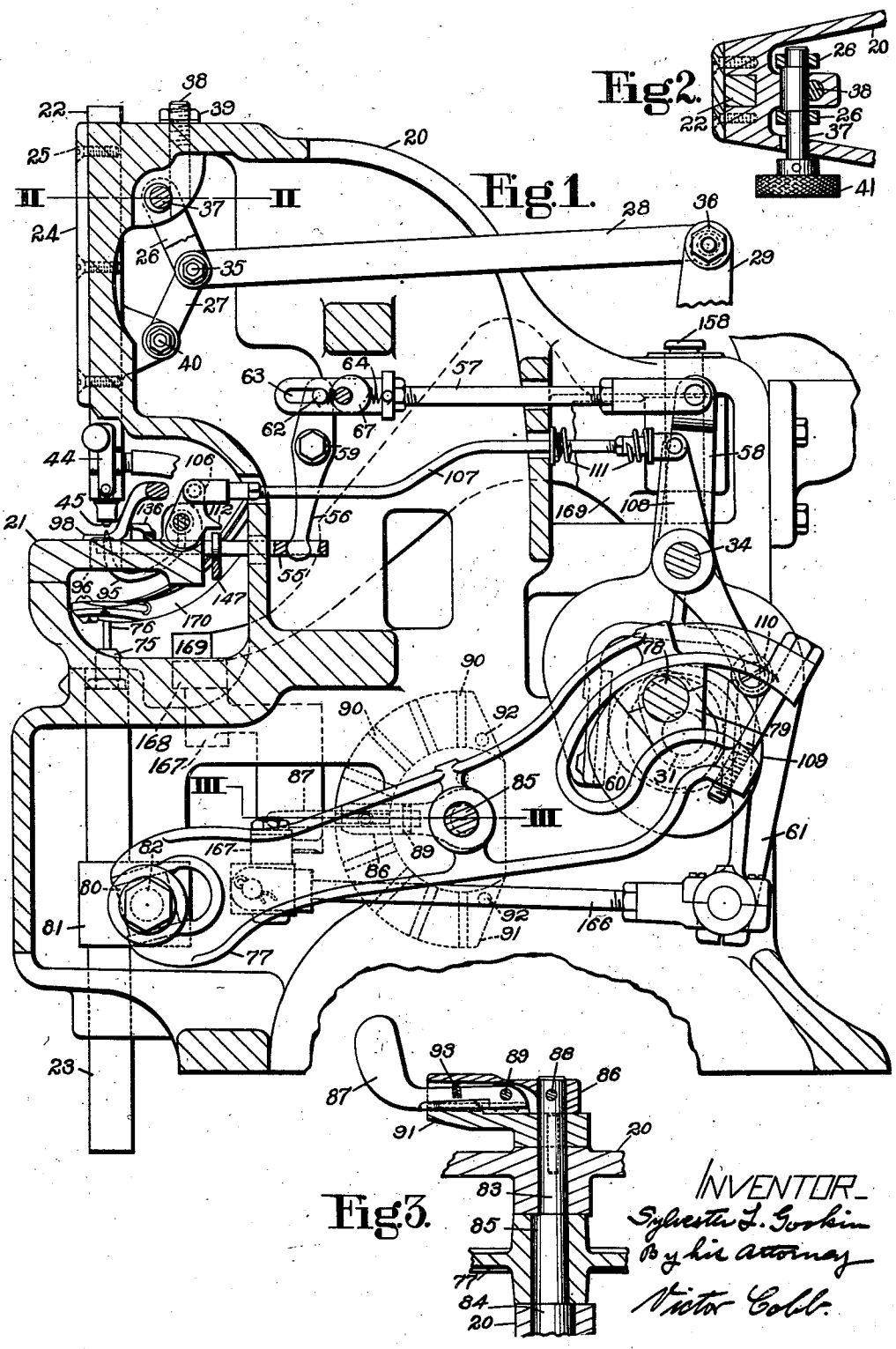
Nov. 3, 1942. S. L. GOOKIN 2,300,499

EYELETING MACHINE

Filed Aug. 10, 1939 4 Sheets-Sheet 1



Nov. 3, 1942. S. L. GOOKIN 2,300,499

EYELETING MACHINE

Filed Aug. 10, 1939 4 Sheets-Sheet 2

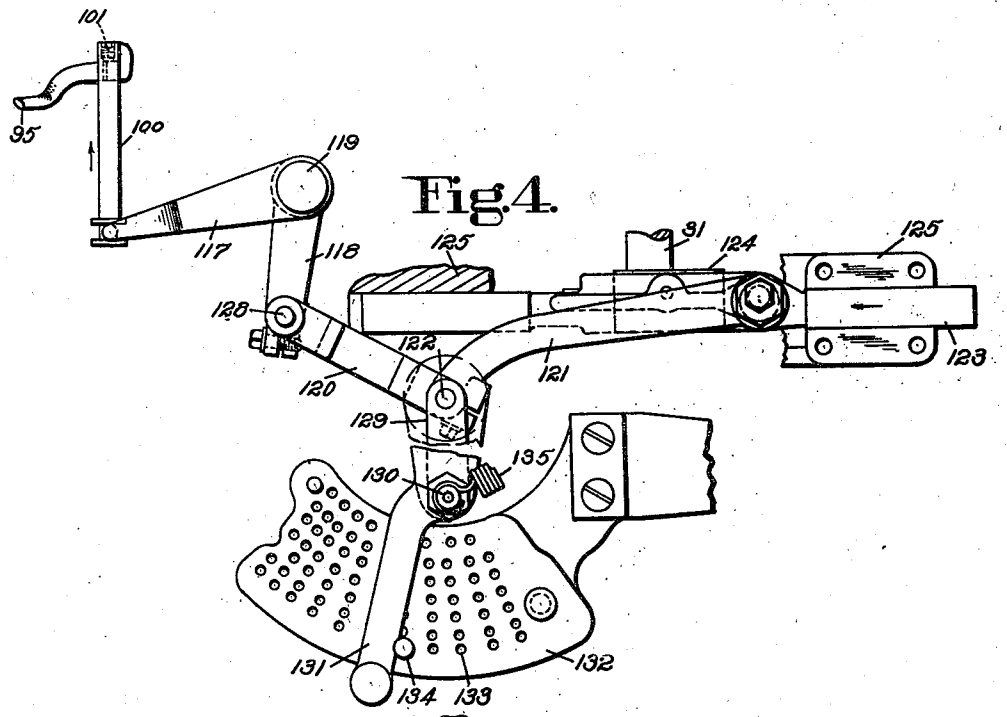


Fig.4.

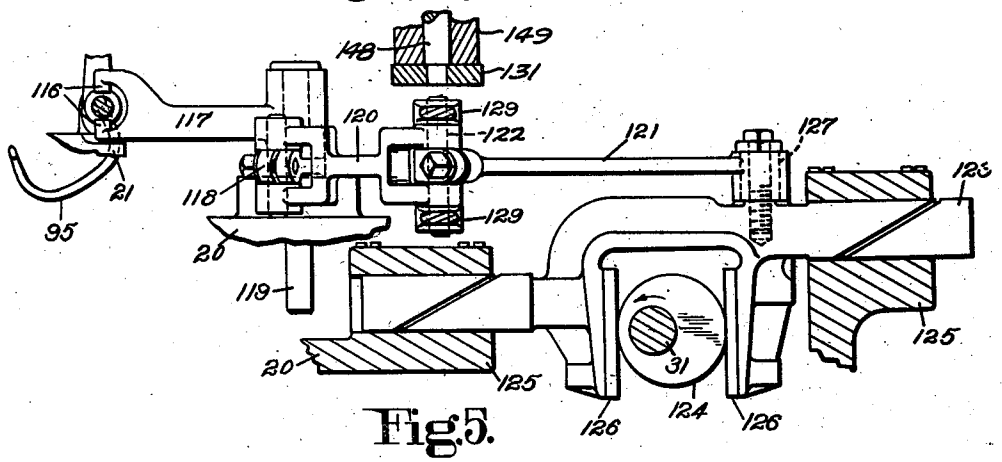


Fig.5.

INVENTOR.
Sylvester L. Gookin
By his attorney
Victor Cobb.

Nov. 3, 1942. S. L. GOOKIN 2,300,499

EYELETING MACHINE

Filed Aug. 10, 1939 4 Sheets-Sheet 3

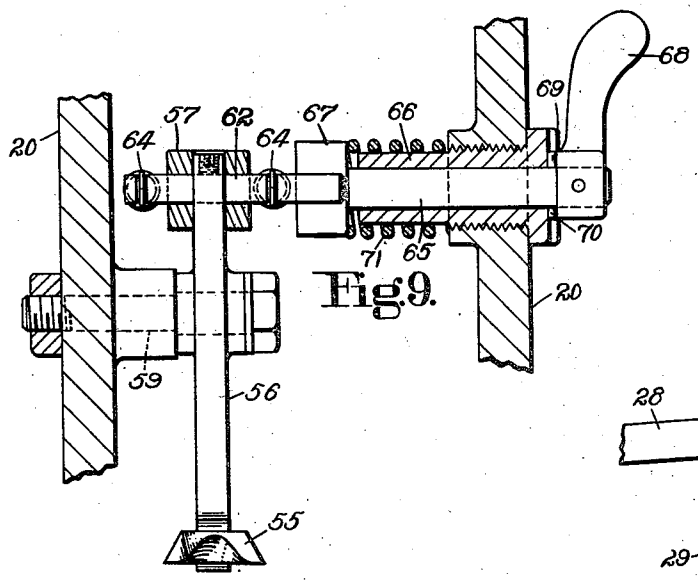


Fig.9.

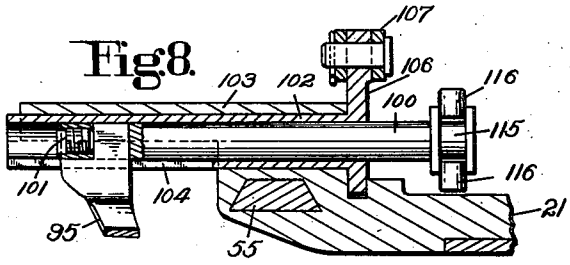


Fig.8.

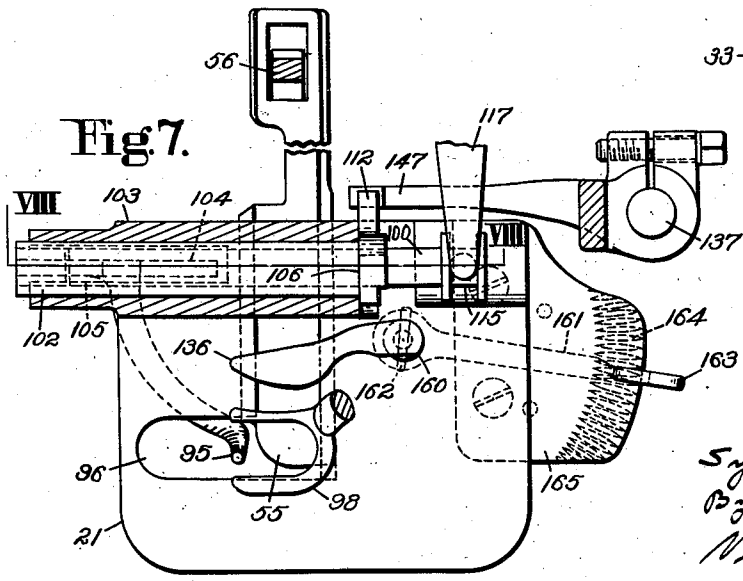


Fig.7.

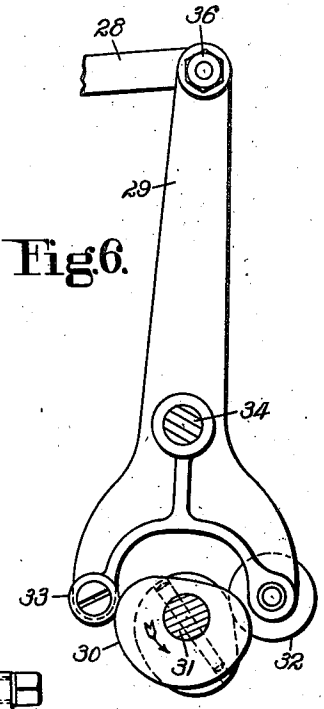


Fig.6.

INVENTOR
Sylvester L. Gookin
By his Attorney
Victor Cobb.

Nov. 3, 1942. S. L. GOOKIN 2,300,499

EYELETING MACHINE

Filed Aug. 10, 1939 4 Sheets-Sheet 4

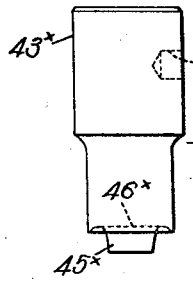


Fig.12.

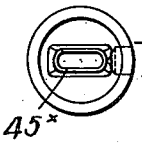


Fig.13.

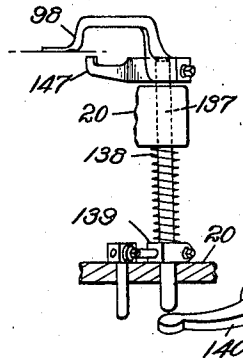
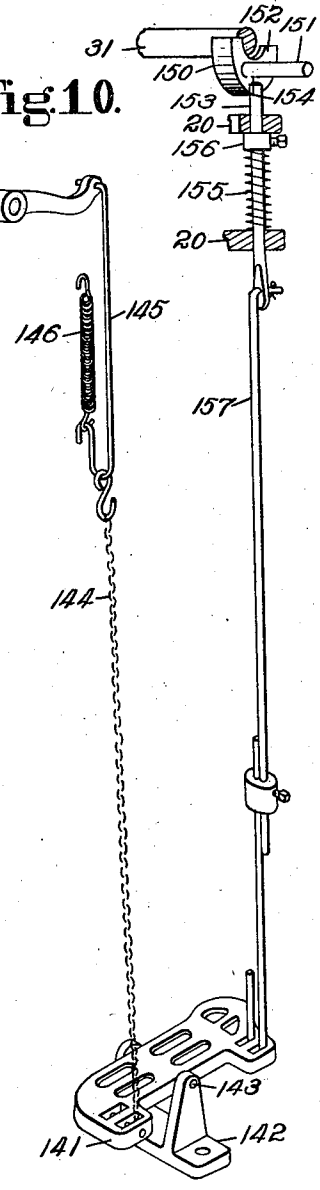


Fig.10.



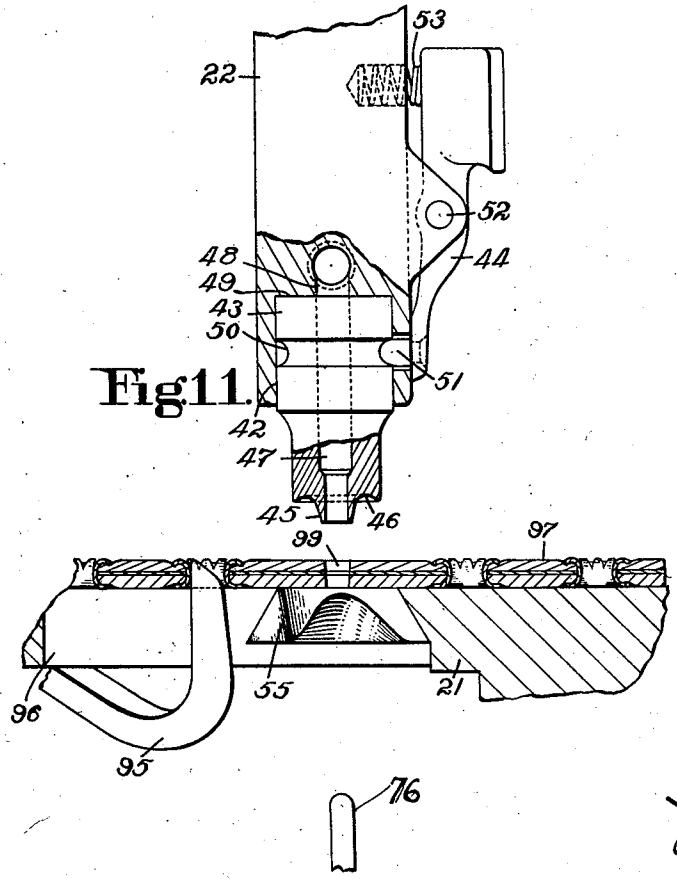


Fig.11.

INVENTOR
Sylvester L. Gookin
By his attorney
Victor Cobb.

Patented Nov. 3, 1942

2,300,499

UNITED STATES PATENT OFFICE

2,300,499

EYELETING MACHINE

Sylvester L. Gookin, Quincy, Mass., assignor to United Shoe Machinery Corporation, Borough of Flemington, N. J., a corporation of New Jersey

Application August 10, 1939, Serial No. 289,446

10 Claims. (Cl. 218—15)

This invention relates to automatic, high speed, eyeleting machines of the type in which a plurality of power-operated mechanisms are organized to punch eyelet-receiving holes in the work one at a time, to insert and clench eyelets one at a time, and to feed the work step by step. The invention is illustrated as embodied in a machine intended primarily to operate on shoe uppers and is described accordingly but its utility is not limited to work of that kind.

Among the objects of the invention are the following: To insure precision of alinement of the eyelet-setting tools, to facilitate replacement of one of the setting tools with a corresponding tool having different characteristics according to the eyelets to be used, to provide improved work-feeding mechanism, to provide for punching the eyelet-receiving holes and inserting the eyelets at a common locality, to provide for using a certain ara of the punch-block under all conditions irrespective of changes in the length of the feeding movements by which the work is fed, to provide for a constant relation between the edge-gage and the punching locality irrespective of changes in the length of feeding steps, and to provide improvements in the hopper-and-raceway assemblage by which eyelets are supplied to one of the setting tools.

One of the novel features of the machine illustrated herein is that the cooperative eyelet-setting tools are arranged and operated in constant alinement one with the other, one of them having a punching portion to form the eyelet-receiving holes and the other having a spindle of well-known construction and operation by which the eyelets are taken one at a time from a raceway and carried to the work. A movable punch-block is arranged to be projected between the setting tools when the latter are separated and is automatically shifted to and from its operative postion. The respective bars that carry the setting tools are arranged in fixed bearings in the main frame of the machine, and once the setting tools are arranged in alinement one with the other, they are not subjected to any action that might militate against the precision of their alinement.

Since neither of the setting tools plays any part in feeding the work, the mechanism provided for feeding the work may be allotted a greater proportion of a cycle of operations in which to perform its duty than it could be alotted if it were, as in former eyeleting machines, required to remain quiescent during those portions of the cycle allotted to punching the holes and inserting the eyelets. Accordingly, a novel feature provided by the present invention is a work-feeding mechanism, the feeding period of which is alotted about 180° of each cycle of operations as against about 90° as in eyeleting machines heretofore in use. Moreover, the work-feeding mechanism provided by the present invention is much lighter in weight than the corresponding mechanisms in former machines, since its burden does not include any heavy-duty element, such as a punch-bar. The work-engaging element of the feeding mechanism herein illustrated is a slender spur or finger that has merely to enter a clenched eyelet at the eyelet-inserting locality and move laterally therefrom while the punching tool and the eyelet-inserting tool are returning to their initial positions. Preferably, and as herein illustrated, the mechanism for imparting feeding movement to this finger is of the type that produces reciprocatory motion so near harmonic as to be a mechanical equivalent thereof; that is to say, the feeding movements are initially slow and accelerative through the first half of each stroke and are decelerative through the latter half of each stroke. Consequently, jerking of the work is avoided and the work progresses through the machine smoothly and without disturbing the operator's control of it and without being displaced from the edge-gage.

Other improvements are illustrated in the drawings and are hereinafter described and claimed.

Referring to the drawings,

Fig. 1 is a vertical section of an eyeleting machine embodying the novel features of the present invention, the front of the machine being at the left of the figure;

Fig. 2 is a horizontal section of an adjusting device intersected by line II—II of Fig. 1;

Fig. 3 is a horizontal section of an adjusting device intersected by line III—III of Fig. 1.

Fig. 4 is a top plan view of the work-feeding mechanism including a regulating device by which the length of the feeding steps may be varied;

Fig. 5 is an elevation, partly in section, of the work-feeding mechanism, the direction of the view being the same as that of Fig. 1;

Fig. 6 is an elevation of a lever and its cam for operating the punch, the direction of the view being the same as that of Fig. 1;

Fig. 7 is a top plan view including the work-supporting table, parts carried thereby and a portion of the presser foot, the front of the table being at the bottom of the figure;

Fig. 8 is a vertical section of the structure intersected by line VIII—VIII in Fig. 7;

Fig. 9 is a vertical section, partly in elevation, of parts for shifting the punch-block automatically, and a manually operable device for retracting the punch-block from its operative position;

Fig. 10 is a perspective view including a treadle and two trains of parts operable thereby, the function of one train being to trip a driving clutch and the function of the other train being to lift the presser foot and depress the work-engaging member of the feeding mechanism;

Fig. 11 is an elevation, partly in section, on a magnified scale, including the work-supporting table, the punch-block, the punch, a work-piece, and the work-engaging member of the feed mechanism in the act of locating an uneyeleted hole in the work-piece in register with the eyelet-setting tools for the reception of an eyelet;

Fig. 12 is a front elevation of a combined punch and setting tool for operating on oblong eyelets; and

Fig. 13 is an end view of the punching end of a tool such as that shown in Fig. 12.

Referring to Fig. 1, the main frame 20 is provided with a rigid horizontal work-supporting table 21 and with fixed bearings for a vertically movable punch-bar 22 and a vertically movable set-bar 23. The punch-bar is square in cross-section and its bearing is afforded by a groove of corresponding section in the frame (Fig. 2). A plate 24 is fastened to the frame by screws 25 to maintain the punch-bar in its bearing. This bar is reciprocated by a train of mechanism comprising toggle members 26 and 27, a link 28, a lever 29, and a conjugate cam 30 (Fig. 6). The cam is affixed to a cam-shaft 31 and the latter is journaled in bearings in the frame 20. One section of the cam 30 engages a cam-roll 32 and the other section engages a cam-roll 33, both rolls being mounted on the lever 29. The lever itself is mounted on a fulcrum-pin 34 and the latter is affixed to the frame 20. The effect of the cam 30 is to operate the lever 29 positively in opposite directions.

Referring again to Fig. 1, the link 28 is connected to the knee of the toggle by a pivot member 35 and to the lever 29 by a clamping stud and an eccentric bushing 36 that may be adjusted to shift the range of travel of the member 35. The toggle members 26 are suspended from eccentric portions 37 of an anchoring pivot secured in the frame 20 by a draw-bolt 38. When this draw-bolt is loosened by slackening its nut 39 the anchoring pivot may be turned by a knob 41 (Fig. 2) for purposes of adjustment hereinafter explained. The toggle members 27 are connected to the punch-bar 22 by a pivot member 40. All the parts occupy their initial positions as pictured in Fig. 1, the knee-pivot 35 of the toggle being at the rear of its dead-center position and the punch-bar 22 being raised, but when the knee-pivot is shifted as far as it will go toward the front of the machine it will stand somewhat in front of its dead-center position.

The lower end of the punch-bar 22 (see Fig. 11) is provided with a cylindrical socket 42 for the reception of the butt 43 of a combined punch and eyelet-setting tool which is retained in the socket by a finger-latch 44. The tool shown in Fig. 11 is provided with a circular punching portion 45, a circular eyelet-clenching surface or anvil portion 46, and a duct 47 through which the chips of punched material may travel to be discharged through a communicating duct 48 in the punch-bar. The wall 49 that forms the upper end of the socket 42 provides a seat for the upper end of the butt 43 and these surfaces are maintained one against the other to insure positive operation of the punch 45 without lost motion. For this purpose the butt 43 is provided with a circumferential groove 50 and the latch 44 is provided with a retaining lug 51 that projects through a hole in the bar 22 and engages the wall of the groove. The latch 44 is mounted on the bar 22 by a pivot-pin 52 and is biased by a compression spring 53 that maintains the lug 51 with pressure against the wall of the groove 50.

If the machine is to be used for inserting eyelets having non-circular barrels the combined punch and setting tool illustrated in Fig. 11 will be detached from the bar 22 and a tool having other characteristics will be inserted into the socket 42. For example, for inserting eyelets having oval barrels a tool such as that represented in Figs. 12 and 13 will be substituted. This tool has a tubular punching portion 45X of oval cross-section surrounded by an oval eyelet-clenching surface 46X, the butt 43X being cylindrical to fit the socket 42 but having a short radial bore 50X instead of an annular groove to receive the retaining lug 51. This detail of construction will permit the lug 51 to function only when the bore 50X is in register therewith and will prevent the tool from turning about its own axis when the parts are assembled and interlocked in the only relation possible. The bore 50X will, of course, be located with regard to the position in which non-circular eyelets are to lie when inserted.

The punching tool cooperates with a hardened steel slide 55 (Figs. 1, 7, 9, and 11) that constitutes a punch-block. This slide has a bearing in a dovetail groove in the work-supporting table 21 and the upper surface of the slide is flush with that of the table. The slide is movable to the front and rear of the machine and it stands in its forward position only when the punch-bar 22 descends to punch an eyelet-receiving hole in a work-piece. As soon as the pressure of the punch against the punch-block has been relieved by shifting the knee-pivot 35 of the toggle to the forward side of its dead-center position the punch-block is retracted to clear the path of travel of the eyelet about to be inserted. For this purpose the machine is provided with a train of mechanism comprising a lever 56, a fulcrum stud 59 therefor, a link 57, an arm 58 constituting a part of a forked lever, and a conjugate cam 60 carried by the shaft 31. The forked lever is mounted on the fulcrum-pin 34 and it serves also to operate a raceway hereinafter described. For the latter purpose the forked lever is provided with a downwardly extending arm 61 as in the raceway-operating mechanism illustrated and described in United States Letters Patent No. 1,722,286, granted July 30, 1929, on my application

A clevis at the forward end of the link 57 straddles the lever 56 as shown in Fig. 9, and a pin 62 affixed to the lever 56 projects through and beyond slots 63 in the clevis to provide for a yieldable operating connection. Two tension springs 64 anchored to the clevis are engaged with the pin 62 and normally maintain the latter at the rear ends of the slots 63. This train of mechanism is therefore effective to retract the punch-block 55 positively, but the springs 64 permit the link 57 to move in the event that the

movement of the punch-block toward its operative position is obstructed.

The springs **64** also permit the punch-block to be retracted manually from its operating position as when the combined punching and clenching tool is to be detached from the bar **22** and another tool inserted into the bar. For this purpose, the machine is provided with a manually operable retracting device, shown in Fig. 9. This device comprises a stem **65** which is rotatably mounted in a bushing **66**, and is provided with an eccentric **67** and an operating handle **68**. The bushing **66** is screwed into a wall of the frame **20** and its outer end is provided with a radially extending groove **69** to receive complemental teeth **70** formed on the hub of the handle **68**. A compression spring **71** maintains the handle against the outer end of the bushing and the teeth **70** are thereby drawn into the groove **69** to maintain the eccentric **67** in either of two positions 180° apart. The pin **62** carried by the lever **56** is extended to be operated by the eccentric **67**. This device does not interfere with or partake of the automatic operation of the punch-block since the eccentric **67**, when in the position shown in Fig. 1, is not within the range of travel of the pin **62**.

The set-bar **23** (Fig. 1) is provided at its upper end with a fastener-inserting tool **75** of common construction, as illustrated, for example, in the above-mentioned Patent 1,722,286, and it includes the usual spring-pressed spindle **76** by which eyelets are taken, one at a time, from a raceway and carried to the work. The mechanism for operating the set-bar **23** comprises a lever **77**, a crank **78**, and a two-piece block **79** engaging the crank and arranged to slide on curved bearing surfaces formed in the lever. The forward end of the lever **77** is forked and straddles a swiveled block **80** carried by a split clamping member **81** and connected thereto by a pivot stud **82**. The member **81** surrounds the bar **23** and is securely clamped to the latter by the stud **82** when set up tightly. These details of construction are all well known in eyeleting machines of the type illustrated in my pending application for Letters Patent of the United States, Serial No. 252,599, filed January 24, 1939.

A novel feature of the present invention provides improved means for regulating the pressure with which the eyelets will be clenched, with regard to the thickness of the materials in which they are to be inserted. The regulation of such pressure is accomplished by raising or lowering the limits of travel of the bar **23** through the medium of the lever **77**, and the device for accomplishing this purpose is illustrated in Fig. 3. About midway between its ends, the lever **77** is mounted on an adjustable fulcrum pin comprising two concentric portions **83** and **84**, and an intermediate eccentric portion **85**. The lever **77** engages the eccentric portion and the concentric portions **83** and **84** are mounted in bearings in the walls of the frame **20**. The portion **83** projects beyond the corresponding wall of the frame and is provided with a two-piece lever comprising the members **86** and **87**. The member **86** is affixed to the portion **83** as by a pin **88**, and the member **87** is partially nested in a groove formed in the member **86** and is connected to the latter by a pivot pin **89**. The member **87** constitutes a handle by which the fulcrum pin may be turned and one of its edges is formed to enter any selected one of a series of radial grooves **90** formed in a quadrant **91**. The quadrant is affixed to the frame **20** as by pins **92**. A compression spring **93** seated on the members **86** and **87** is effective to maintain the member **87** in any one of the grooves **90** with which it may be in register. To alter the effective pressure of the eyelet-inserting tool **75**, requires merely swinging the handle about the axis of the fulcrum pin to a position in register with one of the other grooves **90**.

At the completion of each eyelet-clenching operation, the punch-bar **22** is raised and the set-bar **23** is depressed, and at this stage a feeding spur or finger **95**, (Figs. 1, 4, 7, and 11) enters the eyelet just clenched and moves from right to left a regulatable distance to feed the work one step. The finger **95** enters the eyelet from below the work-supporting table **21** and in the space vacated by retracting the punch-block, the table being provided with an elongated opening **96** of sufficient dimensions to receive the lower setting tool **75** and to permit the finger to feed with strokes of maximum length. Throughout the operation of the machine, a work-piece **97**, such as a shoe upper (Fig. 11), is clamped continuously against the work-supporting table with light pressure by a presser foot **98**, the details of which are hereinafter described. Fig. 11 illustrates the work-piece as having been provided with a series of clenched eyelets and with a punched hole **99** into which no eyelet has been inserted. This condition is, however, illustrated for the purposes of a later explanation as to the use of the finger **95** for locating a punched hole **99** in the desired position to receive an eyelet that should have been inserted into it during a previous run of the machine but which, through accident, was omitted. In the normal operation of the machine, of course, the two eyelets appearing at the right in Fig. 11 would not yet have been inserted, nor would their holes have been punched.

The feeding finger **95** is in the form of a hook and its butt-end is detachably affixed to a carrier **100** represented as a short length of cylindrical rod. A set-screw **101**, (Fig. 8) screwed into the left-hand end of the rod **100** provides for securing the finger to the rod. The rod **100** is telescopically mounted in a bearing sleeve **102** and the latter is mounted in a horizontal bore in a boss **103** formed on the table **21**, adjacent to its rear edge. A train of mechanism is provided to oscillate the sleeve **102**, and another train of mechanism is provided to reciprocate the rod **100** lengthwise of its axis, these two motions being compounded to impart an orbital motion to the eyelet-engaging extremity of the finger **95**. To provide for compounding these motions, the sleeve **102** is provided with a slot **104** that extends lengthwise thereof and is of a width corresponding to that of the butt-end of the finger **95**. Consequently, when the butt-end is inserted into the rod **100**, it extends through the slot **104** and is thus interlocked with the sleeve **102** to partake of the rocking motions of the latter. A slot **105** in the boss **103** affords the clearance required by the oscillatory motions of the finger.

The right-hand end of the sleeve **102** is provided with an arm or head **106** by which it may be rocked about its axis. The train of mechanism for producing this motion is shown in Fig. 1 and comprises a link **107**, a lever **108**, and a cam **109** secured to the shaft **31**. The lever **108** is mounted on the fulcrum pin **34**. A cam-roll **110** is mounted on the lever **108** and is maintained in

contact with the cam by a compression spring 111 that surrounds the link 107, one end of the spring being seated against a stationary abutment such as a web of the frame 20 and the other end being seated against an abutment on the link. The effect of this spring is to raise the tip of the finger 95 according to the timing of the cam 109 but the latter is effective to disengage the finger positively from an eyelet at the completion of each feeding stroke. The spring 111 also provides for depressing the tip of the finger 95 manually under certain conditions, as when locating a work-piece on the table 21 prior to automatic operation of the machine. For this purpose the head or arm 106 formed on or affixed to the sleeve 102 is provided with a nose 112 by which the sleeve may be rocked in consequence of lifting the presser foot as hereinafter described.

To provide for imparting feeding strokes to the finger 95 the right-hand end of the rod 100 (Figs. 4 and 7) is formed with a circumferential groove 115 between two circular flanges, and this groove is occupied by a pair of cylindrical lugs 116 (Fig. 5) formed on an arm 117 of a bell-crank lever. The other arm of this lever is indicated at 118 and the fulcrum pin therefor is indicated at 119. A train of mechanism for operating this bell-crank lever and for regulating the length of the feeding strokes imparted to the finger 95 is similar to the corresponding work-feeding mechanism illustrated and described in United States Letters Patent No. 1,228,768 granted June 5, 1917, on application of P. R. Glass. The work-feeding mechanism embodying the present invention differs from that disclosed in the patent last mentioned in that it allots 180° of each cycle to the feeding stroke and 180° to the return stroke, whereas the mechanism illustrated in the patent is allotted only 90° for the feeding stroke, 90° dwell, 90° for the return stroke, and another dwell of 90°.

Referring to Figs. 4 and 5, the train of mechanism for operating the arm 118 of the bell-crank lever comprises links 120 and 121 connected by a pivot pin 122, a sliding bar 123, and circular eccentric 124 secured to the shaft 31. The extremities of the bar 123 are mounted in capped bearings 125 in the frame 20, and the intermediate portion of the bar provides parallel confronting cheeks 126 that engage the eccentric to be operated positively thereby with a harmonic motion but without lost motion or dwell. The link 121 and the bar 123 are connected by a pivot member 127, and the link 120 and the arm 118 are connected by a pivot member 128. Although the motion of the bar 123 is truly harmonic, that of the finger 95 is not quite harmonic because the harmonic quality is slightly distorted by the angular motions of the connections 120, 121 and 129.

The ends of the pivot pin 122 are pivoted in arms 129 of a yoke that is free to oscillate about said pivot pin 122 as well as about a pivot pin 130. The latter pin is affixed to a manually movable arm 131 the purpose of which is to regulate the length of the feeding strokes of the finger 95. A pivot pin 148 tightly pressed into the regulating arm 131 is mounted in a stationary bearing 149 (Fig. 5) and the parts are so organized that the pin 122 is alined with the pin 148 when the feeding finger 95 is at the initial limit of its feeding stroke. This alined relation is represented in Figs. 4 and 5. It is not disturbed by adjusting the arm 131 about the axis of the pin 148, but such adjusting changes the location of the pivot pin 130 and thereby alters the path of the pin 122 to increase or decrease the length of the feeding strokes imparted to the finger 95 by the bar 123.

The regulating arm 131 overlies a stationary plate 132 provided with a large number of holes 133 into which a stop-pin 134 may be inserted. A tension spring 135, anchored at one end to any convenient fixture, engages the pivot pin 130 to maintain the regulating arm in contact with the pin 134 wherever the latter may be located.

The punching mechanism, the eyelet-inserting mechanism, and the work-feeding mechanism are coordinated to operate as follows: A starting-and-stopping mechanism arrests the shaft 31 when the punch-bar is raised, the set-bar 23 is depressed, and the work-feeding finger 95 is at or near the terminal limit of its travel from right to left. At this stage, the tip of the finger 95 projects above the work-table 21 as represented in Fig. 11, and is at an intermediate stage of being depressed. When the machine is set in operation, the punch-block 55 completes its forward travel to its operative position, the punch-bar 22 descends to punch a hole in the work-piece and rises immediately from the punch-block only far enough to relieve the latter from pressure but not enough to withdraw the punch from the work-piece. While this is occurring, the tip of the finger 95 is carried downwardly below the table 21 and to the rear, and at the same time it begins to travel from left to right in a path that enables it to clear the eyelet-inserting tool 75, which, in the meantime, rises to remove an eyelet from the raceway 170 and to insert the eyelet into the work-piece with one continuous up-stroke. Before the spindle 76 of the inserting tool rises to the level of the punch-block 55, the latter is retracted to the rear, thereby clearing the opening 96 in the work-table to receive the tool 75. The up-stroke of the tool 75 finally inserts the eyelet through the work-piece and clenches it with the cooperation of the anvil or clenching surface 46 of the upper tool. Having completed the inserting and the clenching of an eyelet, the set-bar 23 descends immediately and the punch-bar 22 rises, and as the spindle 76 of the lower tool clears the clenched eyelet, the finger 95 enters the same eyelet and feeds the work with a stroke that continues through 180° of a cycle.

Since the work-feeding portion of the motion imparted to the finger 95 is nearly, if not strictly, harmonic, ample time is available near the limits of the feeding movement for the up-and-down movements of the finger 95. The cam 109 and the eccentric 124 are so coordinated that the feeding movement begins while the tip of the finger is rising and almost, but not quite, in the eyelet about to be engaged. To facilitate its entrance into the eyelet without fouling the latter, the tip of the finger is pointed by providing it with an end surface that slants downwardly from left to right as shown in Fig. 11. This view represents the initial positions of the finger 95 and the punching tool, the feeding being completed and the finger being slightly below its highest level and in the descending portion of its orbit.

If, during a run of the machine comprising a series of cycles, the lower tool 75 fails to receive an eyelet from the raceway, or, for any other reason fails to insert an eyelet in regular course, it may happen that a work-piece will receive all

but one of its quota of eyelets and will have an uneyeleted hole 99, as represented in Fig. 11. In these circumstances, the operator will present the work-piece again to the machine to insert an eyelet for the one missing, and may avail himself of the finger 95 to locate the uneyeleted hole 99 in register with the setting tools. To do so, he has merely to place one of the previously clenched eyelets on the tip of the finger 95, as illustrated in this figure, and place the lacing edge of the work-piece against an edge-gage 136, (Figs. 1 and 7). The work-piece will thus be located by the combined effects of the finger 95 and the edge-gage to register the hole 99 in line with the setting tools with the same degree of accuracy as though an eyelet had been inserted in regular course.

Since the tip of the finger 95 extends slightly above the level of the work-table in every case when the machine is stopped, it is also available as a starting gage to locate a work-piece initially for the first eyelet of a series. In these circumstances, the operator has only to place the left-hand edge of the work-piece against the right-hand side of the finger 95 and the lacing edge against the edge-gage. On the other hand, if the left-hand margin of the work-piece must project beyond the finger to locate the first eyelet at the desired point, the operator may depress the finger below the level of the work-table where it will not interfere with the left-hand margin.

For the latter purpose, the invention provides a treadle-operated mechanism represented in Fig. 10. As shown in this figure, the presser foot 98 is affixed to the upper end of a vertical rod 137. This rod is movable up and down in bearings afforded by portions of the frame 20 and is normally depressed by a light spring 138 to maintain the presser foot on the work-piece. This spring exerts downward pressure against a collar 139 clamped to the rod; but the rod extends below its lower bearing to be engaged by a lifting lever 140. The hub of the lever 140 is bored to receive a horizontal fulcrum pin (not shown). Another arm formed on the lever has connection with the heel end 141 of a treadle mounted in a floor-bracket 142 and connected thereto by a pivot pin 143. The connections between this treadle and the lever 140 comprise a chain 144, and a rod 145, one end of the rod being engaged with the lower end of a tension spring 146 by which the parts are normally maintained in the positions shown. When the heel end 141 of the treadle is depressed against the tension of the spring 146, it causes the lever 140 to lift the presser foot from the work-table far enough to permit insertion of a work-piece under the presser foot. If the heel end of the treadle is depressed as far as it will go the tip of the finger 95 will be depressed below the level of the work-table by an arm 147 formed on or affixed to the presser foot. This arm is arranged to engage and lift the nose 112 (Fig. 1) of the arm 106 that rocks the sleeve 102 and the finger 95. When this is done, all obstruction is removed from the level of the work and the work-piece may be located wherever desired for punching the first hole and inserting the first eyelet.

The treadle included in Fig. 10 is utilized also to trip a clutch by which the shaft 31 is driven, this clutch being of a well-known type that is fore fully illustrated and described in United States Letters Patent No. 2,056,316, granted October 6, 1936, on my application. The member 150 is an element of the driven member of the clutch and is also an element of the stopping mechanism. A pin 151 affixed to the member 150 is movable endwise to and from engagement with a driving lug on the driving member of the clutch. The portion 152 of the member 150 has a wedging face that engages a controlling pin 153 when the latter is raised to the position shown in the drawings, the wedging face being effective to disengage the pin 151 from the driving member, and a shoulder 154 formed on the member 150 being effective to arrest rotation of the shaft 31 when the pin 153 stands in its path. The pin 153 has bearings in two portions of the frame 20, spaced one from the other to accommodate a compression spring 155 and a collar 156 affixed to the pin. The spring 155 normally raises the pin 153 into the path of rotation of the member 150. A rod 157 comprising two relatively adjustable sections provides connection between the pin 153 and the toe end of the treadle. After the heel end of the treadle has been depressed to retract the finger 95 below the level of the work-table the toe end may be depressed to set the machine in operation.

Referring to Fig. 7, the edge-gage 136 is formed aod arranged to overlie the punch-block 55 and to engage the lacing edge of a shoe-upper at a point directly behind but in register with the punching and eyelet-inserting locality. A cylindrical stem 160, formed on the edge-gage, extends through the work-table 21 and has a bearing therein. Its lower end is provided with a flexible arm 161 fastened to it by a pin 162. The outer end of the arm 161 is provided with a finger-piece 163 by which the edge-gage may be adjusted toward and from the punching locality. A tooth formed on the arm 161 may be pressed into any one of a series of grooves 164 formed in the lower surface of a stationary plate 165 to maintain the edge-gage in any desired position of adjustment, the resilience of the arm 161 being sufficient to hold the retaining tooth in the notch selected.

The raceway-operating mechanism of the illustrated machine is similar to that shown in the aforesaid patent No. 1,722,286 but it differs from all prior raceway-operating mechanisms in that it is combined with mechanism for shifting the punch-block to and from its operative position. Referring to Fig. 1, the arm 61 of the forked lever serves to operate the raceway, the train of connections for this purpose comprising a link 166, a bell-crank lever 167, another link 168, and a carrier 169 on which the raceway 170 is mounted. This mechanism and the mechanism for shifting the punch-block both derive their operations from the cam 60 and are so coordinated as to place the punch-block in its operative position when the delivery end of the raceway is in register with the spindle 76 of the lower setting tool. By the time that the set-bar 23 has risen far enough to insert the spindle 76 into an eyelet at the delivery end of the raceway, the latter is being retracted from the path of the tool 75 and, at the same time, the punch block is also being retracted. The rear end of the raceway-carrier 169 is mounted on a vertical fulcrum pin 158 affixed to the frame 20 (Fig. 1). The punch block 55 and the end of the raceway are sufficiently retracted, by the time that the setting tool 75 approaches clenching position, so that those parts clear each other properly.

The raceway 170 may embody the improvements set forth in United States Letters Patent No. 2,254,215, granted September 2, 1941, on my divisional application Serial No. 325,667 filed March 25, 1940.

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

1. An eyeleting machine comprising cooperative eyelet-setting tools one of which is provided with an eyelet-carrying spindle, and a plurality of synchronized power-operated mechanisms, two for operating said tools respectively, one for supplying eyelets one at a time to said spindle, and one arranged to feed the work with respect to said tools by engaging the clenched eyelets successively in register with said spindle and moving them in a straight path to space one eyelet from another.

2. An eyeleting machine comprising a work-supporting table, cooperative eyelet-setting tools one of which includes a spindle for holding an eyelet, power-operated means for supplying eyelets one at a time to said spindle, power-operated means for operating said tools respectively, and power-operated means including an eyelet-engaging finger arranged to feed the work with respect to said tools by engaging the clenched eyelets successively, said eyelet-engaging finger being constrained to travel lengthwise of a fixed axis to feed the work and to oscillate about said axis to enter and leave the eyelets in their path of feeding movement.

3. An eyeleting machine comprising a work-supporting table, cooperative eyelet-setting tools, power-operated means for operating said tools respectively, an eyelet-engaging finger arranged to impart feeding steps to the work by engaging the clenched eyelets successively, power-operated means arranged to move said finger into and out of the eyelets, and power-operated means by which said finger is moved sidewise to and fro with strokes each coextensive with 180° of each cycle of the machine.

4. An eyeleting machine as defined in claim 1 in which said work-feeding mechanism comprises a carrier movable lengthwise of a fixed axis parallel to the path of the work, a feeding finger carried by said carrier, mechanism arranged to oscillate said carrier about said axis to carry said finger into and out of the clenched eyelets successively, and mechanism arranged to reciprocate said carrier lengthwise of said axis to impart steps of feeding movement to the work.

5. An eyeleting machine comprising a fixed work-supporting table, reciprocatory bars and cooperative eyelet-setting tools carried thereby, fixed bearings in which said bars are arranged to slide toward and from each other, power-operated means by which said bars are operated, a work-feeding finger formed and arranged to enter freely a clenched eyelet with upward movement from below the plane of said table, and power-operated means by which said finger is operated to enter the clenched eyelets successively in register with said tools and feed them to space the eyelets one from another.

6. An eyeleting machine comprising a work-table, cooperative eyelet-setting tools and power-operated mechanisms by which they are operated to insert and clench eyelets one at a time in a work-piece lying on said work-table, a work-feeding device having a finger arranged to rise to enter a clenched eyelet from below, power-operated mechanism by which said feeding device is operated to insert said finger into and retract it from the clenched eyelets successively, the latter said mechanism including a yieldable element arranged to permit retraction of said finger from its eyelet-engaging position, power-operated mechanism arranged to impart work-feeding movements to said device, and manually operable means by which the tip of said finger may be depressed below the plane of the work-engaging surface of said table.

7. An eyeleting machine comprising a work-table, a presser-foot arranged to clamp a work-piece against said table, cooperative eyelet-setting tools one of which is provided with an eyelet-carrying spindle, power-operated mechanisms for operating said tools respectively to insert and clench eyelets one at a time, a work-feeding device having a finger arranged to rise to enter a clenched eyelet in the work, power-operated mechanism by which said feeding device is operated with yielding force to place said finger in an eyelet, power-operated mechanism by which said feeding device is operated to feed the work, manually operable means by which said presser-foot may be retracted, and means operable by retractory movement of the presser-foot to depress the tip of said feeding finger below the plane of the work-engaging surface of said table.

8. An eyeleting machine comprising a work-table, cooperative eyelet-setting tools one of which is arranged to insert an eyelet into a work-piece and clench it against the other setting tool, power-operated mechanisms for operating said tools respectively, a power-driven underfeed mechanism having a finger movable into and out of the clenched eyelets successively, starting-and-stopping mechanism including a controlling member and a rotary driven clutch member by which said power-operated mechanisms may be operated, a treadle, means by which movement of said treadle in one direction will retract said finger from its work-engaging position, and means by which movement of said treadle in another direction will impart starting movement to said controlling member.

9. An eyeleting machine comprising a plurality of synchronized rotary actuators, an eyelet-inserting tool operated by one of said actuators, a combined punch and eyelet-setting tool operated by one of said actuators, and a laterally movable punch-block and a raceway both operatively connected to one of said actuators to be shifted thereby to and from the path of said eyelet-inserting tool.

10. An eyeleting machine comprising a work-table, a movable punch-block, an eyelet-inserting tool, a work-feeding finger the tip of which is formed and arranged to enter a clenched eyelet, a plurality of synchronized power-operated mechanisms by which said punch-block, said tool and said finger are shifted successively to and from a common locality, a punch provided with an eyelet-clenching surface, and a power-operated mechanism by which said punch is actuated to cooperate with said punch-block and said eyelet-inserting tool.

SYLVESTER L. GOOKIN.