



A. R. HAVENER.  
MACHINE FOR SETTING LACING HOOKS.  
APPLICATION FILED FEB. 28, 1910.

977,090.

Patented Nov. 29, 1910.

6 SHEETS—SHEET 2.

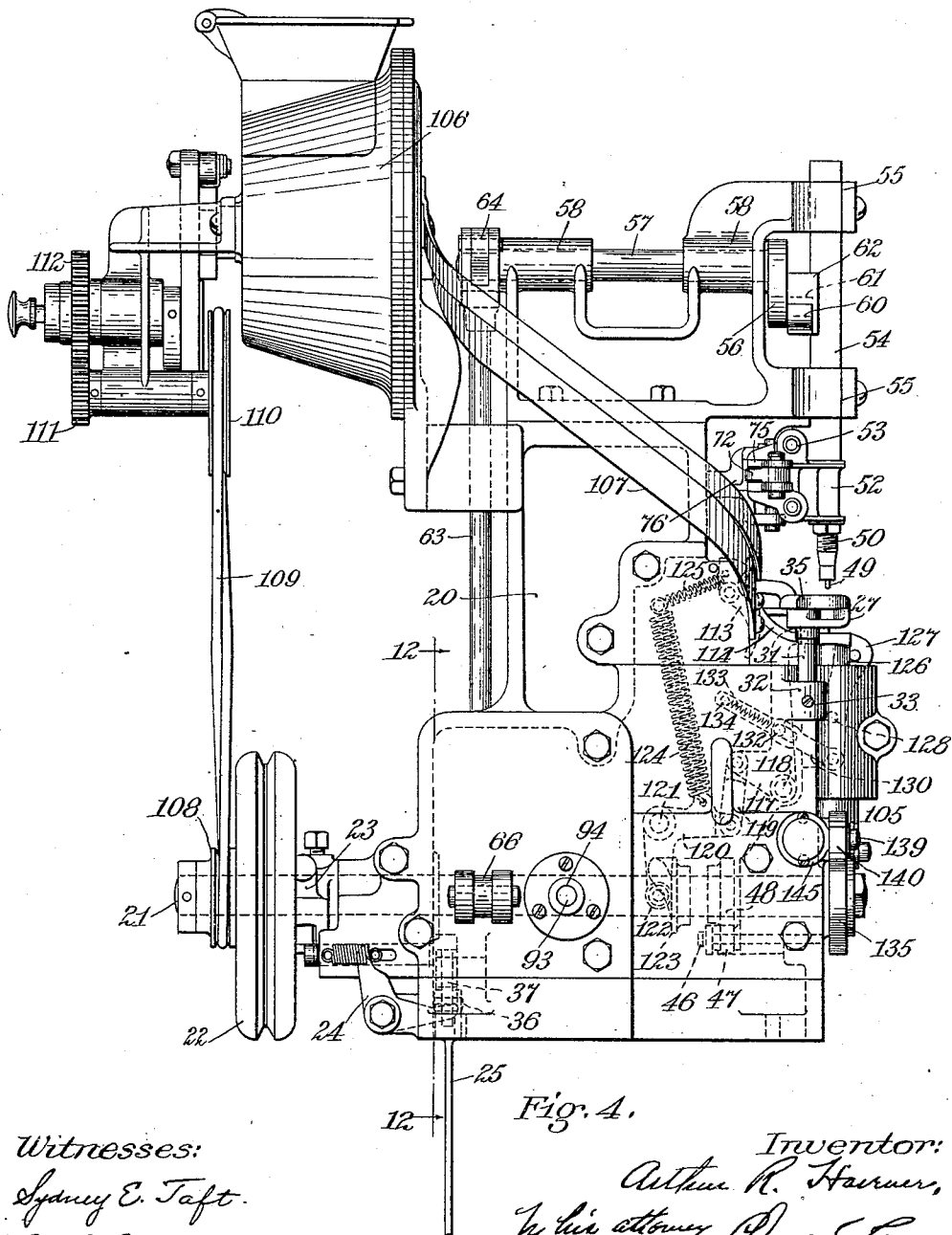


Fig. 4.

Witnesses:  
Samuel E. Taft.  
M. S. Crozier.

Inventor:  
Arthur R. Havener,  
by his attorney, Charles S. Gooding.

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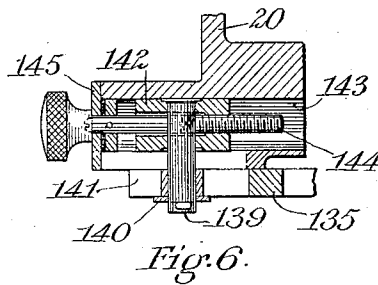


Fig. 6.

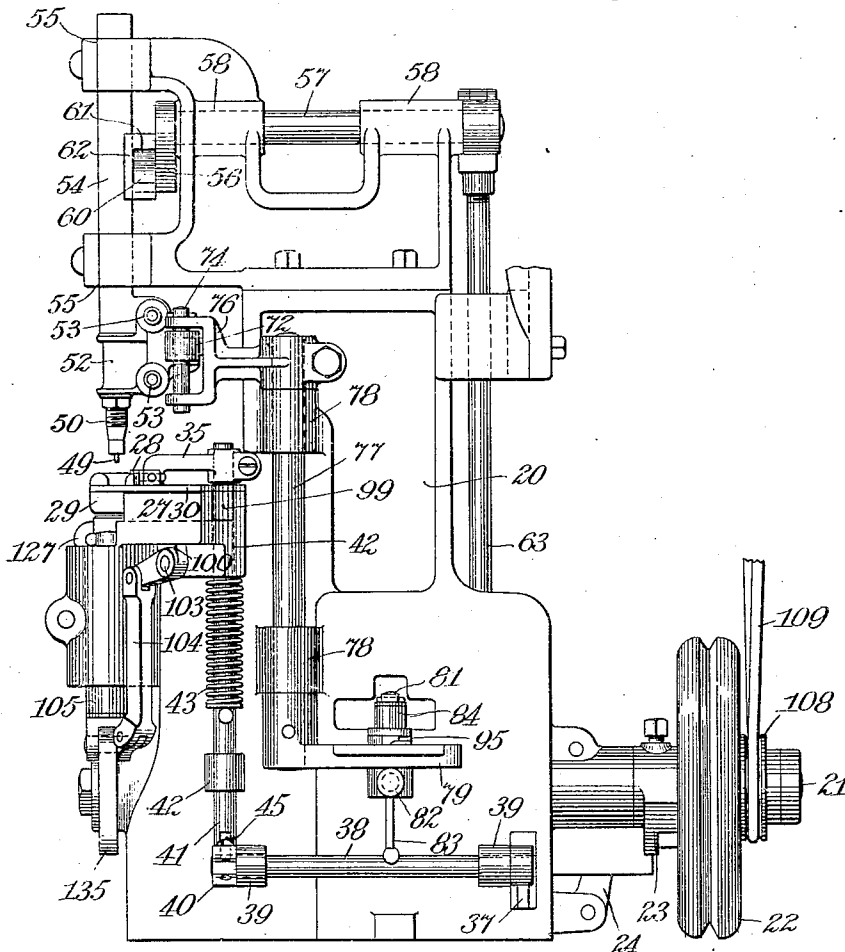


Fig. 5.

Witnesses:

Sydney E. Toft.  
M. G. Crozier

Inventor:

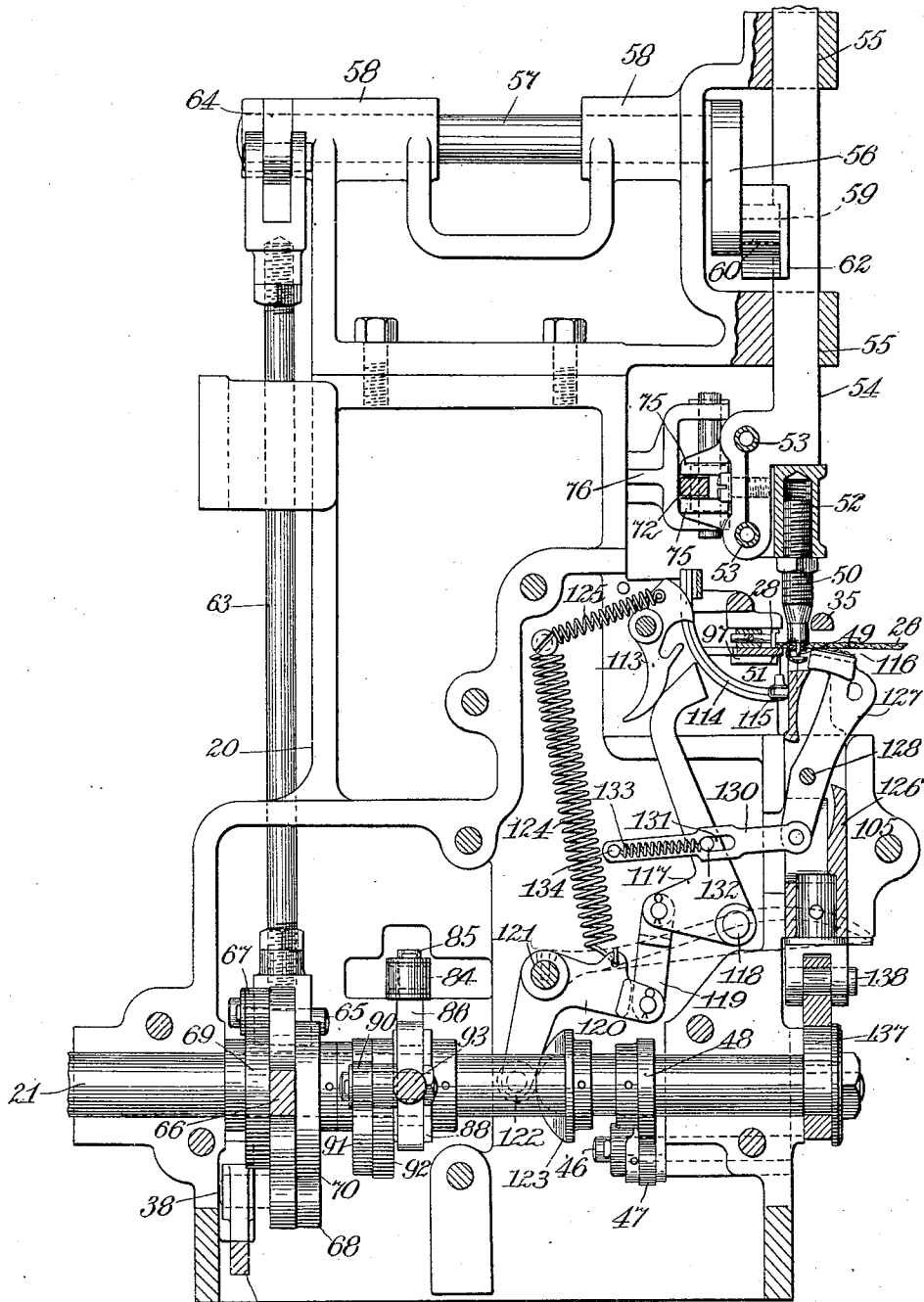
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Witnesses:  
Sydney E. Taft.  
M. E. Crozier.

Fig. 7.

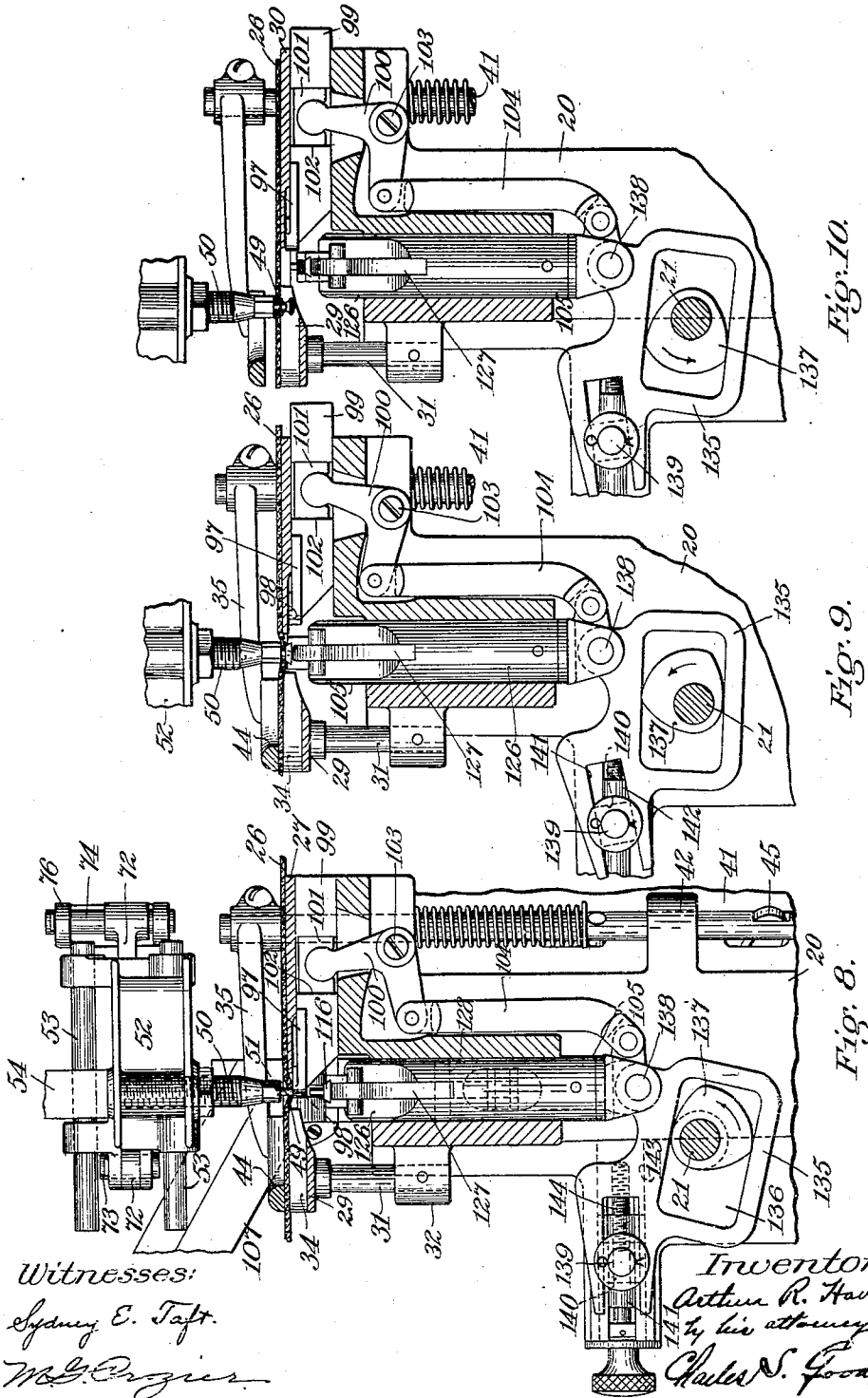
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6 SHEETS—SHEET 6.

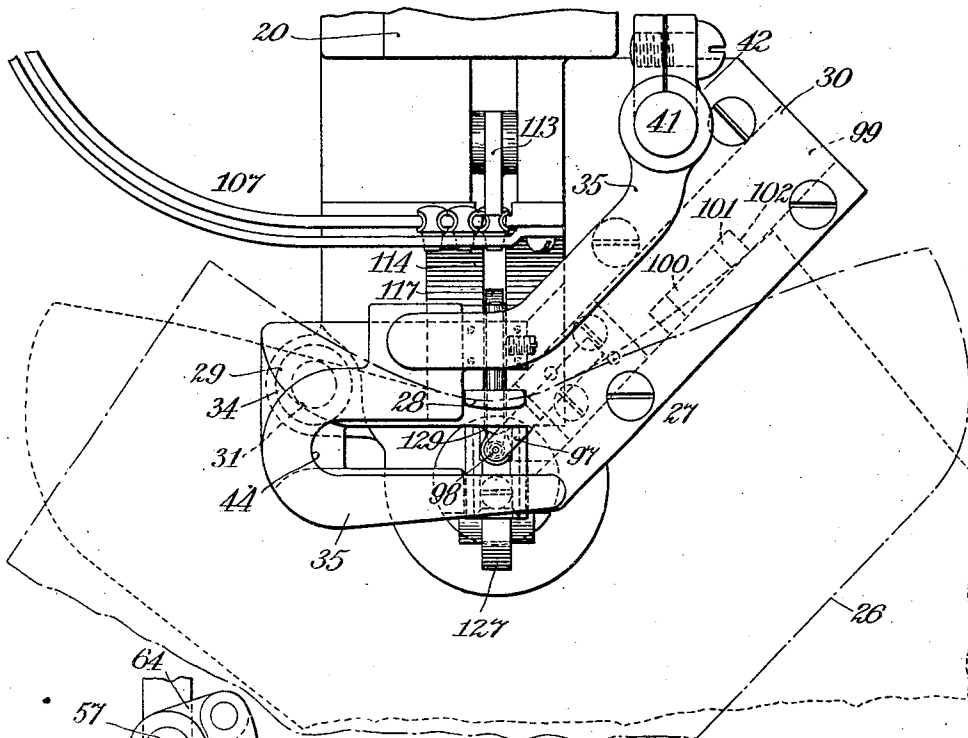


Fig. 11.

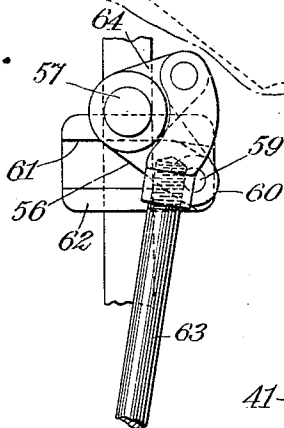


Fig. 13.

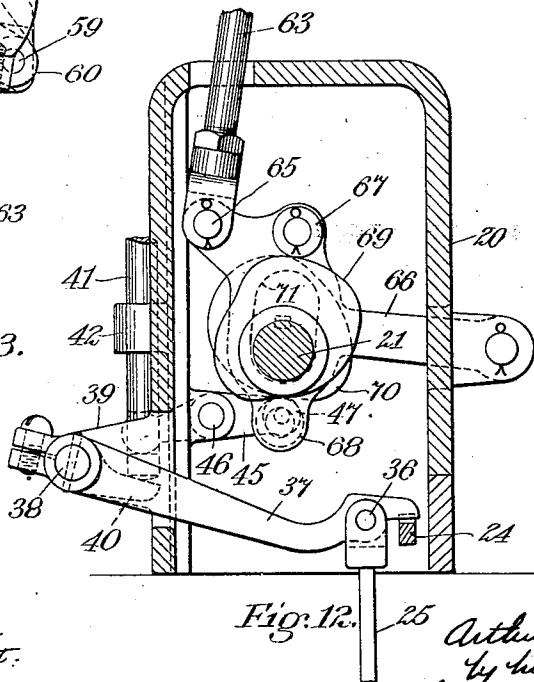


Fig. 12.

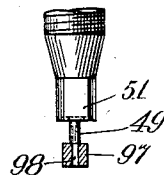


Fig. 14.

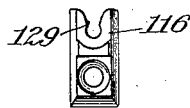


Fig. 15.

Witnesses:  
Sydney E. Taft.  
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Inventor:  
Arthur R. Havener,  
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# UNITED STATES PATENT OFFICE.

ARTHUR R. HAVENER, OF WALTHAM, MASSACHUSETTS, ASSIGNOR TO AMERICAN LACING HOOK CO., A CORPORATION OF NEW JERSEY.

## MACHINE FOR SETTING LACING-HOOKS.

977,090.

Specification of Letters Patent.

Patented Nov. 29, 1910.

Application filed February 28, 1910. Serial No. 546,373.

*To all whom it may concern:*

Be it known that I, ARTHUR R. HAVENER, a citizen of the United States, residing at Waltham, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Machines for Setting Lacing-Hooks, of which the following is a specification.

This invention relates to machines for setting articles such as lacing hooks, eyelets and the like in sheet material.

The machine of this invention is particularly adapted to set lacing hooks in the uppers of boots and shoes, and the object of the invention is to provide a machine of this character which not only sets the lacing hooks in the uppers of boots and shoes, but automatically feeds said uppers a correct distance to space the lacing hooks relatively thereto and to each other.

The machine of this invention differs from machines of the prior art for a like purpose in that the upper is punched by a suitable punch which has an annular clenching surface thereon and before the upper is fed by the punch the lacing hook is brought up, the shank inserted through the upper, with the punch projecting into the interior of the shank and the upper edge of the shank clenched against the annular clenching surface upon the punch to set the lacing hook firmly in the upper. This punch coöperates with a die-plate which may have a hole in it or may not, but preferably does have a hole, and the hole is of smaller diameter than the diameter of the punch, so that the leather which is punched from the upper is forced down into the hole, but the punch does not have to aline exactly with the hole in the die-plate, as is the case with punches and dies which coöperate in the punching operation, by the punch entering the hole in the die. In the present machine, the punch does not enter this hole, and after the punch has descended and forced the leather into the hole, the punch stops at the upper surface of the die-plate and the die-plate draws away from the punch laterally thereof and out of alinement therewith to allow the lacing hook to be brought up, the stem of the lacing hook to be pushed through the hole which has been made by the punch in the upper and forced onto the punch and against the annular clenching surface thereon to clench the shank or stem of the lacing hook in the

upper. This is all done before the upper is fed. The lacing hook then having been set in the upper, as described, the lacing hook carrier, which has brought the lacing hook up and set it in the leather against the punch and anvil, also as described, moves out of the way and leaves the upper free to be fed by the punch, with the punch projecting into the hole in the shank of the lacing hook. The feeding operation then takes place, the upper, during the feeding operation, resting upon a suitable work-support or plate. The presser foot, after the feeding of the upper is completed, clamps the upper to the work-support, and the punch rises and returns to its original position, ready to punch another hole and have another lacing hook set thereon.

The gist of the invention, therefore, resides in the method of setting a lacing hook in the upper and then feeding the same by said lacing hook, and in the mechanism for thus setting the lacing hook and feeding the upper. That is, the upper is first punched and the lacing hook set, and then the upper is fed by means of the lacing hook with the punch in engagement therewith.

Heretofore it has been customary in machines of this character to punch the upper and then feed it and finally set the lacing hook after the upper has been fed, and during the feeding of the upper with the punch projecting thereinto, prior to the setting of the lacing hook, there has been a great deal of difficulty, especially in uppers formed of light leather, such as kid and the like, in the feeding operation, the same not being correctly performed for the reason that the upper will slip off of the end of the punch. Attempts have been made to overcome this difficulty by providing means to push the upper up on the punch during the feeding operation, so that the punch would project through the upper, but it will be seen that this manner of feeding the upper is very uncertain, for the reason that a light leather upper is very liable to buckle during the feeding operation which, it will be remembered, is very rapid, and thus cause inaccuracy in the feeding of the upper and consequently in the setting of the lacing hooks therein, but when the upper is fed by means of the metallic lacing hook rigidly set therein, and especially when it is fed by the punch which is projecting into the hole in

the shank of the lacing hook, it will be seen that the feeding of the upper is very positive, whether the leather is thick or thin and whether the upper is made of leather  
5 which is stiff or flimsy.

Applicant believes that he is the first to conceive the idea hereinbefore set forth, viz., of attaching a series of lacing hooks to the upper of a boot or shoe by first punching a  
10 hole in the upper, then inserting the shank of the lacing hook in said hole and riveting the shank to the upper, then moving the upper a predetermined distance by means of the lacing hook which has been set therein,  
15 and then repeating the operation set forth, and, therefore, this invention consists, not only in a machine, its details of construction and combination of parts, but in the method of attaching a series of lacing hooks to the  
20 upper of a boot or shoe.

The invention further consists in the punch and die by means of which the hole is punched in the leather preparatory to the setting of the lacing hook therein wherein  
25 the punch is of greater diameter than the hole in the die. This construction is of great advantage in a machine of this character, because it obviates the necessity of having the punch in exact alinement with  
30 the hole in the die during the punching operation and still such a punch and die for a soft material like leather is equally efficient in the punching operation as is a punch and die in which the punch exactly fits the hole  
35 in the die and in which combination, of course, the punch has to be brought in exact alinement with the hole in the die before the punching operation can take place. Furthermore, in a machine of this character and operating in the sequence of move-  
40 ments hereinbefore partially set forth and hereinafter more fully set forth, the lateral movement of the die can take place while the punch is in the leather and pressing the punched portion of the upper into the hole  
45 in the die and when the die is moved laterally of the punch it acts, in conjunction with said punch, to shear off of the upper that portion of the leather which has been forced  
50 out of the upper by the punch, and further there is no possibility of dropping the upper from the punch prior to the insertion of the shank of the lacing hook therein, as hereinbefore described.

55 The invention further consists in the combination and arrangement of parts set forth in the following specification and particularly pointed out in the claims thereof.

Referring to the drawings: Figure 1 is a  
60 front elevation of my improved lacing hook setting machine. Fig. 2 is a detail plan, partly in section, taken on line 2—2 of Fig. 1, illustrating the mechanism for imparting a lateral movement to the punch. Fig. 3 is  
65 a detail section, partly in elevation, taken

on line 3—3 of Fig. 2. Fig. 4 is a left hand side elevation of the machine of my invention. Fig. 5 is a right hand side elevation of the same, with the hopper and its actuating mechanism and the raceway removed.  
70 Fig. 6 is a sectional plan in detail taken on line 6—6 of Fig. 1. Fig. 7 is a sectional elevation taken on line 7—7 of Fig. 1, looking toward the right. Fig. 8 is a sectional elevation taken on line 8—8 of Fig. 2 illustrating the punching operation. Fig. 9 is a  
75 view similar to Fig. 8 illustrating the setting operation. Fig. 10 is a view similar to Figs. 8 and 9 illustrating the feeding operation. Fig. 11 is a detail plan of the presser  
80 foot, work-support and raceway, showing also in broken and dotted lines a right and left hand upper in position relatively to the edge gage and the punching and setting mechanisms, to have a lacing hook set there-  
85 in. Fig. 12 is a sectional elevation taken on line 12—12 of Fig. 4, looking toward the right in said figure and illustrating details of the clutch operating mechanism, the presser foot operating mechanism and the  
90 punch operating mechanism. Fig. 13 is a detail rear elevation of a portion of the punch operating mechanism. Fig. 14 is a detail view of the punch and a portion of the punch block and anvil in connection with  
95 the die-plate, which plate is shown in section. Fig. 15 is a plan view of the lacing hook carrier plate.

Like numerals refer to like parts throughout the several views of the drawings.

100 In the drawings, 20 is the frame of the machine and 21 the main driving cam shaft which is driven by means of a clutch pulley 22 which runs loose upon the main driving shaft 21 until locked thereto by a clutch  
105 in a manner well known to those skilled in the art by means of a clutch lever 24 which is operated by a rod 25 connected to a suitable treadle (not shown in the drawings), and by an arm 37 connected to said rod  
110 (Fig. 12).

The upper 26 of the shoe is placed upon a work-support 27 by the operator, with the front edge of the upper resting against an edge gage 28 (Fig. 11). The work-support  
115 27 is made in two parts 29 and 30. The part 29 has a stem 31 extending downwardly therefrom into a boss 32 upon the frame 20 and is fastened thereto by means of a set-screw 33 (Fig. 4). This part 29 of the work-support has a slot 34 extending along the top thereof through which the lacing hooks pass as the upper is fed forward after the setting operation has taken place. The part  
120 30 of the work-support 27 is a plate which is screwed to the frame, as seen in Fig. 11, and extends around and abuts against the upper portion of the part 29, forming a flat surface upon which the upper is placed. The upper is clamped to the work-support  
125 130

by means of a presser foot 35, and this presser foot can be raised by foot power from the treadle by means of the rod 25, or the same can be raised and lowered by means of the mechanism which I will now proceed to describe.

*Presser foot mechanism.*—Referring to Figs. 1, 4, 5, 7, 8, 11 and 12, it will be seen that when the rod 25 is pushed upwardly by its treadle, referring particularly to Figs. 5 and 12, the upper end of said rod, which is connected by a pin 36 to an arm 37, will push said arm upwardly. The arm 37 is fastened to a rock-shaft 38 journaled to rock in bearings 39, 39 on the right hand side of the frame. The rock-shaft 38 has adjustably fastened to its front end an arm 40, and the free end of this arm bears against the bottom of a rod 41 adapted to slide vertically in bearings 42, 42 on the frame 20. A spring 43 holds the lower end of said rod against the arm 40. The presser foot 35 is adjustably fastened to the upper end of the rod 41 (Figs. 5 and 11), said presser foot having a slot 44 within which the punch moves during the operation of feeding the upper. Thus, it will be seen that when it is desired to raise the presser foot 35 by foot power and by means of the treadle, the rod 25 is pushed upwardly by the treadle, raising the arm 37 and the arm 40 and thus pushing the rod 41 upwardly and raising the presser foot 35, which is fastened thereto, from the work-support or from the upper which rests upon the work-support. The presser foot is always lowered by means of the spring 43 and it is raised automatically by power through the mechanism illustrated in Figs. 7 and 12.

Referring to Figs. 5, 7 and 12, it will be seen that a lever 45 is pivoted at 46 to the frame 20. This lever has journaled thereon a cam roll 47 which bears against the periphery of the cam 48 fast to the main driving shaft 21 (Fig. 7) and projects through a slot in the frame of the machine and into a slot in the rod 41, (Fig. 5) so that as the lever 45 is rocked at the proper time by its cam 48, the rod 41 will be raised and lowered, thus raising and lowering the presser foot 35 at the proper time to release the upper and allow it to be fed forward by the punch after the lacing hook has been set therein, said presser foot being lowered to clamp the upper in position after the feeding operation has taken place and before a new punching and setting operation takes place.

*Punch and anvil and actuating mechanism.*—Referring to Figs. 1, 2, 3, 4, 5, 7, 8 and 14, it will be seen that the punch proper 49 is formed upon the lower end of a stud 50 which has a shoulder or annular clenching projection 51 thereon constituting an anvil against which the shank of the lacing hook strikes to clench the same during the

setting operation. This stud 50 is screw-threaded to engage a slide 52, constituting a punch holder, guided to slide laterally of the punch upon tubes 53, 53 which are fastened to a plunger 54 arranged to slide vertically in bearings 55 in the frame 20. A vertical reciprocatory motion is imparted to the plunger 54 by a crank-arm 56 fast to the end of a rock-shaft 57 journaled to rock in bearings 58, 58 in the frame 20. The crank-arm 56 has a crank-pin 59 thereon which has a roll 60 journaled thereon and projecting into a slot 61 formed in the block 62 fast to the plunger slide 54 (Fig. 13). A rocking motion is imparted to the shaft 57 by the mechanism illustrated in Figs. 7 and 12, consisting of a link 63 pivotally connected at its upper end to an arm 64 fast to the shaft 57 and pivotally connected at its lower end 65 to a cam lever 66. This cam lever has journaled thereon two cam rolls 67 and 68. The cam roll 67 bears against a cam 69; the cam roll 68 bears against a cam 70. Both of these cams 69 and 70 are fast to the shaft 21 and the lever 66 is slotted at 71 to straddle said shaft, so that as the shaft 21 is revolved, the lever 66 is rocked upwardly and downwardly in proper time to impart a rocking motion to the rock-shaft 57 by means of the rocker-arm 64. Thus, it will be seen that the rocking motion imparted to the rock-shaft 57 through the crank-arm 56 imparts a vertical reciprocatory motion to the plunger 54 and thus the punch and the anvil thereon are raised and lowered in proper time to punch the material and assist in the setting of the lacing hook in the material.

*Punching and feeding of the upper.*—A lateral movement is imparted to the punch 49 by means of the mechanism illustrated in Figs. 1, 2, 3, 5 and 7. The punch holder 52 is arranged to slide, as hereinbefore set forth, upon the tubes 53 and a sliding movement is imparted thereto by the mechanism illustrated in Figs. 2 and 3 and consisting of a link 72 pivotally connected at 73 to the punch holder slide 52. The opposite end of the link 72 is connected to a pin 74 and is slidable vertically upon said pin. Said link 72 is guided between two ears 75, 75 formed upon and extending rearwardly from the punch holder slide 52. The pin 74 is fastened to an arm 76 (Fig. 5) which, in its turn, is adjustably fastened to a rock-shaft 77 arranged to rock in bearings 78, 78 on the frame 20 and having fastened to its lower end an arm 79 which is slotted at 80 to receive a pin 81. The pin 81 is gripped to the arm 79 by an eccentric stud 82 which is provided with a handle or arm 83 by means of which it may be rotated so as to perform the gripping operation. A link 84 is pivoted at one end upon the stud 81 and at the other end is pivoted to a stud 85 fast to a cam

slide 86. The cam slide 86 is slotted at 87 to receive a slide block 88 mounted upon the main driving shaft 21. Two cam rolls 89 and 90 are mounted upon the cam slide 86, the cam roll 89 engaging the cam 91 and the cam roll 90 engaging the cam 92. The cam slide 86 is further guided by a stem or shank 93 arranged to slide in a bearing 94 fast to the frame 20. An index finger 95 is fastened to the stud 81 and moves therewith when the same is adjusted longitudinally of the slot 80, the outer end of said index finger moving over graduations 96 upon the arm 79. It will be seen that the cams 91 and 92 impart a reciprocatory motion to the cam slide 86 and this, through the link 84, rocks the arm 79, rock-shaft 77 and arm 76, the arm 76 imparting to the punch holder 52 a reciprocatory movement in a direction laterally of the punch by means of the link 72 and thus feeding the upper when the punch is inserted in the lacing hook shank after the setting operation has taken place and also moving said punch back to its first position after the upper has been fed and the punch has been moved vertically by the mechanism hereinbefore set forth out of engagement with the lacing hook subsequent to the feeding movement.

*Operation of die.*—The die plate 97 has a hole 98 extending therethrough and this hole is of smaller diameter, as hereinbefore set forth, than the diameter of the punch 49, as illustrated in Fig. 14. The die plate 97 is fastened to a slide 99 which is adapted to slide in ways in the frame 20, as clearly illustrated in Figs. 8, 9, and 10. A reciprocatory motion is imparted to said slide by a lever 100 pivoted to the frame 20 and with one arm thereof engaging a slide block 101 located in a slot 102 in said slide 99. The lever 100 is pivoted at 103 to the frame 20 and is connected by a link 104 to the lacing hook carrier slide 126 (Fig. 8). Thus it will be seen that as the lacing hook carrier slide is reciprocated, as hereinafter described, the link 104 will impart a rocking movement to the lever 100 and thus a reciprocatory movement will be imparted to the slide 99 and to the die plate 97 fast thereto, whereby the same may be moved into and out of alignment with the punch at times, as hereinafter fully set forth.

*Lacing hook feeding mechanism.*—The lacing hooks are placed in mass in a hopper 106 (Figs. 1 and 4) and are fed from said hopper onto a raceway 107 by suitable mechanism partly inclosed within said hopper and partly outside thereof and driven by a pulley 108 connected by a belt 109 to the pulley 110 which drives the gears 111 and 112, the gear 112 driving the lacing hook hopper mechanism hereinbefore set forth. The raceway 107 guides the lacing hooks in a manner well known to those skilled in the

art downwardly from the hopper to a detent lever 113 (Fig. 7) which separates the lacing hooks and feeds them, one at a time, down the quarter bend auxiliary raceway 114. The lacing hook 115 is pushed from the auxiliary raceway 114 onto the lacing hook carrier plate 116 when the parts are in the position illustrated in Fig. 4—that is, when the lacing hook carrier is in its lowermost position, at which time the lacing hook carrier plate is in alinement with the lower end of the auxiliary raceway 114. Said lacing hook is pushed from the auxiliary raceway 114 onto the lacing hook carrier plate by means of a lever 117 pivoted at 118 to the frame of the machine, the upper end of said lever arranged to pass between the two sides of the auxiliary raceway and push the lacing hook therealong in a manner well known to those skilled in the art. A rocking movement is imparted to the lever 117 by means of a link 119 connecting said lever to a cam lever 120 which is pivoted at 121 to the frame of the machine and has journaled thereon a cam roll 122 which is in engagement with a cam 123 fast to the main driving shaft 21. A spring 124 keeps the cam roll 122 in engagement with the cam 123. Another spring 125 imparts a rocking movement to the detent lever 113 in one direction, said detent lever being rocked in the opposite direction by the lever 117 which abuts thereagainst and rocks the same at the proper time to drop the lacing hook down the auxiliary raceway 114, as illustrated in Fig. 7.

*Lacing hook setting mechanism.*—The lacing hook carrier 105, by means of which the lacing hook is taken from the end of the auxiliary raceway and carried up to insert the shank through the upper and on to the punch and drive the same against the anvil to set the lacing hook shank in the upper, consists of a slide 126 arranged to slide in the frame of the machine (Fig. 7) and of a lever 127 pivoted at 128 to said slide 126. This lever has fastened to its upper end the lacing hook carrier plate 116 which is notched or recessed at 129 (Fig. 15) to receive the lacing hook which is about to be set. A rocking movement is imparted to the lever 127 by a link 130 (Fig. 7). Said link is slotted at 131 to receive a pin 132 fast to the lever 117, and a spring 133 is connected at one end to said pin 132 and at the opposite end thereof to a pin 134 fast to the link 130. The carrier slide 126 has a reciprocatory motion imparted thereto by a lever 135 (Fig. 8) which is slotted at 136 to receive a cam 137 fast to the main driving shaft 21. This lever 135 is connected by a pin 138 to the lower end of the lacing hook carrier slide 126 and is pivoted to a stud 139, shown in detail in Fig. 6. The stud 139 projects through a slide block 140 arranged

to slide in a slot 141 provided in the lever 135 and said stud is fastened to another slide block 142 which is arranged to slide in a hole 143 in the frame of the machine. The slide block 142 has screw-threaded engagement with an adjusting screw 144 which is free to rotate upon a plate 145 fast to the frame of the machine, but which is prevented from longitudinal movement, so that, by rotating the screw 144 the block 142 is moved lengthwise of the hole 143 and the stud 139 is, therefore, moved, together with the sliding block 140, lengthwise of the slot 141 in the lever 135. Thus, the pivot of the lever 135 is moved relatively to the pin 138 by which the lever 135 is connected to the carrier slide 126 and, therefore, the throw of the lever 135 and the vertical movement of the carrier slide 126 and the carrier lever 127 pivoted thereto may be increased or diminished, respectively, by setting the stud 139 toward or away from the pin 138. This adjustment is always performed when the parts are in the position illustrated in Fig. 8 and the slot 141 and hole 143 are parallel to each other, and this relative position of parts occurs when the lacing hook carrier is in its lowermost position and the lacing hook carrier plate is in alinement with the lower end of the auxiliary raceway 114. It will be understood that the stud 50 is screw-threaded to enable the punch 49 to be adjusted upwardly or downwardly until the lower end of said punch is substantially flush with the upper face of the die 97 when cooperating therewith to punch a hole in the leather as hereinbefore described, and that this adjustment cannot be used to vary the clench of the shank of the lacing hook in the leather, as the lower end of said punch must always come substantially flush with the upper face of the die during the punching operation, and the variation in clench must, therefore, be obtained by the variation in throw of the lower setting mechanism. To this end, it will be seen that by having the slot 141 and hole 143 parallel to each other when the parts are in the position illustrated in Fig. 8, viz, when the lacing hook carrier is at its lowermost position, with the lacing hook carrier plate in alinement with the lower end of the auxiliary raceway 114 and the hole 98 in the die-plate 97 in alinement with the punch 49, that these parts will always return to the same relative positions at the same time, independent of the length of throw which may be imparted to the lacing hook carrier. Oftentimes a lacing hook with the same length of shank is used in different thicknesses of leather and by the adjustment hereinbefore set forth, whereby the throw of the lacing hook carrier may be increased and still have said lacing hook carrier returned to the same lowermost position, the shank

of the lacing hook may be clenched in either a thin leather or a thick leather by increasing or diminishing, respectively, the throw of the lacing hook carrier through the adjustment of the pivot of the lever 135 hereinbefore described. The object of the adjustment is to increase the throw of the lacing hook carrier or decrease the same to suit hooks having varying lengths of shanks for different thicknesses of leather, so that the lacing hook may be set with the same amount of clench in a thick leather and in a thin leather, or to enable hooks with the same length shank to be firmly clenched in a thin leather or in a thick leather.

The general operation of the mechanism hereinbefore specifically described is as follows: The operator presses the treadle in the proper direction to raise the rod 25, rocking the arm 37, rock-shaft 38 and arm 40 so as to lift the rod 41 and thus raise the presser foot 35. The operator then places the upper on the work-support 27, whether it be a right or a left hand upper, in the respective positions illustrated in Fig. 11, with the front edge of the upper resting against the edge gage 28. He then releases the treadle and the presser foot descends and is operated to clamp the upper to the work-support 27 by the spring 43. The treadle which operates the rod 25 can be rocked in opposite directions by the operator, and having now placed the upper in position to have a lacing hook set therein and to be subsequently fed, the operator throws the machine into clutch by rocking the treadle in the opposite direction to that in which he rocked it for the purpose of raising the presser foot, hereinbefore described, in order that he might insert the upper beneath the presser foot and have it clamped to the work-support. The operator now, therefore, rocks the treadle to lower the rod 25, and by so doing the free end of the arm 37 engages the lever 24 and rocks the same to throw the clutch into engagement with the clutch pulley 22. This causes the main driving shaft 21 to be operated in order to produce the cycle of movements which will now be described.

First. The punch descends and punches a hole in the leather by coacting with the die plate 97, as hereinbefore described and as shown in Fig. 8, where the punch is shown projecting through the material and the hole in the die plate is in alinement with the punch, so that the material punched from the upper can be forced downwardly through said hole. A vertical movement is imparted to the punch by the plunger 54, crank-arm 56 and rock-shaft 57, said rock-shaft having a rocking movement imparted thereto by the mechanism and in the manner hereinbefore fully set forth. After the hole has been punched in the upper as illustrated

in Fig. 8 and while the upper is still clamped by the presser foot to the work-support, the die moves back.

Second. The lacing hook carrier, including the slide 126 and lever 127, with a lacing hook on the lacing hook carrier plate 116, start upwardly and at the same time that the lacing hook carrier starts upwardly, the die starts to move backwardly out of alinement with the punch and lacing hook carrier. The upward movement of the lacing hook carrier slide 126 is obtained by the rocking of the lever 135 by the cam 137, as hereinbefore described, and as the movement of the die plate laterally toward or away from the punch is obtained by the movement of the slide 99 and said slide is moved by the lever 100 which is rocked by the link 104, and as the link 104 is connected to the lacing hook carrier slide 126, it is evident that any movement of the slide 126 will actuate the slide 99 and its die plate 97 toward or away from the punch, according to whether the said slide 126 is moving downwardly or upwardly, respectively. The lacing hook carrier then continues its upward movement and the slide its backward or lateral movement away from the punch and out of alinement with the punch and lacing hook carrier, so that said lacing hook carrier can set the lacing hook in the upper, which it does by moving upwardly and forcing the lacing hook shank through the upper, the punch at this time projecting into the hole in the shank of the lacing hook, and also at this time a downward movement is imparted to the punch to meet the carrier during the latter part of the setting operation, and this downward movement of the punch begins as soon as the die has moved sufficiently laterally of the punch to clear the same, and then the shank is clenched against the anvil clenching surface or anvil 51 upon the punch. The lacing hook is shown as just having been set in the manner hereinbefore described in Fig. 9.

Third. The punch is now elevated slightly to release the pressure upon the lacing hook.

Fourth. As soon as the lacing hook has been set in the upper, as hereinbefore set forth, the lacing hook carrier lever 127 is moved toward the front of the machine to clear the plate 116 from the lacing hook, as illustrated in Fig. 7, this movement being obtained by the rocking of the lever 117 which brings the pin 132 into contact with the left hand end of the slot 131 in the link 130, thus positively rocking the lever 127 and causing the plate 116 to be withdrawn from the lacing hook.

Fifth. The presser foot is at this time raised in order that the upper may be fed and this raising of the presser foot is automatically performed by the mechanism here-

inbefore described and consisting of the rod 65 41, lever 45 and cam 48.

Sixth. During the rocking movement of the lacing hook carrier lever 127 to feed the same from the lacing hook hereinbefore described, the lever 117, which accomplishes said rocking movement, at the latter part of its backward movement, engages the detent lever 113 and rocks the same to drop a lacing hook down the auxiliary raceway 114. The rocking movement of the lever 117 is accomplished by the link 119, lever 120 and cam 123. It will be noted that the lever 127 is moved at its upper end to disengage the plate 116 from the lacing hook positively because the pin 132 strikes against the end of the slot 131 in the link 130 and is rocked positively by the cam 123 to perform this movement. The other movement of the lever 117 toward the front of the machine, which movement accomplishes the feeding of the lacing hook from the auxiliary raceway onto the plate 116, is a yielding movement, for the reason that it is accomplished by the spring 124 acting upon the lever 120. It will also be noted that when the lever 127 is moved toward the left at its upper end, in order to move the lacing hook plate 116 into position to receive the lacing hook from the auxiliary raceway, if the lacing hook should happen to be out of position it will not be jammed by said plate 116, because said plate would come to a stop and the spring 133 would yield, so that by these arrangements for yielding, it is impossible to injure the lacing hook during the placing of the same upon the plate 116, but the lever 127 is positively rocked to remove the plate from the lacing hook after it has been set in the upper.

Seventh. Now, the parts being in the positions illustrated in Fig. 7, a lateral movement is imparted to the punch while the same is projecting into the shank of the lacing hook to feed the upper the proper distance to space the hooks, and this lateral movement is accomplished by means of the mechanism hereinbefore described, consisting of the cams 91 and 92, cam slide 86, link 84, arm 79, rock-shaft 77, arm 76, link 72 and punch holder slide 52, said punch holder slide sliding on the tubes 53, 53, thus moving the upper toward the left to the position illustrated in Fig. 10.

Eighth. During the feeding of the upper, hereinbefore described, the lacing hook carrier slide descends from the position illustrated in Fig. 7 to that illustrated in Fig. 4, and the lacing hook carrier plate 116 is thus brought into alinement with the lower end of the auxiliary raceway 114 and another lacing hook is placed thereon by the lever 117, as hereinbefore described. When the punch has fed the upper as hereinbefore

described and as illustrated in Fig. 10, the presser foot is automatically lowered to clamp the upper to the work-support.

Ninth. The punch now moves upwardly out of the lacing hook and then moves laterally to its first position, as in Figs. 1 and 4, in readiness to descend, and the cycle of operations hereinbefore described is then repeated to punch the upper, set the lacing hook therein, and feed said upper.

The principal advantages derived from the construction and operation of the lacing hook setting machine hereinbefore described are that the punch, after punching the hole in the upper, does not move upwardly at all until the lacing hook has been carried up and the shank carried onto the punch and through the upper and clenched in the leather, and then the punch only moves up very slightly so as to allow the lacing hook carrier lever 127 to move forwardly out of engagement with the lacing hook, so that the upper may be fed to space the hooks, and as the punch remains projecting into the lacing hook shank and feeds the upper by means of said shank, there is no possibility of the upper buckling or becoming disengaged from the punch in the feeding operation of the upper, so that the upper is always fed positively the correct distance to space the hooks a predetermined distance.

The principal advantage of the specific construction of punch and die in which the diameter of the punch is larger than the diameter of the hole in the die consists in the fact that while a piece of leather can be punched out of the upper into the hole in the die, it is not necessary to exactly align the punch with the hole in the die, and, moreover, it is unnecessary to move the punch upward before the die can be moved laterally with relation thereto in order to take the die out of the path of the lacing hook carrier as the same is raised during the setting operation, and the less the number of movements and extent of movements in a machine of this character, the more rapidly can the machine be run, and this is one of the chief requisites of an automatic lacing hook setting machine of this character, viz, speed.

While I prefer to have the specific construction of punch and die hereinbefore set forth, viz, with a punch of greater diameter than the hole in the die, I do not wish to be understood as limiting my invention to such specific construction, as the same would be operative without any hole in the die, although such a construction would not be so desirable as that which has been illustrated and described.

Another advantage obtained by the construction hereinbefore set forth is found in making possible the high speed at which

this machine can be operated in the construction and operation of the punch and its horizontal and vertical carrying means. The vertical movement of the punch is very much less than the lateral movement thereof and, therefore, if the part to which the punch is attached and to which a lateral movement is imparted, can be made comparatively light and small compared with that part which imparts the vertical movement to the punch, a resulting improvement in possible speed of the feed of the material will be obtained, and in the machine of this invention this result is obtained by attaching the punch to a light and comparatively small slide piece, viz, the piece 52, which is the slide to which the punch is directly fastened and to which a lateral movement for the feeding of the upper is imparted, while the vertical movement of the punch, which, as before stated, is slight as compared with the lateral movement, is imparted by the comparatively large and heavy means, viz, the plunger slide 54.

I am aware that heretofore it has been customary to impart a four-motion feed to the punch, but in such four-motion feeds, the piece to which the punch is directly attached moves vertically and the mechanism which imparts the lateral movement to the punch moves horizontally, carrying with it the block or slide to which the punch is directly attached, which is just the opposite from the construction set forth in the present invention, in which the light and comparatively small slide block to which the punch is directly attached moves laterally and the main plunger and its comparatively heavy and slow moving mechanism moves vertically, with the evident result that in applicant's mechanism the punch can perform its four-motion movement at greater speed than in machines of the alternative construction hereinbefore set forth.

Having thus described my invention, what I claim and desire by Letters Patent to secure is:

1. A machine for setting a lacing hook or the like in the upper of a boot or shoe having, in combination, a punch and anvil, a die adapted to cooperate with said punch, mechanism adapted to move said punch and anvil longitudinally thereof toward said die, mechanism adapted to subsequently move said die out of alinement with said punch while said punch is inserted in said upper, mechanism adapted to move said punch laterally thereof to feed said upper, a carrier adapted to hold a lacing hook in alinement with said punch and anvil prior to said lateral feeding movement of said punch, and mechanism adapted to move said carrier toward said punch and anvil, whereby the shank of said lacing hook may

be driven through said upper and clenched upon said anvil prior to the feeding of said upper and whereby said punch may be caused to perforate said upper and to subsequently feed the same while projecting into said lacing hook.

2. A machine for setting a lacing hook or the like in the upper of a boot or shoe having, in combination, a punch and anvil, a die, mechanism adapted to move said punch and anvil longitudinally thereof toward said die until said punch enters said upper, mechanism adapted to subsequently move said die out of alinement with said punch, a carrier adapted to hold a lacing hook in alinement with said punch and anvil, mechanism adapted to move said carrier toward said punch and anvil, whereby the shank of said lacing hook may be driven through said upper and clenched upon said anvil with said punch projecting into said lacing hook, means to move said carrier out of engagement with said hook, and mechanism adapted to move said punch laterally thereof while the same is projecting into the shank of said lacing hook, whereby said upper is pierced by said punch, said lacing hook is set in said upper with said punch projecting thereinto, and said upper is fed by said punch.

3. A machine for setting lacing hooks and the like in the upper of a boot or shoe having, in combination, means adapted to set a lacing hook in said upper embodying a punch adapted to pierce a hole in said upper and to project into the shank of said lacing hook during the setting operation and mechanism adapted to move said punch laterally thereof after the setting operation and while said punch still projects into said shank, whereby said upper may be fed to space said hooks.

4. A machine for setting a lacing hook or the like in the upper of a boot or shoe having, in combination, a punch, an annular shoulder thereon, constituting an anvil, a die adapted to cooperate with said punch to punch holes in said upper, mechanism adapted to move said punch laterally thereof to feed said upper, a carrier adapted to hold a lacing hook in alinement with said punch prior to said lateral feeding movement of said punch, mechanism adapted to move said punch toward said die to punch said upper, mechanism adapted to move said die laterally relatively to said punch while said punch projects into said upper, and mechanism adapted to subsequently move said carrier toward said punch, whereby a lacing hook may be set in said upper around said punch prior to the feeding of said upper, by said punch.

5. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, a punch, an annular

shoulder thereon constituting an anvil, a die adapted to cooperate with said punch to punch a hole in said upper, a carrier adapted to hold a lacing hook in alinement with said punch, mechanism adapted to move said punch toward said die and into said upper, mechanism adapted to move said die laterally relatively to said punch while said punch projects into said upper, mechanism adapted to move said carrier toward and away from said punch and anvil, and mechanism adapted to move said punch laterally thereof while the same is in engagement with said lacing hook subsequent to the setting operation, whereby said upper may be punched and fed to space said hooks, by said punch.

6. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, a punch having an anvil thereon, a carrier adapted to hold a lacing hook in alinement with said punch, a die located between said punch and carrier, said die having a hole therein of less diameter than said punch and adapted to cooperate with said punch to punch a hole in said upper, means to move said punch toward said die until it projects into said upper, whereby a hole may be punched in said upper, means adapted to move said die laterally of said punch and out from between said punch and carrier while the punch is projecting into said upper, and means adapted to move said carrier toward said punch and anvil whereby the shank of a lacing hook may be inserted in said hole and riveted to said upper.

7. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, a punch having an anvil thereon, a carrier adapted to hold a lacing hook in alinement with said punch, a die located between said punch and carrier, means to move said punch toward said die, whereby a hole may be punched in said upper, means adapted to move said die laterally of said punch and out from between said punch and carrier while said punch is projecting into said upper, means adapted to move said carrier toward said punch and anvil whereby the shank of a lacing hook may be inserted in said hole and riveted to said upper around said punch, and mechanism adapted to move said punch laterally thereof while it is projecting into said shank, whereby said upper may be punched and fed a predetermined distance by said punch, with the same projecting into said shank.

8. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, a punch having an anvil thereon, a carrier adapted to hold a lacing hook in alinement with said punch, a die located between said punch and carrier, said die having a hole therein of less diameter

than said punch and adapted to cooperate with said punch to punch a hole in said upper, means to move said punch toward said die until it projects into said upper, whereby a hole may be punched in said upper, means adapted to move said die laterally of said punch and out from between said punch and carrier while the punch is projecting into said upper, and means adapted to move said carrier toward said punch and anvil whereby the shank of a lacing hook may be inserted in said hole and riveted to said upper, and mechanism adapted to move said punch laterally thereof while it is projecting into said shank, whereby said upper may be punched and fed a predetermined distance by said punch.

9. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, a work-support, means to clamp said upper thereto, means adapted to set a lacing hook in said upper embodying a punch adapted to pierce a hole in said upper and to project into the shank of said lacing hook during the setting operation, and mechanism adapted to move said punch laterally thereof after the setting operation and while said punch still projects into said shank, whereby said upper may be fed to space said hooks.

10. A machine for setting a lacing hook or the like in the upper of a boot or shoe having, in combination, a punch, a die having a hole therein of less diameter than said punch adapted to cooperate with said punch to punch a hole in said upper, means adapted to move said punch toward and away from said die, mechanism adapted to move said die laterally relatively to said punch while said punch projects into said upper, a carrier consisting of a lever adapted to hold a lacing hook in alinement with said punch during the punching operation and a slide to which said lever is pivoted, mechanism adapted to move said slide toward and away from said punch, and mechanism adapted to rock said lever on said slide whereby said lacing hook may be set in said upper.

11. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, a punch, a die adapted to cooperate with said punch, means adapted to move said punch toward said die until said punch projects into said upper, mechanism adapted to move said die laterally relatively to said punch while said punch projects into said upper, a carrier consisting of a lever adapted to hold a lacing hook in alinement with said punch and a slide to which said lever is pivoted, mechanism adapted to move said slide toward and away from said punch, mechanism adapted to rock said lever on said slide, whereby a lacing hook may be set in said upper, and means to move said punch laterally thereof while in

engagement with said lacing hook subsequent to the setting operation.

12. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, a punch, an anvil thereon, a carrier consisting of a lever adapted to hold a lacing hook in alinement with said punch during the punching operation and a slide to which said lever is pivoted, a raceway, a lever adapted to feed a lacing hook along said raceway and onto said carrier lever, mechanism adapted to move said slide toward and away from said punch and anvil, and a link connecting said lacing hook feed lever and carrier lever.

13. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, a lacing hook carrier consisting of a slide and a lever adapted to receive a lacing hook pivoted to said slide and mechanism adapted to rock said lever on said slide, a lever connected to said slide, means to rock said last named lever, a pivot therefor, and means to adjust said pivot toward and away from said slide without changing the position of said slide, whereby the throw of said slide from said position may be diminished or increased.

14. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, an anvil, a lacing hook carrier adapted to receive a lacing hook, mechanism adapted to move said lacing hook carrier toward and away from said anvil in a direction longitudinally of the shank of a lacing hook held thereon, and means to vary the throw of said carrier in said direction from a given point toward said anvil and back to said given point.

15. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, an anvil, a lacing hook carrier adapted to receive a lacing hook, and mechanism adapted to move said lacing hook carrier toward and away from said anvil, said mechanism comprising a lever connected to said carrier, means to rock said lever, a pivot therefor, and means to adjust said pivot relatively to said carrier without changing the position of said carrier from a given point, whereby the throw of said carrier from said given point toward said anvil and back to said given point may be varied.

16. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, an anvil, a lacing hook carrier adapted to receive a lacing hook and embodying a slide, mechanism adapted to move said slide toward and away from said anvil, said mechanism comprising a lever connected to said slide, means to rock said lever, a pivot therefor, and means to adjust said pivot toward and away from said slide without changing the position of said slide

when it is in the position farthest removed from said anvil, whereby the throw of said slide from said position toward said anvil and back to said farthest removed position may be varied.

17. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, an anvil, a lacing hook carrier adapted to receive a lacing hook, mechanism adapted to move said lacing hook carrier toward and away from said anvil, said mechanism comprising a lever pivotally connected to said carrier, means to rock said lever, a pivot therefor projecting into a slot in said lever, means to adjust said pivot in a hole formed in the frame of said machine, the bore of said hole and said slot being parallel one to the other when said carrier is in the position farthest removed from said anvil, whereby the throw of said slide may be varied without changing its position when farthest removed from said anvil.

18. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, an anvil, a raceway, a lacing hook carrier consisting of a slide and a lever adapted to receive a lacing hook, pivoted to said slide, mechanism adapted to rock said lever on said slide, mechanism adapted to move said slide from its lowermost position, in which said lever is in alignment with said raceway to receive a hook therefrom, toward said anvil and back to said lowermost position, and means to vary the throw of said slide without changing said lowermost position thereof.

19. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, a punch, an anvil, a raceway, a lacing hook carrier consisting of a slide and a lever adapted to receive a lacing hook, pivoted to said slide, a die interposed between said punch and slide and mechanism connecting said die and slide adapted to move said die out from between said punch and slide, mechanism adapted to rock said slide lever on said slide, mechanism adapted to move said slide from its lowermost position, in which said lever is in alignment with said carrier to receive a lacing hook therefrom and said die is interposed between said punch and carrier, toward said punch and anvil and back to said lowermost position.

20. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, a punch, an anvil, a raceway, a lacing hook carrier consisting of a slide and a lever adapted to receive a lacing hook, pivoted to said slide, a die interposed between said punch and slide and mechanism connecting said die and slide adapted to move said die out from between said punch and slide, mechanism adapted to

rock said lever on said slide, mechanism adapted to move said slide from its lowermost position, in which said lever is in alignment with said carrier to receive a lacing hook therefrom and said die is interposed between said punch and carrier, toward said punch and anvil and back to said lowermost position, and means to vary the throw of said slide without changing said lowermost position thereof.

21. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, an anvil, a carrier consisting of a slide and a lever pivoted thereto and adapted to hold a lacing hook in alignment with said anvil, a raceway, a lever adapted to feed a lacing hook along said raceway and onto said carrier lever, mechanism adapted to move said slide toward and away from said anvil, and a link connecting said lacing hook feed lever and carrier lever.

22. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, an anvil, a carrier consisting of a slide and a lever pivoted thereto and adapted to hold a lacing hook in alignment with said anvil, a raceway, a lever adapted to feed a lacing hook along said raceway and onto said carrier lever, mechanism adapted to move said slide toward and away from said anvil, a link connecting said lacing hook feed lever and carrier lever, and mechanism adapted to move said lacing hook feed lever positively in one direction and yieldingly in the opposite direction.

23. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, an anvil, a carrier consisting of a slide and a lever pivoted thereto and adapted to hold a lacing hook in alignment with said anvil, a raceway, a lever adapted to feed a lacing hook along said raceway and onto said carrier lever, mechanism adapted to move said slide toward and away from said anvil, and a connection between said lacing hook feed lever and carrier lever, said connection adapted to yield when force is applied in one direction to allow one of said levers to move independently of the other, said connection forming a positive connection between said levers when force is applied in the opposite direction to move one of said levers relatively to the other.

24. A machine for setting lacing hooks and the like in the upper of a boot or shoe having, in combination, means adapted to set a lacing hook in said upper embodying a punch adapted to pierce a hole in said upper and to project into the shank of said lacing hook during the setting operation and mechanism adapted to move said punch laterally thereof after the setting operation and while said punch still projects into said shank, whereby said upper may be fed to

space said hooks, and means to vary the throw of the mechanism whereby said punch is moved laterally thereof.

25. A machine for setting a lacing hook or the like in the upper of a boot or shoe having, in combination, a punch, an annular shoulder thereon, constituting an anvil, a die adapted to cooperate with said punch to punch holes in said upper, mechanism adapted to move said punch laterally thereof to feed said upper, a carrier adapted to hold a lacing hook in alinement with said punch prior to said lateral feeding movement of said punch, mechanism adapted to move said punch toward said die to punch said upper, mechanism adapted to move said die laterally relatively to said punch while said punch projects into said upper, mechanism adapted to subsequently move said carrier toward said punch, whereby a lacing hook may be set in said upper around said punch prior to the feeding of said upper by said punch, and means to vary the throw of the mechanism whereby said punch is moved laterally thereof.

26. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, means adapted to set a lacing hook in said upper embodying a punch adapted to pierce a hole in said upper and to project into the shank of said lacing hook during the setting operation, a slide, mechanism adapted to impart a vertical reciprocatory motion thereto, a holder for said punch, said holder adapted to move horizontally on said slide, and mechanism adapted to move said punch and its holder

on said slide laterally of said punch after the setting operation and while said punch still projects into the shank of said lacing hook, whereby the vertical median line of said punch may be brought into and out of alinement with the vertical median line of said slide and said upper be fed to space said hooks.

27. A machine for setting lacing hooks or the like in the upper of a boot or shoe having, in combination, means adapted to set a lacing hook in said upper embodying a punch adapted to pierce a hole in said upper and to project into the shank of said lacing hook during the setting operation, a slide, mechanism adapted to impart a vertical reciprocatory motion thereto, a holder for said punch, said holder adapted to move horizontally on said slide, mechanism adapted to move said punch and its holder on said slide laterally of said punch after the setting operation and while said punch still projects into the shank of said lacing hook, whereby the vertical median line of said punch may be brought into and out of alinement with the vertical median line of said slide and said upper be fed to space said hooks, and means to increase and diminish the distance to which said punch may be moved out of alinement by said mechanism.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ARTHUR R. HAVENER.

Witnesses:

CHARLES S. GOODING,  
LOUIS A. JONES.