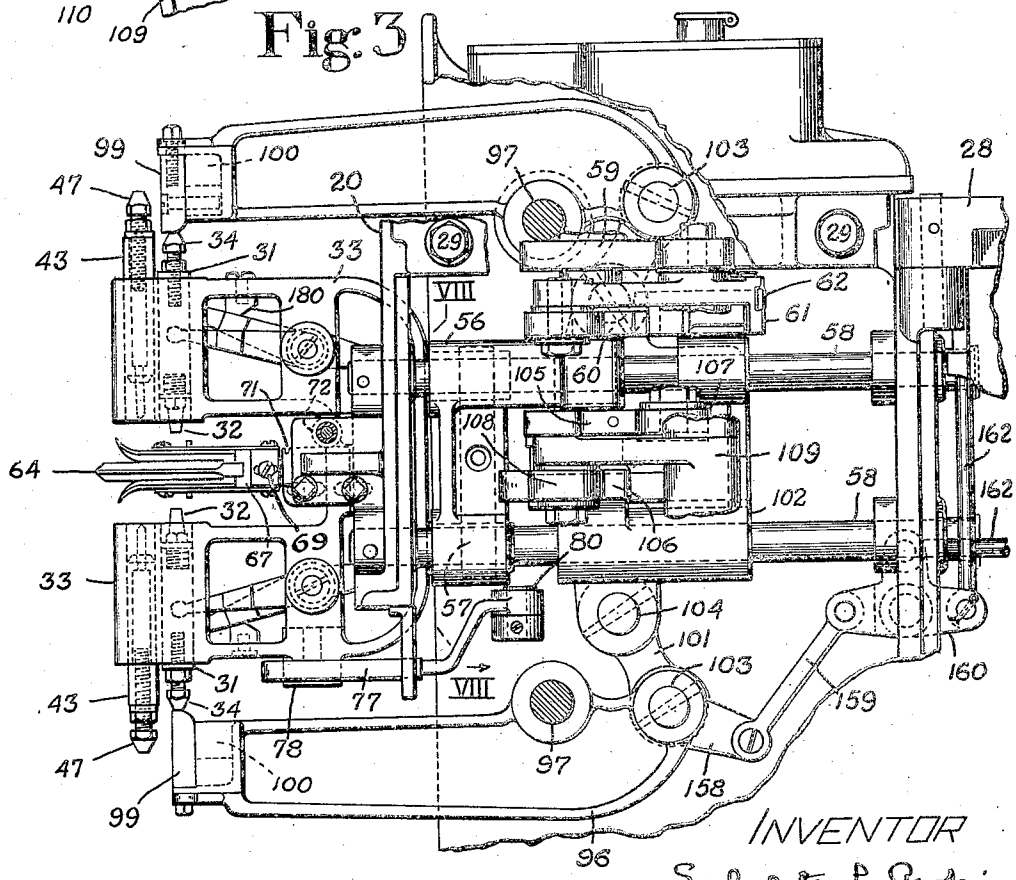


Fig. 5

Fig. 3



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Fig. 6

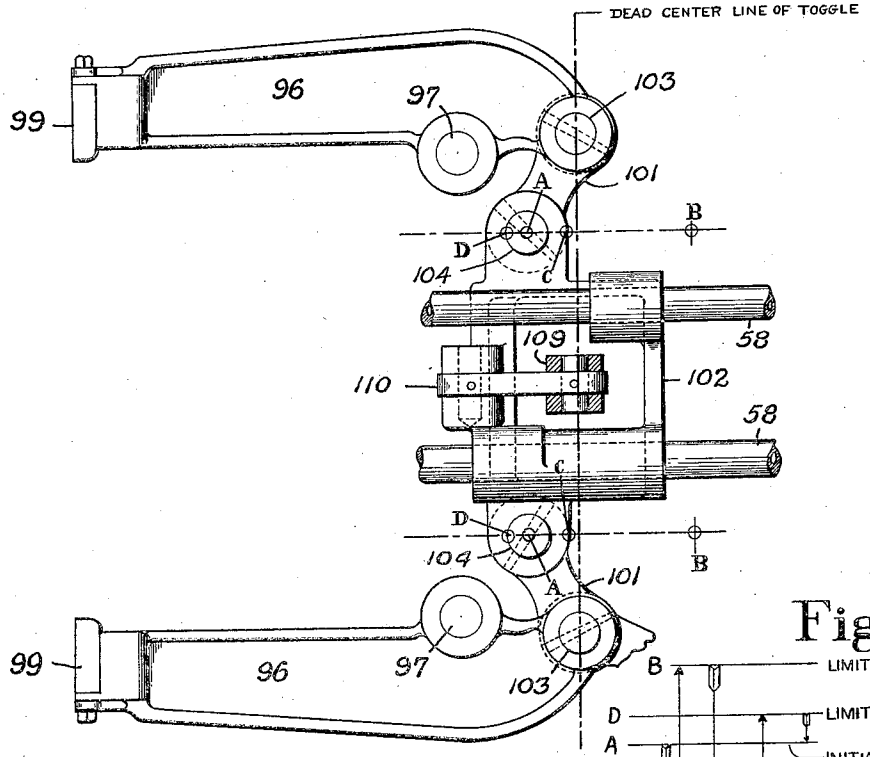


Fig. 7

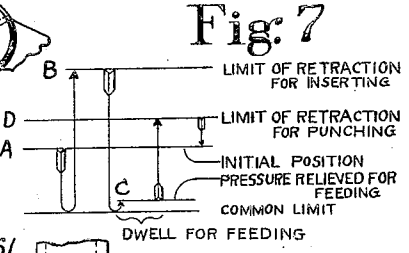
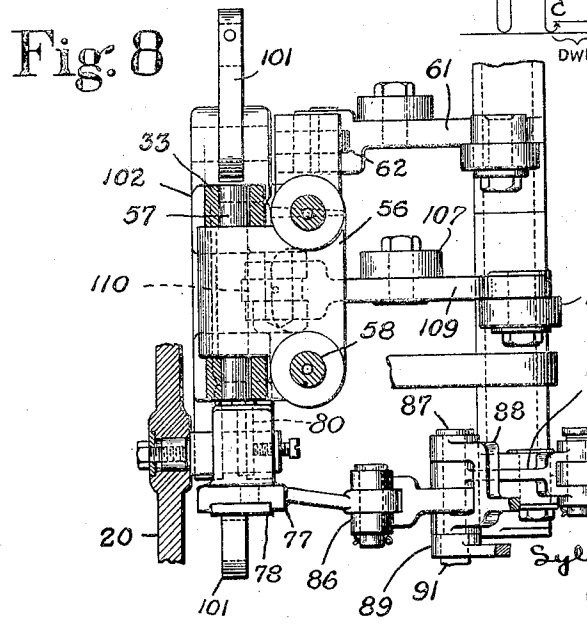


Fig. 8



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Fig. 10

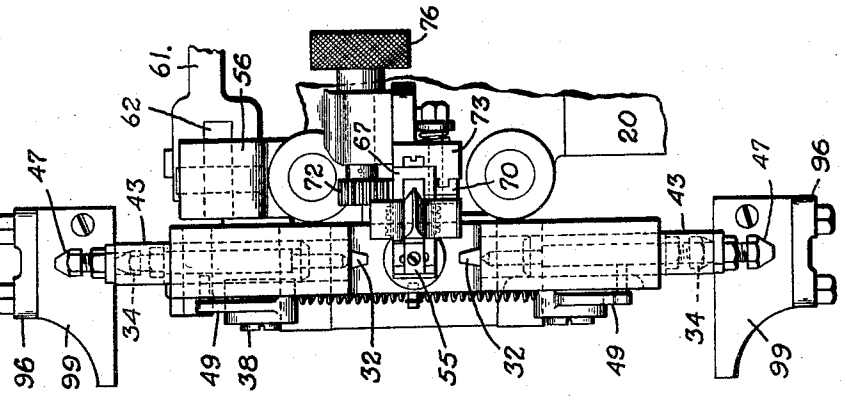


Fig. 9

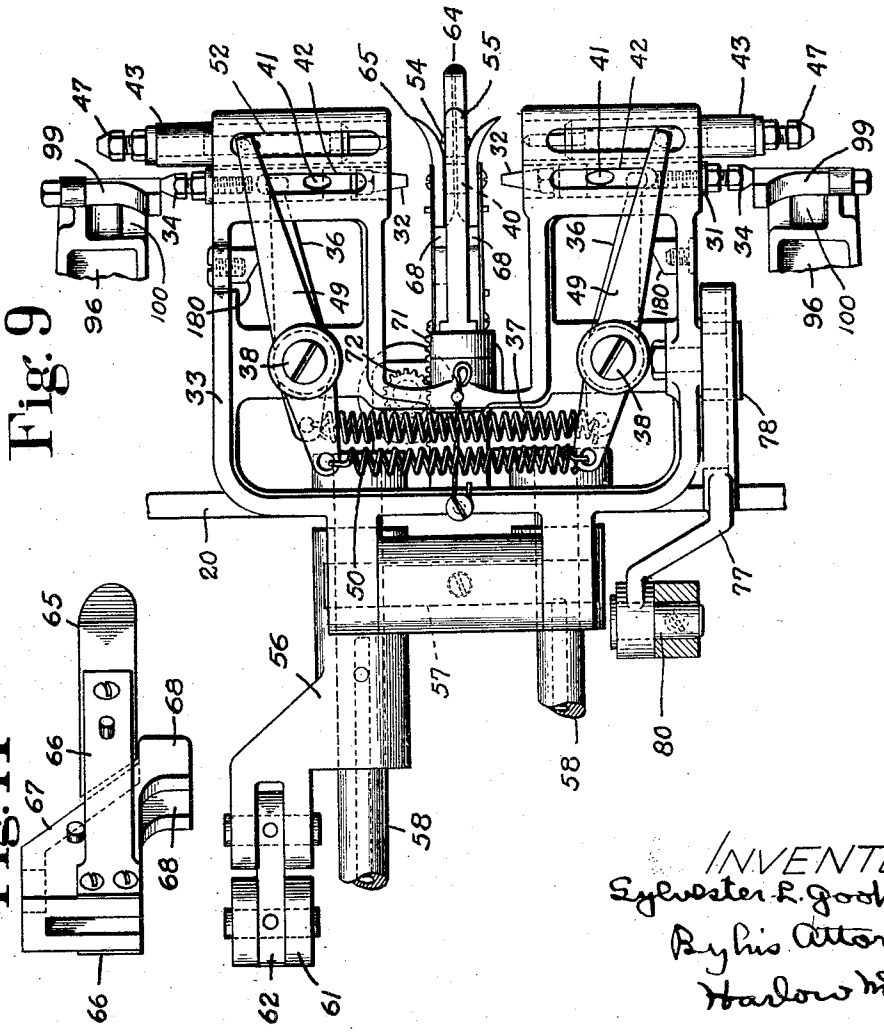


Fig. 11

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FASTENER INSERTING MACHINE

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Fig. 14

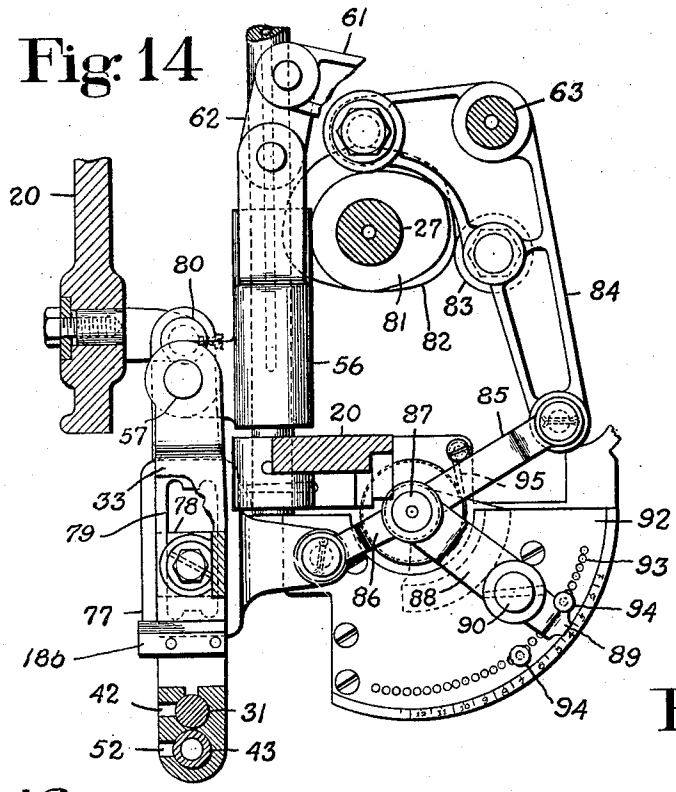


Fig. 13

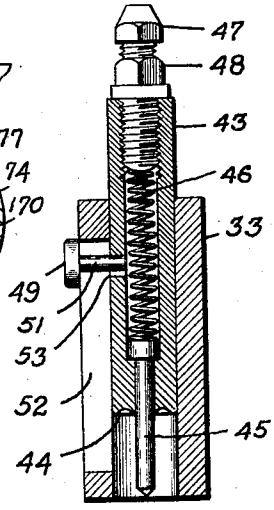


Fig. 12

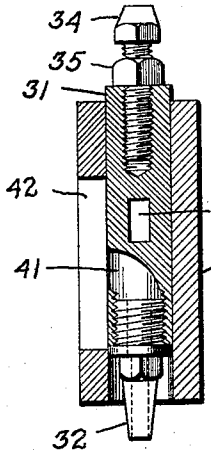


Fig. 16

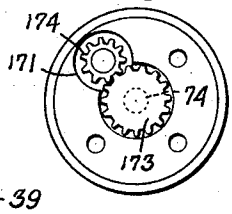


Fig. 17

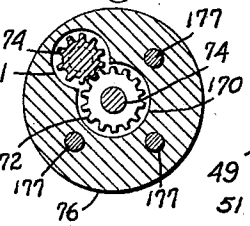
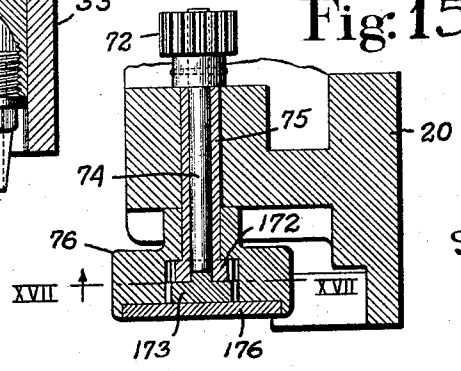


Fig. 15

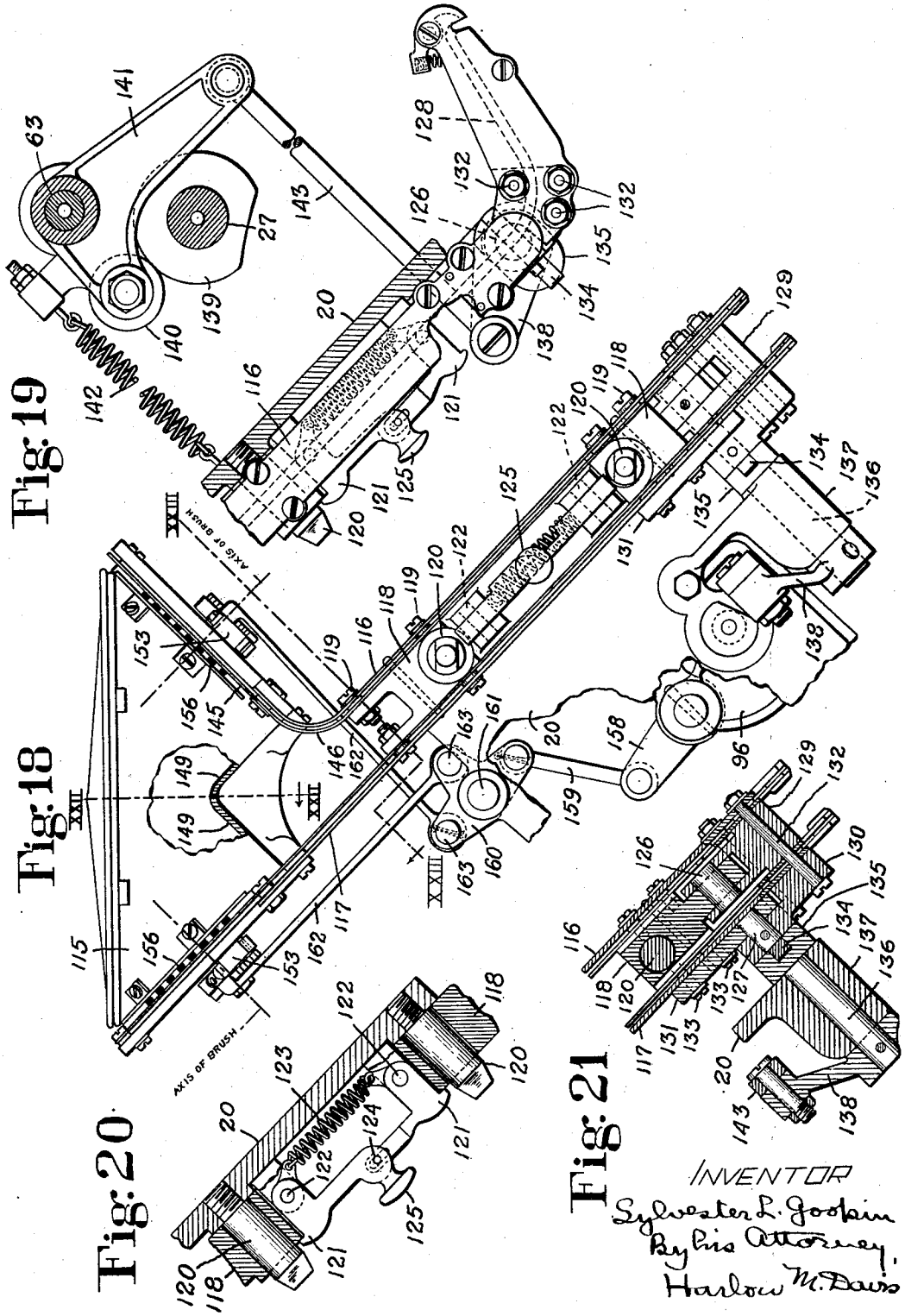


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FASTENER INSERTING MACHINE

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Fig. 22

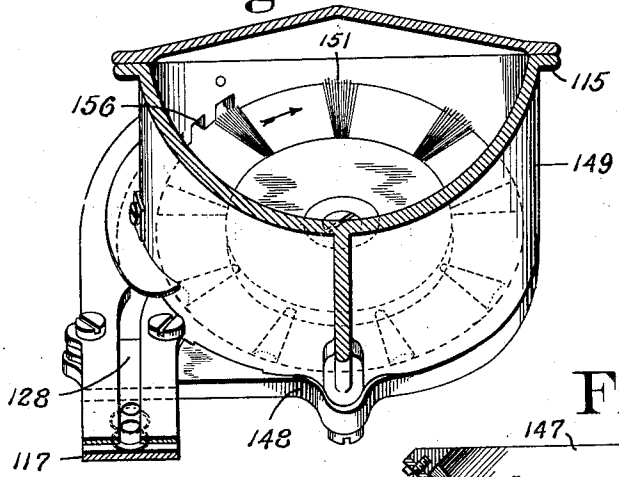


Fig. 24

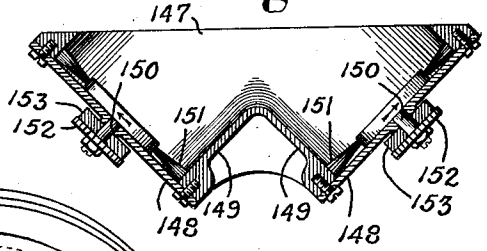


Fig. 23

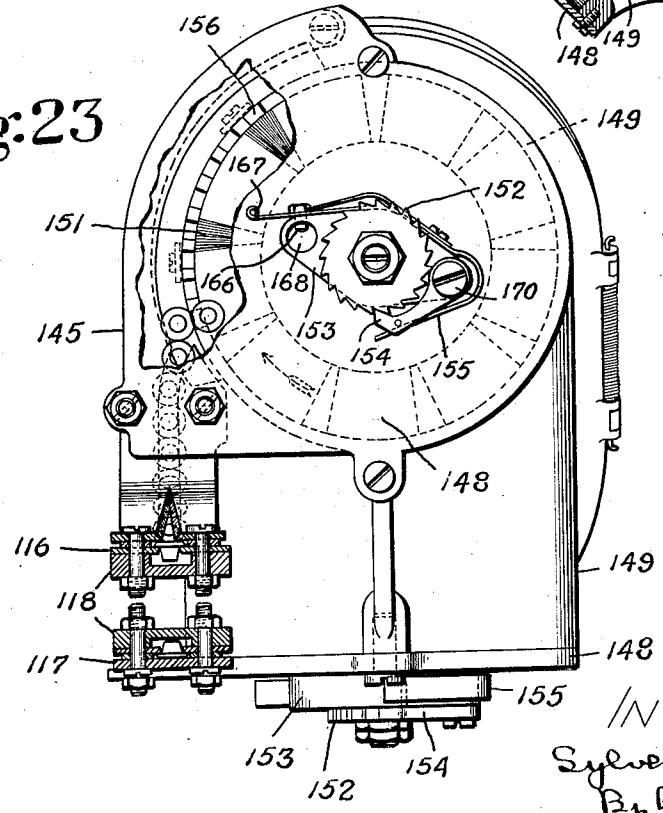
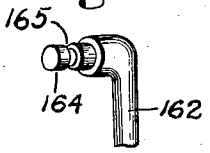


Fig. 25



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Patented Apr. 18, 1933 1,904,306

UNITED STATES PATENT OFFICE

SYLVESTER LEO. GOOKIN, OF QUINCY, MASSACHUSETTS, ASSIGNOR TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY

FASTENER INSERTING MACHINE

Application filed July 21, 1930. Serial No. 469,432.

This invention relates to fastener-inserting machines and is herein illustrated as embodied in a duplex machine designed to insert two eyelets simultaneously in two confronting elements of work such as the quarters of a shoe-upper. It is to be understood, however, that in some of its aspects the invention is not limited to eyeleting machines nor to machines for operating on shoe-uppers, or even to machines of the duplex type. Nevertheless, for purposes of explanation, the illustrated machine will be described in terms commonly used in referring to duplex eyeleting machines.

Regarded generally, the invention aims, among other things, to improve the organization of duplex fastener-inserting machines with regard to high speed, smoothness and quietness of operation, efficient application of power to the parts that operate under heavy stresses, and facility in effecting substitutions of interchangeable raceway assemblages.

Machines of the duplex type are commonly provided with two groups of elements for punching fastener-receiving holes in the work and for inserting and upsetting fasteners in the holes so punched. Each of the groups comprises a punching device and a fastener-inserting device arranged side by side, and a hammer for operating those devices alternately. The punching device and the inserting device are shifted laterally, first to place the inserting device in register with the hole made by the punching device, and thereafter to feed the work so that the successive fasteners of a series will be suitably spaced one from another.

In some former machines in which an operating hammer acts first on a punching device that cooperates with a solid punch-bed and thereafter acts on a fastener-inserting device, no provision has been made for regulating the strokes of these devices each independently of the other. Consequently, to provide for such regulation in some other former machines each hammer has been provided with two individually adjustable strikers, one for the punching device and the other for the fastener-inserting device. While the latter expedient has been used extensively it necessitates offsetting at least one of the strikers from the axis or center line of the device operated thereby and also requires a lateral projection on that device to receive the blow of the offset striker. A machine of that type is illustrated in United States Letters Patent No. 934,066, granted September 14, 1909 on application of George Goddu. Although a construction of that kind will operate with satisfactory results when the parts are new or not badly worn, the offset relation between one of the strikers and the device operated thereby develops considerable side thrust of that device against the bearing member in which it slides, and also develops a skewing tendency of the device, both of which wear away the guiding surfaces unevenly and cause loose play between the worn device and its guiding member before the machine is otherwise seriously affected by wear.

With a view to eliminating this cause of excessive wear, without sacrificing provisions for individually regulating the strokes of a punching device and a fastener-inserting device, an object of the present invention is to provide an improved construction that will do away with forming a lateral projection on either of the devices and permit a common operating member such as a striker to act alternately on the two devices substantially at the center line of each device.

Accordingly, an improvement constituting one feature of the present invention consists in a novel combination in which a punching device and a fastener-inserting device arranged side by side are both engaged centrally by a common operating member such as a hammer and are shifted laterally to and fro to be operated alternately by that member, the said devices being provided with centrally located and individually adjustable heads by which their respective strokes may be regulated.

When a punching device and a fastener-inserting device are individual and separate from each other, as in machines of the type under consideration, a relatively short stroke suffices for the punching device, whereas a

longer stroke is required by the inserting device because this device has the additional duty of detaching the fasteners from a raceway and inserting them into the work. Hence, to favor high speed and ease of operation the present invention also provides improved mechanism by which unnecessary motion of a double-duty operating member is eliminated. This result is obtained in the illustrated machine by causing less retraction of a double-duty operating member after the fastener-inserting stroke of that member than after the punching stroke thereof, and by limiting the retractory movement of the punching device so that this device will clear the operating member when the latter is at the terminal limit of its shorter retractory stroke.

Another object of the invention is to provide improved hammer-operating mechanism. In machines that utilize one double-duty hammer to operate both a punching device and a fastener-inserting device the hammer is required to execute two operating strokes in each cycle. With that condition as the basis of a problem that also involves the application of considerable power to operate the hammer against heavy resistances, an effective solution of the problem is provided by a form of operating mechanism that may be termed a double-throw toggle-mechanism. The double-throw effect of the illustrated toggle-mechanism is obtained by reciprocating a toggle-element across and to opposite sides of its dead-center position. Consequently, each stroke of such range of the toggle-element causes one operating stroke and a reverse stroke of the part or parts operated thereby, and so it follows that one corresponding reciprocation of the toggle-element causes two reciprocations of the operated part or parts. Therefore, to utilize such a mechanism consistently with the aforesaid purpose of reciprocating a double-duty operating member such as a hammer with strokes of two lengths, a feature of this invention consists in providing a double-throw toggle-mechanism arranged to travel a greater distance to one side of its dead-center position than to the other.

The illustrated machine comprises a raceway to which fasteners are fed from a hopper and by which the fasteners are delivered to the fastener-inserting means. In factories that use such machines to insert fasteners of different styles, colors or sizes, it is commonly necessary to change from one kind of fastener to another several times each day, but, to avoid the inconvenience of removing the unused fasteners from one raceway-and-hopper unit and substituting fasteners of another kind in the same unit, it is common to provide a plurality of interchangeable raceway-and-hopper units stocked with different kinds of fasteners and to substitute one such unit for another whenever a change of fasteners is necessary. In making these substitutions, it has heretofore been necessary to disconnect the raceway-operating mechanism from a raceway-and-hopper unit before detaching that unit from the machine and to connect the operating mechanism to the substituted unit after attaching the latter to the machine.

With regard to the conditions last mentioned, still another object of the present invention is to save time and simplify the procedure incidental to attaching and detaching raceway-and-hopper units.

To this end a novel feature of the present invention consists in providing a detachable raceway and the raceway-operating mechanism of a fastener-inserting machine with co-operative interlocking elements formed and arranged to be cooperatively coupled by the act of placing the raceway in cooperative relationship to the fastener-inserting means of the machine. As herein shown, the coupling elements mentioned embody tongue-and-groove formations arranged to be coupled by moving the raceway sidewise into its cooperative relationship with the fastener-inserting means.

Various improved features embodied in the illustrated means for supplying fasteners to the fastener-inserting mechanism constitute the subject-matter of my application Serial No. 552,698, filed July 23, 1931 as a division of this application.

The illustrated machine also embodies various other features of invention hereinafter described and set forth in the appended claims.

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 drawings;

Fig. 3 is a view similar to Fig. 2 but omitting some of the elements in the foreground of Fig. 2 to show more clearly certain elements in the background;

Fig. 4 is a top plan view, partly in section, of the principal elements included in Fig. 3;

Fig. 5 is a top plan view of an operating connection forming a part of the mechanism shown in Fig. 4;

Fig. 6 is a diagrammatic view of a double-throw toggle mechanism and double-duty hammers for operating the punching devices and the fastener-inserting devices;

Fig. 7 is a chart of the motions imparted to one of the hammers by the mechanism shown in Fig. 6;

Fig. 8 is a sectional view indicated by line VIII—VIII of Fig. 3;

Fig. 9 is a left-side elevation of the punch-

ing devices, the fastener-inserting devices and elements closely related thereto;

Fig. 10 is a front elevation of the assemblage shown in Fig. 9;

Fig. 11 is a perspective view of an adjustable unit of well-known construction comprising a duplex edge-gage and presser-feet;

Fig. 12 is a longitudinal section of the upper punching device;

Fig. 13 is a longitudinal section of the upper fastener-inserting device;

Fig. 14 is a top plan view, partly in section, of regulatable work-feeding mechanism;

Fig. 15 is a horizontal sectional view of means for adjusting the unit shown in Fig. 11;

Fig. 16 and Fig. 17 are two views of gearing included in Fig. 15, the plane of Fig. 17 being indicated by line XVII—XVII;

Fig. 18 is a left side elevation, partly in section, of a duplex eyelet-hopper, a duplex raceway and related operating mechanisms;

Fig. 19 is a top plan view projected from Fig. 18 showing a portion of the raceway and mechanism for operating the delivery end thereof;

Fig. 20 is a top view, partly in section, of a latching device by which the raceway may be detachably secured to the frame of the machine;

Fig. 21 is a sectional view in a vertical plane of the structure at the lower right of Fig. 18;

Fig. 22 is a vertical section through the hopper in a plane indicated by line XXII—XXII on Fig. 18;

Fig. 23 is a view showing the hopper in elevation and the raceway in cross-section as indicated by line XXIII—XXIII of Fig. 18;

Fig. 24 is a vertical sectional view of the hopper in a plane extending from front to rear; and

Fig. 25 is a perspective view of the upper portion of one of two similar links for operating the hopper brushes respectively.

Referring 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 idle pulleys, one represented at 23, are mounted to guide a driving belt 24 to a receiving pulley 25 forming a part of a disconnectible clutch, the pulleys 23 and 25 being enclosed in the frame 20, and the base 21 having an opening through which the belt extends.

To facilitate assembling the mechanism, the main frame 20 is preferably formed to receive a detachable unit comprising upper and lower bearing members 26, a cam shaft 27 journaled therein, a rod 63 by which the members 26 are rigidly connected, and various other elements carried by the rod as well as those carried by the cam shaft. Accordingly, the right-hand side of the frame 20 is provided with a hinged section 28 which may be opened to permit the insertion and removal of the detachable unit. The bearing members are affixed to the main frame 20 by bolts 29 (see Figs. 2 and 3).

Any suitable type of clutch may be used to operate the cam shaft 27 but I prefer a clutch of the type shown and described in United States Letters Patent No. 1,351,138, granted August 31, 1920, on application of R. B. Smith. Since the construction and operation of this type of clutch are well known, the details of construction are not herein shown. For the purposes of the present description it will be sufficient to state that the clutch is provided with a controlling member 30 (Fig. 1) which may be connected to a treadle (not shown) and which controls the clutch as follows. When the controlling member 30 is retracted against the stress of a spring, the driven portion of the clutch and the cam shaft 27 are picked up and rotated by the continuously rotating pulley 25, the coupled relation continuing until the cam shaft reaches a predetermined angular position in any cycle during which the controlling member 30 is released by the treadle. When the controlling member is released it first uncouples the driven member of the clutch from the driving member thereof and thereafter arrests the rotation of the driven member at another predetermined point. Thus, the cam shaft will be arrested always at a certain point to insure the desired initial positions of the several mechanisms.

Before proceeding to a description of the structural features of the machine, the following outline of the general mode of operation will be in the interest of a clear understanding. A pair of opposed punching devices and a pair of opposed fastener-inserting devices are arranged to be shifted laterally to and from a common operating locality. The punching devices stand initially in register with said locality and are operated first to punch holes in two confronting elements of work such as the quarters of a shoe upper. When the punching devices have been operated and retracted both pairs of devices are shifted to the rear, thereby placing the fastener-inserting devices in register with the punched holes, the work remaining stationary. The inserting devices are now operated to transfer eyelets from a duplex raceway to the work and to upset and clench the eyelets in the punched holes. The inserting devices dwell against the eyelets just clenched while they are moved laterally to feed the work, and they are thereafter retracted from the clenched eyelets and are returned to their initial positions, the punching devices also re-

turning to their initial positions at the common operating locality.

Punching devices

Each punching device comprises a plunger 31 and a tubular punching tool 32 carried thereby (see Fig. 12). These punching devices are arranged in opposed relation to each other as shown in Figs. 9 and 10. They are guided toward and from each other and are shifted laterally by a duplex head or carrier 33 in which two coaxial bores are formed to receive them. The outer end of each plunger 31 is bored and tapped to receive a bolt 34 which constitutes an adjustable head, a lock-nut 35 being placed on the shank of the bolt to maintain the head at any desired position of adjustment. This adjustment is to regulate the strokes of the punching devices with regard to their pressure against a punch-bed to be described. A pair of hammers, hereinafter described, operate against the adjustable heads to impart operating movement to the punching devices, but the latter are retracted by spring-stressed means comprising levers 36 and a tension spring 37 connecting the levers. The retracting levers are mounted on fulcrum studs 38 carried by the head 33 and their forward ends extend into recesses 39 formed in the plungers 31.

Referring to Fig. 9, the punching tools 32 cooperate with opposite surfaces of a duplex punch-bed 40. The chips or pills of waste material formed by the punching tools pass through the tips 32 and are discharged through the sides of the plungers 31 which are provided with ducts 41 in register with discharge openings 42 formed in the head 33.

Fastener-inserting devices

The two fastener-inserting devices are likewise mounted in the head 33 in opposed relation to each other. Each of these devices comprises the features of construction shown best in Fig. 13. The plunger 43 of each inserting device is arranged to slide in a bore formed in the head 33 and is provided with an annular groove or seat 44 at its inner end to receive the flanged end of an eyelet. A spindle 45 normally projects from the seat 44 to pick an eyelet from a raceway and to carry the eyelet to a hole punched in the work. A compression spring 46 contained in a bore in the plunger normally projects the spindle 45 but permits the spindle to be repressed during the upsetting and clenching operation. Backing for the spring 46 is provided by a bolt 47 screwed into the outer end of the plunger, the bolt also constituting an adjustable head against which one of the aforesaid hammers acts to operate the inserting device. The bolt 47 also constitutes means for regulating the operating stroke of the inserting device and is provided with a lock nut 48 to maintain it in any desired position of adjustment.

Since each fastener-inserting device is provided with an adjustable bolt 47 to receive the blow of the hammer, the construction provides for easily and quickly altering the conditions of operation according to various thicknesses of work. For example, the accessories for each machine may include a plurality of pairs of fastener-inserting devices of the type illustrated, one pair for operating on thin work, one pair for operating on thick work, and one or more pairs for operating on work of intermediate thickness, the bolts 47 of each pair being adjusted with regard to the particular thickness of work upon which that pair is to be used. Thus, when it becomes necessary to shift from work of one thickness to work of another thickness, the operator has merely to detach the pair of fastener-inserting devices then in the machine and substitute another pair in which another condition of regulation is maintained by the bolts 47 and the lock-nuts 48.

The two fastener-inserting devices are retracted by spring-stressed means comprising levers 49 and a tension spring 50 connecting the levers. These levers are mounted on the fulcrum studs 38 and their outer ends are provided with laterally extending pins 51 which extend through slots 52 formed in the head 33 and project into recesses 53 formed in the plungers 43. The retractory movements of the spring-stressed levers 36 and 49 are limited by stops 180 carried by the head 33. The inserting devices cooperate with a duplex clenching anvil 54 mounted adjacent to the punch-bed 40. The punch-bed 40 and the clenching anvil 54 are mounted side by side in a tongue 55 affixed to the head 33 and arranged to project between two confronting elements of work.

The head 33 is movable from front to rear and is also movable from side to side, the first of these movements being utilized to place the fastener-inserting devices in register with the holes punched in the work by the punching devices, while the other movement is utilized to feed the work. For these purposes, the head 33 is mounted on a carriage 56 (Fig. 9) to which it is connected by a pivot pin 57. The carriage 56 is arranged to slide first to the rear and then to the front on two straight parallel guide rods 58. The ends of these rods are mounted in sockets formed in the frame 20. The carriage 56 is reciprocated by mechanism comprising two cooperative cams 59 and 60 (Figs. 3 and 4), a bell-crank lever 61, cam rolls carried by the lever and engaging said cams respectively, and a link 62 (Fig. 9) connecting the lever and the carriage. The lever 61 is mounted on the rod 63 which

serves as a fulcrum for a series of cam levers likewise mounted thereon. As previously stated herein the rod 63 rigidly connects the removable bearing pieces 26. The pivot pin 57 connecting the head 33 and the carriage 56 provides for angular movement of the head for the purpose of feeding the work.

Referring to Figs. 1, 2, 3, 4, 9 and 10, the machine is provided with a stationary duplex work-support 64 and with two presser-feet 65 arranged to cooperate with opposite surfaces thereof to clamp two confronting elements of work. The construction and arrangement of these parts are substantially similar to those illustrated in United States Letters Patent No. 1,030,833, granted June 25, 1912 on application of F. A. Rumney. Moreover, as shown in Fig. 11 the presser-feet 65 are carried by leaf-springs 66 anchored to a bifurcated block 67 of well-known construction by which duplex edge-gages 68 are provided to straddle the tongue 55 in which the punch-bed and the clenching anvil are imbedded. The block 67 also straddles the stationary work-support 64 and is affixed thereto by a clamping screw 69 (see Fig. 3). The work-support 66 is affixed to a bar 70 (Fig. 10) provided with rack-teeth 71 (Fig. 9) on its upper surface. A pinion 72 meshes with the rack-teeth for the purpose of adjusting the support 64 to the front and rear, the edge-gages 68 being thereby adjusted to regulate the distance from the guide edges of the work elements to the rows of inserted eyelets. The rack-bar 70 has tongue-and-groove connection with a guiding fixture 73 (Fig. 10) attached to the frame 20. The adjusting pinion 72 is pinned on a cylindric stem 74 journaled in a fixed bearing sleeve 75. A knob 76 is provided for turning the stem 74.

Figs. 15, 16 and 17 illustrate a form of gearing by which fine increments of rotation may be imparted to the pinion 72 by the knob 76. The knob is arranged to turn on a projecting portion of the fixed sleeve 75 and is formed with a central recess 170 and with a non-central recess 171. The recess 170 encloses a sun-gear 172 and a driven gear 173. These gears are of substantially the same diameter but one of them is provided with one more tooth than the other. The teeth of both of these gears are engaged by a planetary pinion 174 carried by the knob 76 and arranged in the recess 171, the ends of this pinion being turned down to provide trunnions, one of which is journaled in the back wall of the knob and the other of which is journaled in a detachable cover-plate 176 secured to the front of the knob by screws 177. As the knob is turned, the planetary pinion rolls around the sun-gear 172 and produces relatively slight turning of the driven gear 173. The latter gear is formed on one end of the stem 74 which transmits the resultant rotational movement to the pinion 72.

Work-feeding mechanism.

Referring to Figs. 9 and 14 the pivotally mounted head 33 has an articulate connection with an arm 77 by which it is oscillated about the pin 57 to feed the work. The connection between the head and the arm is formed by a swiveled block 78 mounted on the head and arranged in a slot 79 formed in the feeding arm. The long dimension of the slot 79 is parallel to the shifting motion imparted to the head by the carriage 56. The arm 77 is mounted to oscillate about a fixed axis parallel to the axis of the pin 57, the fixed axis being provided by a pivot member 80 connecting the rear end of the arm 77 to a boss formed on the frame 20. When the parts are in their initial positions as shown in Figs. 9 and 14, the pivot pin 57 is out of register with the pivot member 80, but when the head 33 has been shifted to the rear to place the inserting tools in register with the eyelet-receiving holes the pivot pin 57 stands in coaxial relation to the pivot member 80 so that both the head 33 and the feeding arm 77 will move about the fixed axis of the pivot member 80 while feeding the work.

The work-feeding motion is derived from a pair of cooperative cams 81 and 82 carried by the cam shaft 27. These cams are engaged respectively by cam rolls 83 mounted on a bell-crank lever 84, the lever being oscillated positively in both directions without lost motion. The rod 63 constitutes the fulcrum for the lever 84.

The motions of the lever 84 are transmitted to the feeding arm 77 by a well-known form of regulatable mechanism of the type illustrated and described in United States Letters Patent No. 683,488, granted October 1, 1901 on application of M. H. Pearson. This mechanism provides for varying the length of the oscillations imparted to the arm 77 although the amplitude of the oscillations of the bell-crank lever 84 remains constant. Two links 85 and 86 are pivotally connected to the lever 84 and to the arm 77 respectively and they are also pivotally connected to each other by a pivot pin 87 which extends through a radius arm 88 (see Fig. 2). The radius arm is mounted on a manually movable regulator 89 to which it is connected by a pivot pin 90. The regulator 89 is mounted on a pivot stud 91 affixed to the frame 20 and is movable about the axis of that stud to shift the pivot pin 90. When the parts are in their initial positions, as shown in the drawings, the axis of the movable pivot pin 87 coincides with the axis of the fixed pivot stud 91. Consequently, the initial position of the feeding arm 77 is not affected by movement of the regulator 89, but the travel of the connecting links 85 and 86 is modified by shifting the

fulcrum pin 90 of the radius arm 88, with a corresponding increase or decrease in the length of travel communicated to the feeding arm 77. The regulator 89 overlies a stationary sector plate 92 in which a series of holes 93 are formed to receive stop pins 94. These pins may be placed in any desired holes and spaced apart to permit angular movement of the regulator between any desired limits according to the requirements of the work. A torsion spring 95 (Fig. 14) normally maintains the regulator 89 against one of the pins 94 as shown in that figure.

Hammer mechanism

The punching devices 31 and the fastener-inserting devices 43 are operated alternately by two levers 96 hereinafter termed "hammers". The hammers are mounted on fulcrum pins 97 which rock in bearings 98 in the frame 20 (see Fig. 4). The forward end of each hammer is provided with a hardened steel block 99 which constitutes a head or striker. Each hammer operates first a punching device and subsequently a fastener-inserting device, the two devices being shifted alternately into register with a common operating area of the striking surface of the hammer by the reciprocatory movement of the sliding carriage 56 (see Fig. 9).

When the parts occupy their initial positions, the punching devices stand in register with the heads of the hammers while the fastener-inserting devices stand in front of the hammer heads and clear them. On the other hand, after the punching devices have been operated by the hammers and when the head 33 has been shifted to the rear, as hereinbefore described, the fastener-inserting devices stand in register with the hammer heads while the punching devices stand behind the hammer heads and out of the operating range thereof. Cavities 100 are formed in the hammers at the rear of the heads 99 to receive the outer ends of the punching devices when the fastener-inserting devices are in register with the hammer heads, the cavities insuring clearance of the punching devices so that the hammers may operate the fastener-inserting devices without engaging the punching devices.

The invention provides improved mechanism for operating the hammers 96 twice in each cycle, this mechanism embodying a duplex or double-acting toggle construction and being designed to utilize the resistance of each hammer 96 to balance the operating force applied to the other hammer so that the operating stresses of the two punching devices and subsequently the operating stresses of the two fastener-inserting devices will be equalized. Moreover, the operating mechanism about to be described is designed to balance or equalize the operating forces in such a way as to relieve itself, to a considerable extent, of reactionary stresses that normally tend to create friction and wear of the parts.

Referring to Figs. 3 and 6, the rear ends of the hammers 96 are connected by pivoted toggle links 101 to a slide 102 which constitutes the knee of the toggle. The links 101 are connected to the hammers by pivot pins 103 and are connected to the knee 102 by pivot pins 104. The slide 102 is mounted on and guided by the guide rods 58 and is arranged at the rear of the sliding carriage 56 which is also mounted on these rods.

The slide or knee 102 is reciprocated positively in opposite directions by two cooperative cams 105 and 106 (Figs. 1, 2 and 4). These cams engage, respectively, cam rolls 107 and 108 carried by a bell-crank lever 109 mounted on the fulcrum rod 63. The lever 109 and the slide 102 are connected by a pivoted link 110 (Fig. 5). Thus, while the guide rods 58 maintain the knee or slide 102 in a fixed path of travel between the hammers 96 the outer pivots 103 of the toggle both move toward and from each other. Under these conditions the toggle mechanism is double-acting, since each toggle link operates one of the hammers, but the resistance encountered by each of the hammers reacts through the toggle links 101 and the knee 102 to the opposite hammer, thereby relieving the guide rods 58 from the heavy stresses crosswise thereof.

Fig. 6 illustrates diagrammatically successive positions of the knee pivots 104, while Fig. 7 illustrates corresponding motions imparted to the head of one of the hammers. It is to be understood that the motions of the other hammer head are similar to, but the reverse of, those represented in Fig. 7.

Referring to Fig. 6, the parts are shown in their initial positions. The centers of the knee pivots 104 are represented by small circles A, B, C and D at successive positions in their paths of travel. Assuming that the knee pivots stand initially at positions A and that a cycle of operations is about to be executed, these pivots are carried first to positions B. In moving from A to B, the knee pivots are carried across the dead-center line of the toggle which is represented by a dot-and-dash line in this figure. Since the punching devices stand initially in register with the hammer heads 99 they will be operated while the knee pivots 104 progress from positions A to the dead-center line, and the work elements lying against opposite ends of the punch-bed 40 will be completely punched to provide fastener-inserting holes.

The travel of the knee pivots 104 from A to B is continuous, in consequence of which the hammer heads are immediately and fully retracted after having caused the punching devices to function. It is to be observed that the travel of the knee pivots from the dead-center line to B is greater than the travel

from A to the dead-center line. Thus, although the hammer heads 99 stand initially at intermediate positions between their two limits of motion they are retracted to their outer limits of motion when the knee pivots are at B. See the left-hand arrow in Fig. 7 which represents the first motion of the head of the upper hammer. The hammer heads are thus retracted far enough to clear the fastener-inserting devices which are thereupon shifted into register with them. The retracting levers 36 (Fig. 9), as well as the levers 49, now lie against the stops 180, and the punching devices are thereby retracted far enough to clear the raceway.

The knee 102 is next shifted in the reverse direction to carry the pivots 104 from B to C where they dwell while the feeding of the work takes place. In traveling from B to the dead-center line, the pivots 104 cause the hammer heads to operate the fastener-inserting devices, the slight travel of the knee pivots beyond the dead-center line to C resulting in a very slight retraction. See the second arrow from the left in Fig. 7. This slight retraction relieves the pressure of the inserting devices against the fasteners which have now been inserted and completely upset or clenched, but is not sufficient to disengage these devices from the fasteners. Referring to Fig. 10, the heads 99 of the hammers have lateral dimensions sufficient to maintain the inserting devices against the clenched fasteners throughout the maximum work-feeding movement imparted to the head or tool carrier 33.

At the completion of the work-feeding movement the knee of the toggle is advanced to move the knee pivots from C to D (Fig. 6), the heads of the hammers being thereby retracted far enough to clear the outer ends of the punching devices which in the meantime have been maintained at their outer limits of retraction by the stops 180 (Fig. 9) in the paths of the retracting levers 36. The hammers are thus retracted to intermediate positions indicated by the third arrow from the left in Fig. 7 and are maintained in those positions while the carriage 56 moves forward to shift the punching devices again into register with the hammer heads. While this shifting is taking place the inserting devices, which have been only partially retracted, are shifted out of register with the hammer heads and are thus released so that they may be returned to their outer limits of retractory motion by their retracting spring 50. At this point the retracting levers 49 are arrested in their initial positions by the stops 180.

In the meantime, the work-feeding mechanism returns to its initial position and the knee 102 of the toggle moves toward the rear, thereby carrying the knee pivots 104 from D to A. This latter movement of the toggle knee causes the heads of the hammers to advance a short distance as indicated by the right-hand arrow in Fig. 7. The cycle of the toggle mechanism is completed when the motion last described has caused a slight movement of the punching devices toward each other. It will be understood that when the operation of the machine continues through a series of cycles without interruption, the knee pivots 104 will travel from D to B without interruption at A except in the final cycle of each series when the knee pivots will be arrested at A. Thus, when the machine is arrested with the parts in their initial positions, the punching devices are advanced part way through their travel toward the punch block and are sufficiently close to an article of work to indicate to the operator whether the work is initially placed in the desired position for the punching operation about to be performed. Another advantage in timing the toggle mechanism to advance the knee pivots from D to A at the completion of the final cycle is that the force required to effect this short motion, which occurs after the clutch has been disengaged, has a considerable braking effect on the rotation of the cam shaft, and to that extent it relieves the controlling pin 30 (Fig. 1) from a large part of its duty of arresting the cam shaft at a certain point in its rotation.

Fastener-supplying mechanism

The present invention also provides improved means for supplying eyelets to the fastener-inserting devices 43. The illustrated fastener-supplying means comprises a duplex hopper 115 (Figs. 1 and 18) and a duplex raceway, the individual divisions of which are indicated at 116 and 117 respectively. These elements and others by which they are connected and braced constitute a detachable unit which may be readily mounted on the frame 20 and detached therefrom with very little loss of time. Consequently, a plurality of detachable raceway units containing eyelets of different sizes, different colors or other characteristics may be readily interchanged in accordance with the requirements of successive lots of work.

The divisions 116 and 117 of the raceway are parallel to each other except their upper portions which diverge upwardly, the parallel portions being rigidly connected to each other in confronting relation by interposed spacing blocks 118 and screws 119. Moreover, the lower section of the raceway is movable to present the eyelets to the fastener-inserting devices, whereas the upper section and the hopper 115 are stationary. The two sections have an articulate pivotal connection which includes a coupling member designed to cooperate with a complemental coupling member permanently attached

to the frame 20 and forming a part of the operating mechanism by which the delivery end of the raceway is moved to and fro. The construction is such that the act of mounting any one of a plurality of detachable raceway units on the means provided for that purpose also results in coupling the movable section of the raceway to the raceway operating mechanism, no additional act or operation being required to establish the desired connection or relation of the movable section and the operating mechanism.

The raceway is supported in its operative position by two parallel dowel studs 120 projecting horizontally from the left-hand side of the frame 20. The two spacing blocks 118 are bored to receive the dowel studs as shown in Fig. 20. Interconnected latches 121 mounted on the frame 20 and connected thereto by pivot pins 122 are arranged to snap over outer edges of the blocks 118 and thereby maintain the raceway firmly against the frame 20. The latches are connected by a tension spring 123 which maintains them normally in latching position. The latches are also connected by a pin-and-slot connection 124 whereby the movements of one are communicated to the other. A knob 125 is formed on one of the latches to provide convenient means by which the latches may be retracted to release the raceway.

The pivotal joint by which the stationary section and the movable section of the raceway are connected comprises coaxial pivot pins 126 and 127 (Fig. 21). The axis of these pins intersects the channels 128 of the two divisions of the raceway (see Fig. 19) but the pins are spaced apart to clear the lower division so that the eyelets in that division may cross the axis of the joint without interference. A spacing block 129 interposed between the two divisions of the movable section of the raceway is connected to the adjacent stationary block 118 by the pivot pin 126, while a reinforcing block 130 affixed to the lower side of the movable section is connected to a stationary reinforcing member 131 by the pivot member 127. The blocks 129 and 130 and the two divisions of the movable section are all rigidly clamped to each other by bolts 132, while the reinforcing member 131 is affixed to the stationary section of the raceway by screws 133.

The pivot pin 127 is pinned to the block 130 and is utilized to communicate oscillatory motion to the movable section. For this purpose a radially extending tongue 134 is formed on the lower end of this pivot member. The tongue 134 constitutes one element of an interlocking tongue-and-groove coupling, the complemental groove of which is formed in a head 135 of a rock-shaft 136. The rock-shaft is journaled in a boss 137 formed on the frame 20 and is provided with an arm 138 by which it may be oscillated.

The mechanism for operating the movable section of the raceway is shown in Fig. 19. A cam 139 carried by the cam shaft 27 cooperates with a cam-roll 140 carried by a lever 141. The lever is mounted on the fulcrum rod 63 and is held against the cam by a tension spring 142. A link 143 communicates motion from the lever 141 to the arm 138 to oscillate the movable section of the raceway.

When the parts are in their initial positions as shown in Fig. 19, the tongue and groove of the coupling 134, 135 are parallel to the dowel studs 120. Consequently, when a raceway is being mounted on or demounted from the dowel studs by movement lengthwise of the latter, the tongue 134 slides into or out of its interlocking relation in the groove in the head 135, as the case may be, and when the raceway is caught by the latches 121 and thereby held against the outer surface of the frame 20 the pivot pins 126 and 127 of the raceway are maintained in coaxial relation to the rock-shaft 136. Moreover, the dowel studs 120 maintain the tongue 134 in the groove member 135 and thus preserve the coupled relation of the raceway and the operating mechanism.

In duplex eyeleting machines in which both eyelets of a pair are inserted by movement toward each other, it is necessary to deliver the two eyelets in relatively reverse positions. That is, the barrels of the eyelets must be toward each other and the flanges must be away from each other. Moreover, when two series of eyelets are to be delivered respectively to the fastener-inserting devices of a duplex machine, it is desirable to supply them under identical conditions to insure equal replenishment of the two series. With regard to duplex raceways that receive both series of eyelets from a common mass stored in a hopper, equality in the feeding of the two series has constituted one problem, and the delivery of the eyelets in relatively reverse positions has constituted another problem. For example, in some prior constructions the eyelets of one series have been obliged to stand with their flanges at their upper ends to be fed out of the hopper while the eyelets of the other series have been obliged to stand with their flanges at their lower ends to be fed out. In such cases, the feeding conditions of the two series have been dissimilar and the rate of feeding has therefore been unequal.

In other prior constructions the eyelets of the two series have stood in the same position in a common inclined plane while being fed from the hopper, but their delivery from the hopper has been at opposite sides of the axis of a rotary brush or feeding member Under these conditions the eyelets delivered from one side of the hopper have been propelled by downward inclined movement of

the brush into the mass of eyelets while those delivered from the opposite side of the hopper have been propelled by upward inclined movement of the brush out of the mass. Here again, the feeding conditions have been dissimilar and the rate of feeding has therefore been unequal.

With a view to supplying two series of eyelets under similar conditions and with equal rates of feeding from a common mass in a hopper to a duplex raceway, the present invention provides an improved construction which, at the same time, causes the eyelets of the two series to be equally but oppositely inclined as they pass through the outlets from the hopper to their respective divisions of the raceway.

As shown in Figs. 1 and 18, the lower division 117 of the raceway is all in one inclined plane, while the movable section and the lower portion of the stationary section of the upper division 116 are likewise all in one inclined plane parallel to the plane of the division 117. The upper portion 145 of the division 116 and the corresponding portion of the division 117 diverge upwardly and are not only oppositely inclined but have equal steepness or slant. A transverse bend 146 in the division 116 provides for the divergence and parallelism mentioned above.

The shape of the hopper 115 resembles that of a funnel although its mouth 147 is preferably oblong rather than circular. This formation facilitates filling the hopper without spilling any eyelets. Its bottom walls 148 (Fig. 24) are flat and oppositely inclined and converge downwardly, their angles of inclination being equal. These walls are screwed against the lower ends of annular walls 149 by which the massed eyelets in the hopper are localized adjacent to two feeding brushes. The walls 148 are bored to provide bearings for oppositely inclined shafts 150 which extend through them. Each shaft carries a brush 151 at its inner end and a ratchet-wheel 152 at its outer end and each is provided with an oscillatory pawl-carrier 153 loosely mounted thereon between the ratchet-wheel and the adjacent wall 148. Each pawl-carrier 153 carries an operating pawl 154 (see Fig. 23) and a leaf-spring 155 by which the pawl is held against the ratchet-wheel. The pawl is connected to the pawl-carrier by a pivot member 170.

The annular walls 149 of the hopper are provided with notches 156 through which the barrels of the eyelets may pass, the teeth between the notches being spaced from the bottom walls 148 sufficiently to clear the flanges of the eyelets that stand with their flanged ends on the wall 148. Each series of notches 156 forms communication from the interior of the hopper to a division of the raceway (see Fig. 23). Each of the brushes 151 is rotated in a direction that causes upward travel of the tufts as the latter sweep the correctly positioned eyelet through the notches or outlets 156, the conditions under which the eyelets are fed out of the hopper being therefore similar with respect to the two divisions of the raceway.

The illustrated mechanism for operating the brushes 151 receives motion from the lower hammer 96 (see Fig. 18). An extension arm 158 rigidly related to the hammer communicates motion through a link 159 to a bell-crank lever 160. This lever is mounted on the frame 20 by a fulcrum or pivot pin 161. Two links 162 communicate the to-and-fro movements of the bell-crank lever to the pawl-carriers 153, respectively. The pivot pins 163 by which these links are connected to the bell-crank lever are located at points ninety degrees from each other with respect to the axis of the fulcrum 161, and the links are arranged in crossed relation so that when one of them is being moved upwardly the other will be moved downwardly. Thus, the brushes 151 will be operated alternately.

The upper ends of the links 162 are preferably formed to provide for quickly attaching them to and detaching them from the pawl-carriers so that the operation of detaching one raceway unit and attaching another may be facilitated.

Accordingly, each of the links is provided with a connecting stud 164 permanently affixed thereto, as shown in Fig. 25. The stud is provided with a circumferential groove 165 adapted to receive the inner end of a detent 166 (see Fig. 23), the detent being carried by a leaf-spring 167 attached to the pawl-carrier and normally projected into a socket 168 formed in the pawl-carrier for the reception of the stud 164. The leaf-spring 167 is extended a short distance beyond the detent to provide a finger-piece by which the detent may be retracted to release the stud 164 whenever it is desired to disconnect the link 162 from the raceway structure.

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

1. A fastener-inserting machine comprising a work-punching device and a fastener-inserting device arranged side by side, a member arranged to operate said devices, movable means by which said devices are shifted laterally to place their centers alternately in register with an operating surface of said member, said devices being provided with heads against which said surface operates and said heads being individually adjustable to regulate the strokes imparted to said devices by said member, and mechanism for imparting operating movement to said member.

2. A fastener-inserting machine comprising a work-punching device and a fastener-inserting device arranged side by side, a member arranged to operate said devices, movable means by which said devices are shifted laterally to place their centers alternately in register with an operating surface of said member, said devices being provided with central screw-heads against which said surface operates and said heads being individually adjustable to regulate the strokes imparted to said devices by said member, and mechanism for imparting operating movement to said member.

3. A fastener-inserting machine comprising two plungers arranged side by side, a punch and a fastener-inserting tool carried by said plungers respectively, a hammer arranged to operate said plungers, screw-heads screwed into said plungers respectively to transmit the operating movements of said hammer to the plungers, said screw-heads being individually adjustable to regulate the strokes imparted to said plungers by the hammer, mechanism arranged to shift said plungers laterally to place said screw-heads alternately in register with a common operating surface of said hammer, and mechanism for operating said hammer twice in each cycle of operations.

4. A fastener-inserting machine comprising a work-punching device and a fastener-inserting device arranged side by said, an operating member having a surface arranged to act on said devices alternately, movable means by which said devices are shifted to place them alternately in register with said surface, and toggle mechanism arranged to operate said member with strokes of unequal amplitude.

5. A fastener-inserting machine comprising a work-punching device and a fastener-inserting device arranged side by side, a hammer having an operating surface arranged to act on said devices alternately, movable means by which said devices are shifted to place them alternately in register with a common area of said operating surface, and mechanism arranged to operate said hammer with strokes having a common terminal limit but different starting points.

6. A fastener-inserting machine comprising a work-punching device and a fastener-inserting device arranged side by side, a hammer having an operating surface arranged to act on said devices alternately, movable means by which said devices are shifted to place them alternately in register with said operating surface, and mechanism arranged to operate said hammer twice in each cycle with a relatively short stroke from one limit of retraction for the punching device and a relatively long stroke from another limit of retraction for the fastener-inserting device.

7. A fastener-inserting machine comprising a work-punching device and a fastener-inserting device arranged side by side, a hammer having an operating surface arranged to act on said devices alternately, movable means by which said devices are shifted to place them alternately in register with said operating surface and thereafter to feed the work, and toggle mechanism arranged to operate said hammer twice in each cycle with a dwell of the toggle adjacent to its dead-center position during the second operation in each cycle.

8. A fastener-inserting machine comprising a work-punching device and a fastener-inserting device arranged side by side, a hammer having an operating surface arranged to act on said devices alternately, movable means by which said devices are shifted to place them alternately in register with said operating surface, a toggle arranged to operate said hammer, and mechanism arranged to move said toggle a relatively short distance at one side of the dead-center position for operating the punching device and a relatively long distance at the opposite side for operating the fastener-inserting device.

9. A fastener-inserting machine comprising a work-punching device and a fastener-inserting device arranged side by side, a hammer having an operating surface arranged to act on said devices alternately, movable means by which said devices are shifted to place them alternately in register with said operating surface, a toggle arranged to operate said hammer, and mechanism arranged to move the knee of said toggle to and from the dead-center position twice in each cycle first with a relatively short operating stroke for the punching device and thereafter with a relatively long stroke for the fastener-inserting device.

10. A fastener-inserting machine comprising a work-punching device and a fastener-inserting device arranged side by side, a hammer for operating said devices alternately, movable means by which said devices are shifted laterally to place them alternately at a common operating locality, a toggle arranged to operate said hammer, and mechanism arranged to move the knee of said toggle in one direction across the dead-center position to operate the punching device and in the opposite direction to operate the fastener-inserting device, the limits of travel of said knee being unequally distant from the dead-center position, in consequence of which the hammer is operated with alternate short and long strokes.

11. A duplex fastener-inserting machine comprising a pair of opposed fastener-inserting devices and a pair of opposed work-punching devices, two opposed members arranged to operate said punching devices respectively, a double-acting toggle arranged

between and connecting said members, and mechanism arranged to operate said toggle.

12. A duplex fastener-inserting machine comprising a pair of opposed fastener-inserting devices, two opposed members arranged to operate said devices respectively, a double-acting toggle arranged between and connecting said members, and mechanism arranged to operate said toggle.

13. A duplex fastener-inserting machine comprising a pair of opposed fastener-inserting devices, two opposed levers arranged to operate said devices respectively, a slide and means by which it is guided, mechanism arranged to reciprocate said slide, and toggle-links connecting said slide and said levers respectively to impart operating movements to the levers.

14. A duplex fastener-inserting machine comprising a pair of opposed fastener-inserting devices and a pair of opposed work-punching devices, two opposed levers arranged to operate said punching devices respectively, a slide and means by which it is guided, mechanism arranged to reciprocate said slide, and toggle-links connecting said slide and said levers respectively to impart operating movements to the levers.

15. A duplex fastener-inserting machine comprising a pair of opposed punching devices, a pair of opposed fastener-inserting devices arranged beside the punching devices respectively, two opposed hammers arranged to operate the punching devices and the fastener-inserting devices alternately, movable means by which said devices are shifted to place said pairs alternately at a common operating locality, a double-acting toggle arranged between and connecting said hammers, and mechanism arranged to operate said toggle.

16. A duplex fastener-inserting machine comprising a pair of opposed punching devices, a pair of opposed fastener-inserting devices arranged beside the punching devices respectively, two opposed hammers arranged to operate the punching devices and the fastener-inserting devices alternately, movable means by which said devices are shifted to place said pairs alternately at a common operating locality, a double-acting toggle arranged between and connecting said hammers, and mechanism arranged to operate said toggle by moving it back and forth across its dead-center position.

17. A duplex fastener-inserting machine comprising a pair of opposed punching devices, a pair of opposed fastener-inserting devices arranged beside the punching devices respectively, two opposed hammers arranged to operate the punching devices and the fastener-inserting devices alternately, movable means by which said devices are shifted to place said pairs alternately at a common operating locality, a double-acting toggle arranged between and connecting said hammers, and mechanism arranged to operate said toggle by moving it back and forth across its dead-center position to points unequally distant from said position.

18. A duplex fastener-inserting machine comprising a pair of opposed punching devices, a pair of opposed fastener-inserting devices arranged beside the punching devices respectively, two opposed hammers arranged to operate the punching devices and the fastener-inserting devices alternately, movable means by which said devices are shifted to place said pairs alternately at a common operating locality, a double-acting toggle arranged between and connecting said hammers, means arranged to guide the knee of said toggle, and mechanism arranged to operate the toggle by reciprocating the knee thereof.

19. A duplex fastener-inserting machine comprising a pair of opposed punching devices, a pair of opposed fastener-inserting devices arranged beside the punching devices respectively, two opposed hammers arranged to operate the punching devices and the fastener-inserting devices alternately, movable means by which said devices are shifted to place said pairs alternately at a common operating locality, a double-acting toggle arranged between and connecting said hammers, means arranged to guide the knee of said toggle along a straight path, and mechanism arranged to operate the toggle by reciprocating the knee thereof.

20. A duplex fastener-inserting machine comprising a pair of opposed punching devices, a pair of opposed fastener-inserting devices arranged beside the punching devices respectively, two opposed hammers arranged to operate the punching devices and the fastener-inserting devices alternately, movable means by which said devices are shifted laterally to place said pairs alternately at a common operating locality, a double-acting toggle arranged between and connecting said hammers, a slide forming the knee of said toggle, means for guiding the slide along a straight path, and mechanism arranged to operate the toggle by reciprocating said slide.

21. A fastener-inserting machine comprising a punching device and a fastener-inserting device arranged side by side, means by which said devices are shifted laterally to place them alternately at a common operating locality, a hammer arranged to operate said devices alternately, a toggle arranged to operate said hammer, mechanism arranged to operate said toggle by moving it to and from its dead-center position twice in each cycle with a dwell adjacent to said position between the start and finish of the second operation thereof, and mechanism arranged to move said inserting device laterally during said dwell to feed the work, said hammer having a

lateral extension to maintain the fastener-inserting device against an inserted fastener during said dwell.

22. A fastener-inserting machine comprising a punching device and a fastener-inserting device arranged side by side, means by which said devices are shifted laterally to place them alternately at a common operating locality, a hammer arranged to operate said devices alternately, a toggle arranged to operate said hammer, mechanism arranged to operate said toggle by moving it twice across its dead-center position in each cycle with a dwell adjacent to said position between the start and finish of its return movement, and mechanism arranged to feed the work by moving said fastener-inserting device laterally during said dwell, said hammer having a portion arranged to maintain said inserting device against an inserted fastener during said dwell.

23. A fastener-inserting machine comprising a hammer, mechanism arranged to operate said hammer twice in each cycle by advancing it first from an initial intermediate position to a common limit of motion, then retracting it beyond its initial position, then advancing it a second time to said common limit, and thereafter retracting it to but not beyond said initial intermediate position, a punching device and a fastener-inserting device arranged side by side, means by which said devices are shifted laterally to place them alternately in register with a common operating portion of said hammer, means arranged to retract said devices, and means arranged to present a fastener to said inserting device.

24. A fastener-inserting machine comprising a hammer, mechanism arranged to operate said hammer twice in each cycle by advancing it first from an initial intermediate position to a common limit of motion, then retracting it beyond its initial position, then advancing it a second time to said common limit, and retracting it to an intermediate position of dwell adjacent to said common limit, a punching device and a fastener-inserting device arranged side by side, means by which said devices are shifted laterally to place them alternately in register with a common operating portion of said hammer, means arranged to retract said devices, means arranged to present a fastener to said inserting device, and means arranged to impart work-feeding motion to said fastener-inserting device while the hammer is in said intermediate position of dwell.

25. A fastener-inserting machine comprising a hammer, mechanism arranged to operate said hammer twice in each cycle by advancing it first from an initial intermediate position to a common limit of motion, then retracting it beyond its initial position, then advancing it a second time to said common limit, retracting it to an intermediate position only slightly distant from said common limit and maintaining a dwell at that intermediate position, and thereafter retracting it from said position of dwell, a punching device and a fastener-inserting device arranged side by side, means by which said devices are shifted laterally to place them alternately in cooperative relation to said hammer, means arranged to retract said devices, work-feeding mechanism arranged to operate by moving said inserting device laterally while the hammer is at said position of dwell, and means arranged to present a fastener to said inserting device.

26. A fastener-inserting machine comprising a hammer, a toggle arranged to operate said hammer, mechanism arranged to operate said toggle by shifting the knee thereof from an initial position at one side of dead-center to a position at the opposite side, shifting said knee in the opposite direction across dead-center to an intermediate position only slightly distant from dead-center and maintaining a dwell at said intermediate position, and thereafter shifting the knee in said opposite direction to its initial position, a punching device and a fastener-inserting device arranged side by side, means by which said devices are shifted laterally to place them alternately in cooperative relation to said hammer, means by which said devices are retracted, means arranged to present a fastener to said inserting device, and work-feeding mechanism arranged to operate by moving said inserting device laterally while the toggle-knee is at said position of dwell.

27. A fastener-inserting machine comprising a punching device and a fastener-inserting device arranged side by side, means by which said devices are guided lengthwise, a reciprocatory member to which said guiding means is connected by a pivotal joint and by which said devices are shifted to place them alternately at a common operating locality, work-feeding mechanism including a member movable about a fixed axis with which the axis of said pivotal joint coincides during the feeding period, means forming an articulate operating connection between said work-feeding member and said guiding means, and mechanism by which said devices are operated alternately and by which said inserting device is maintained against a clenched fastener during the feeding stroke imparted to said guiding means.

28. A fastener-inserting machine comprising guiding means, two slides arranged in tandem relation thereon, two individual mechanisms arranged to reciprocate said slides respectively, a punching device and a fastener-inserting device arranged side by side, means carried by one of said slides to shift said devices laterally to and from a common operating locality, and means oper-

ated by the other one of said slides to operate said devices alternately.

29. A fastener-inserting machine comprising guiding means, two slides arranged in tandem relation thereon, two individual mechanisms arranged to reciprocate said slides respectively, a punching device and a fastener-inserting device arranged side by side, means carried by one of said slides to shift said devices laterally to and from a common operating locality, the latter said means being movable, relatively to the slide by which it is carried, to feed the work, mechanism arranged to impart work-feeding movement to the latter said means, and mechanism operated by the other one of said slides to operate said devices alternately.

30. A machine comprising fastener-inserting means, a frame in which said means is mounted, a detachable raceway for supplying fasteners to said means, and mechanism arranged in said frame to impart fastener-presenting movement to said raceway, said mechanism and the raceway having cooperative interlocking elements formed and arranged to be cooperatively coupled by the act of placing the raceway in cooperative relationship to said fastener-inserting means.

31. A machine comprising fastener-inserting means, a frame in which said means is mounted, a detachable raceway for supplying fasteners to said means, and mechanism arranged in said frame to impart fastener-presenting movement to said raceway, said mechanism and the raceway having cooperative tongue-and-groove coupling elements formed and arranged to be cooperatively coupled by the act of moving the raceway sidewise into its cooperative relationship with said fastener-inserting means.

32. A machine comprising fastener-inserting mechanism, a jointed raceway having an upper section and a lower section arranged to supply fasteners to said mechanism, means by which said upper section of the raceway is supported in a certain relation to said mechanism and from which the raceway may be detached, and mechanism for operating said lower section of the raceway to present the fasteners, said operating mechanism and said lower section having cooperative coupling elements formed and arranged to be coupled by mounting the upper section of the raceway on said supporting means.

33. A machine comprising fastener-inserting mechanism, a jointed raceway having an upper section and a lower section for supplying fasteners to said mechanism, said sections being connected by a pivotal joint, means by which said upper section is supported in a certain relation to said mechanism and from which the raceway may be detached by moving it laterally, and mechanism for operating said lower section to present the fasteners, said operating mechanism and said lower section having cooperative coupling portions formed and arranged to be coupled by moving the upper section of the raceway laterally on said supporting means.

34. A machine comprising a frame, fastener-inserting mechanism, a plurality of parallel dowels projecting from the frame, a jointed raceway having an upper section and a lower section for supplying fasteners to said mechanism, said upper section having dowel-holes to receive said dowels and thereby locate the upper section of the raceway in a certain relation to said frame, and mechanism for operating the lower section of the raceway to present the fasteners, said operating mechanism and said lower section having cooperative coupling elements formed and arranged to be coupled by moving said upper section along said dowels.

35. A machine comprising fastener-inserting mechanism, a jointed raceway having an upper section and a lower section for supplying fasteners to said mechanism, said sections being connected by a pivotal joint, means arranged to support said raceway in operative position by engagement with said upper section, and raceway-operating mechanism a member of which is arranged to oscillate about an axis coincident with the axis of said pivotal joint, said member and the lower section of the raceway having cooperative coupling elements formed and arranged to be coupled by mounting the raceway on said supporting means.

36. A machine comprising a frame, fastener-inserting mechanism, raceway-supporting means projecting laterally from one side of said frame, a jointed raceway having an upper section and a lower section for supplying fasteners to said mechanism, said sections being connected by a pivotal joint and said upper section being formed to embrace and slide laterally on said supporting means, raceway-operating mechanism, said lower section and said raceway-operating mechanism having cooperative coupling elements formed to be coupled by lateral movement of the raceway on said supporting means, and means for securing said upper section on said supporting means.

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

SYLVESTER LEO. GOOKIN.