No. 648,667. Patented May 1, 1900.

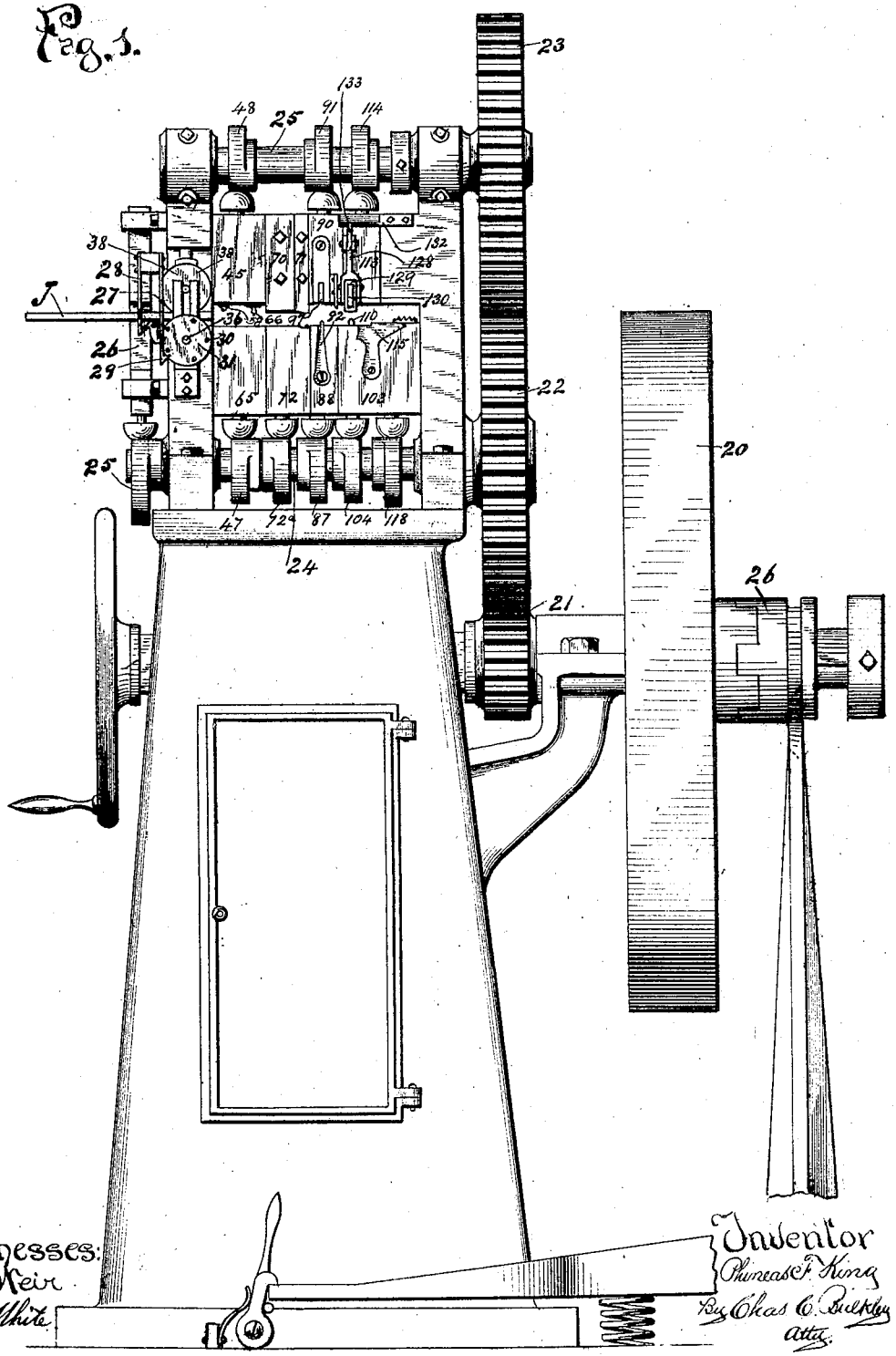
P. F. KING.

MACHINE FOR MAKING FASTENERS.

(Application filed Jan. 3, 1899.)

(No Model.) 5 Sheets—Sheet 1.

Fig. 1.



Witnesses:
[illegible]
R. White

Inventor
Phineas F. King
By Chas. C. Duckley
Atty.

No. 648,667. Patented May 1, 1900.

P. F. KING.

MACHINE FOR MAKING FASTENERS.

(Application filed Jan. 3, 1899.)

(No Model.) 5 Sheets—Sheet 2.

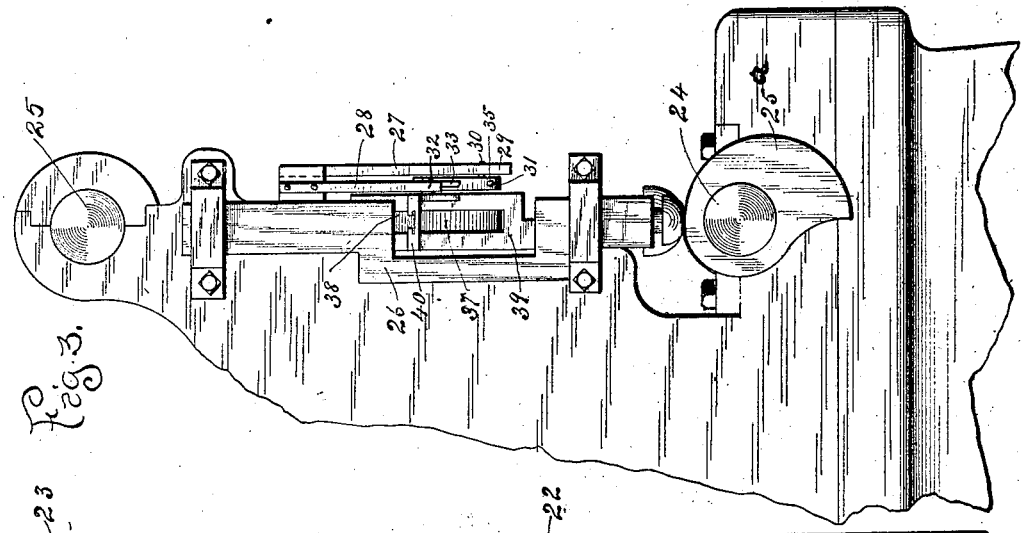


Fig. 3.

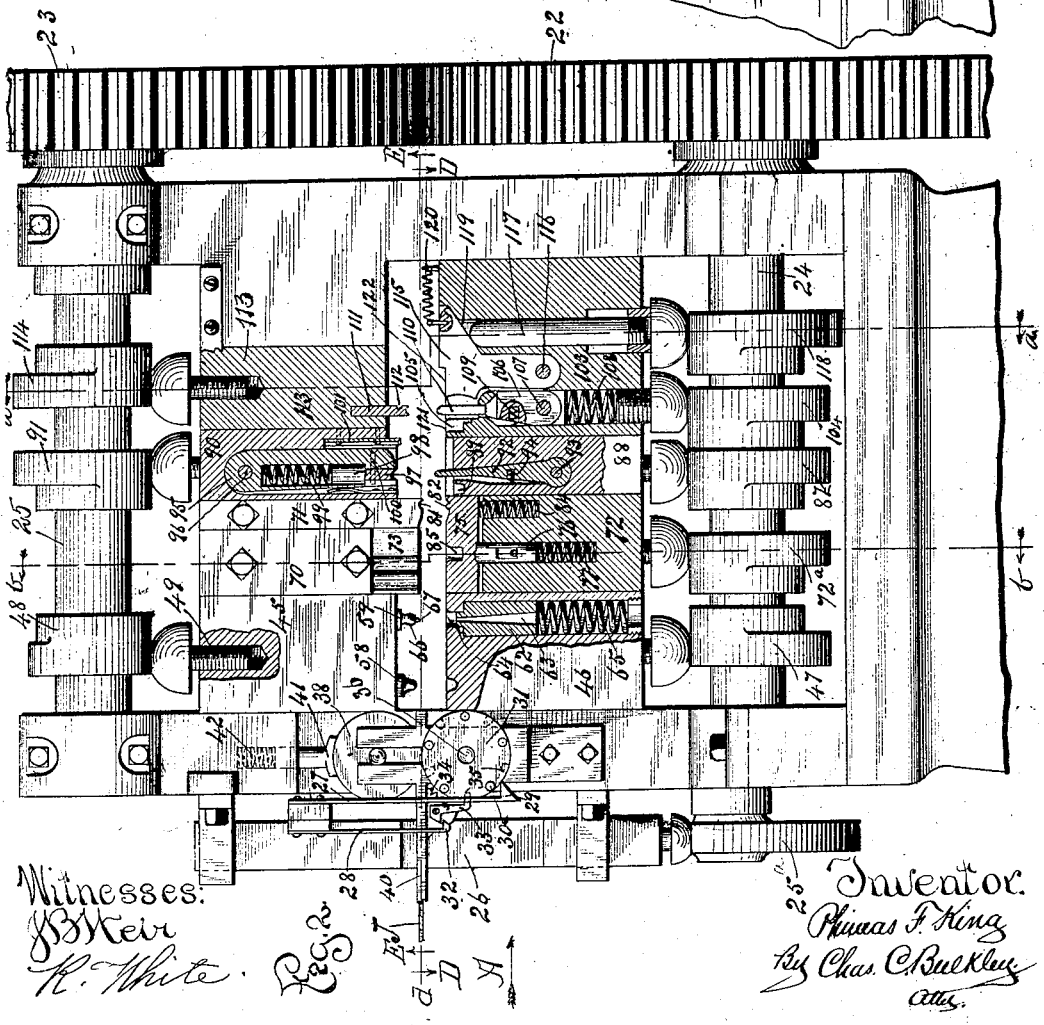


Fig. 2.

Witnesses:
J. B. Weir
R. White.

Inventor.
Phineas F. King
By Chas. C. Bulkley
Atty.

No. 648,667. Patented May 1, 1900.

P. F. KING.

MACHINE FOR MAKING FASTENERS.

(Application filed Jan. 3, 1899.)

(No Model.) 5 Sheets—Sheet 3.

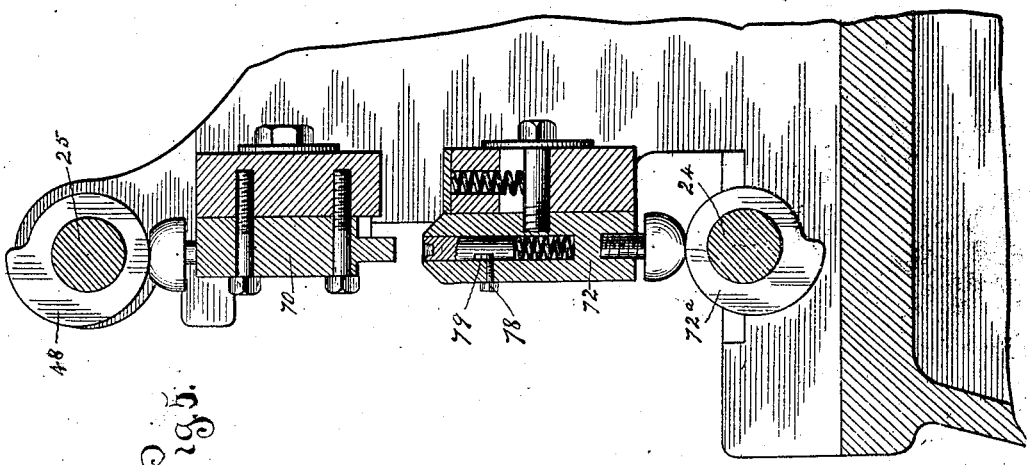


Fig. 3.

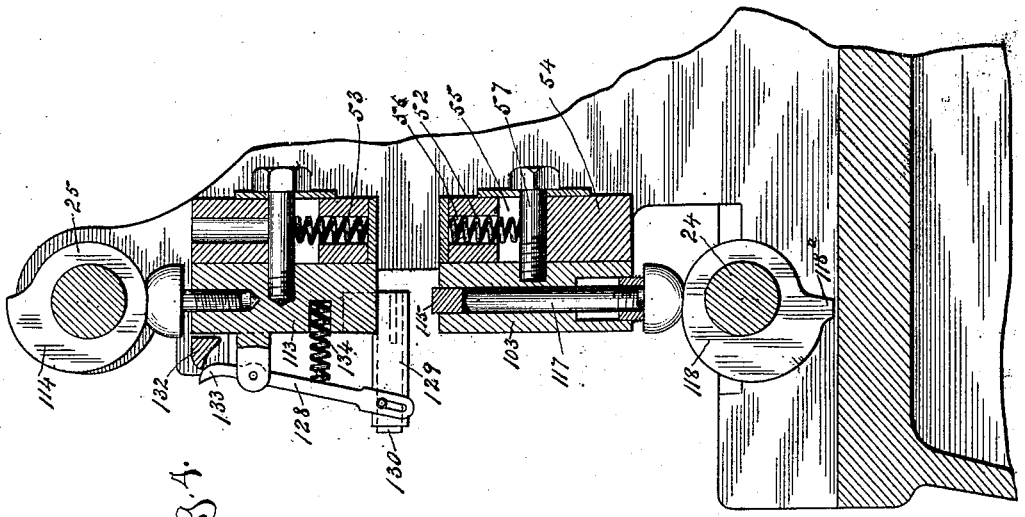


Fig. 4.

Witnesses:
S. B. Weir
K. White.

Inventor.
Phineas F. King,
By Chas. C. Bulkley,
Atty.

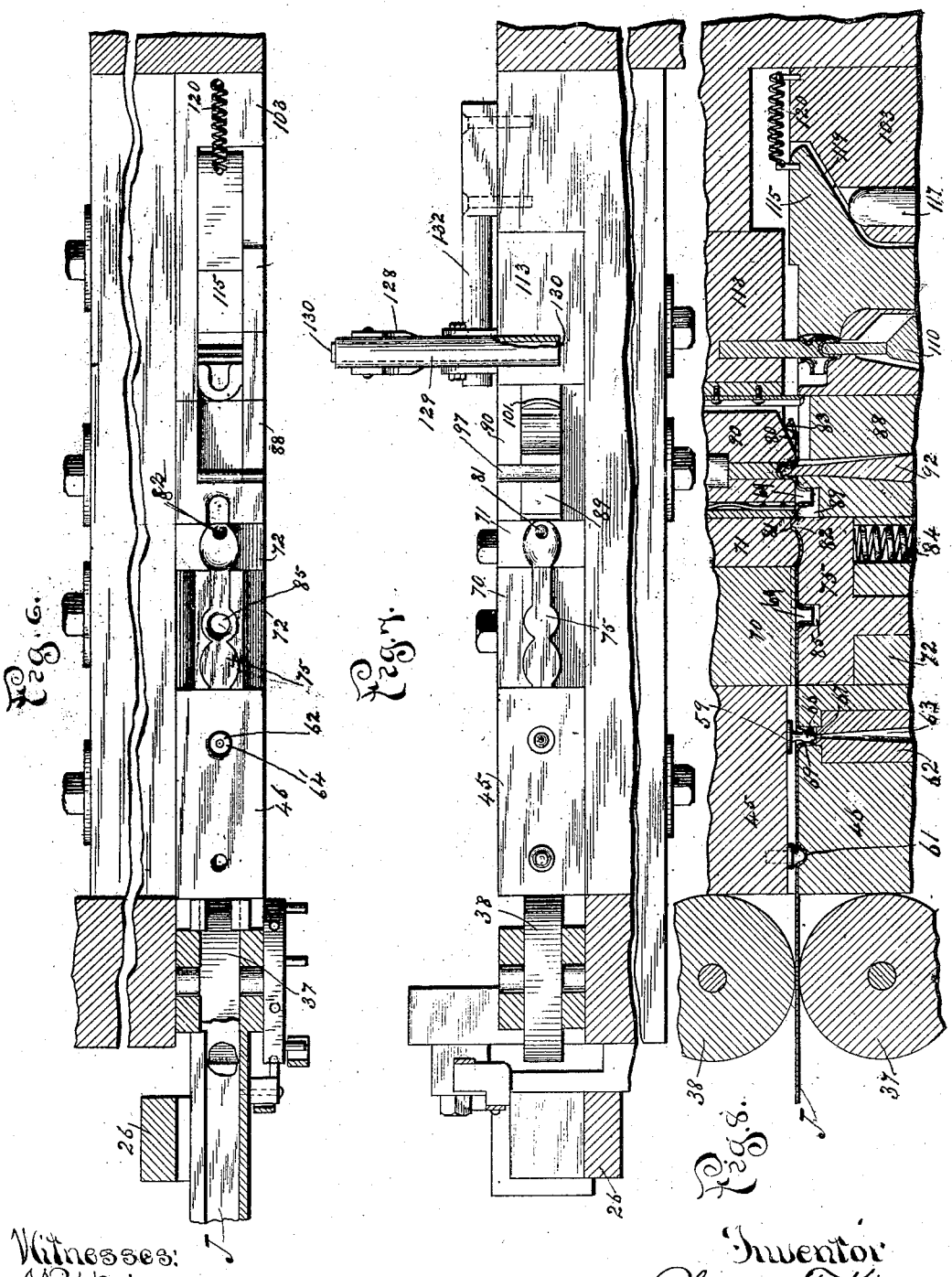
No. 648,667. Patented May 1, 1900.

P. F. KING.

MACHINE FOR MAKING FASTENERS.

(Application filed Jan. 3, 1899.)

(No Model.) 5 Sheets--Sheet 4.



Witnesses:
[illegible]
R. White

Inventor
Phineas F. King,
By Chas. C. Bulkley
Atty.

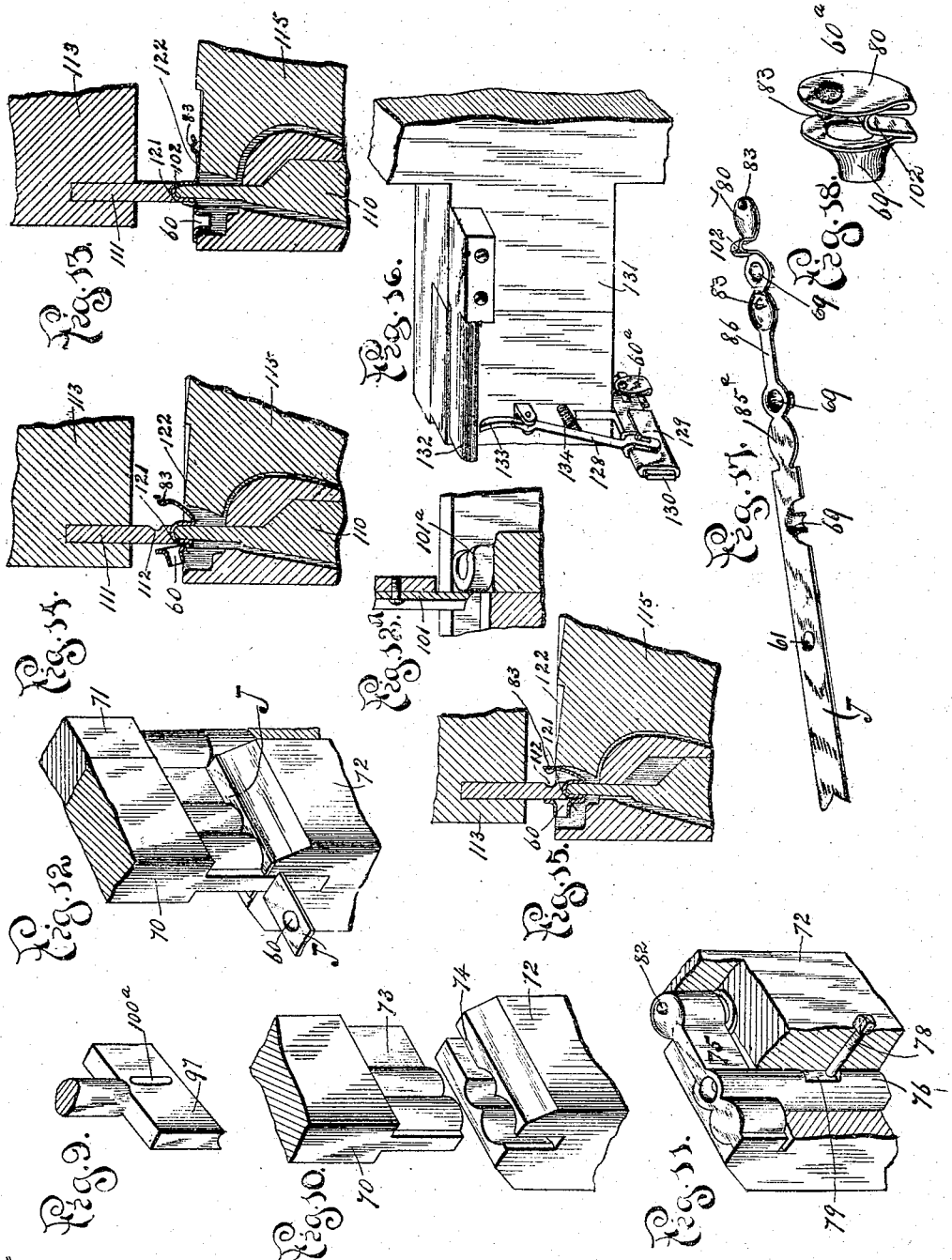
No. 648,667. Patented May 1, 1900.

P. F. KING.

MACHINE FOR MAKING FASTENERS.

(Application filed Jan. 3, 1899.)

(No Model.) 5 Sheets—Sheet 5.



Witnesses
J. Weir
R. White.

Inventor:
Phineas F. King
By Chas. C. Bucklew
Atty.

UNITED STATES PATENT OFFICE.

PHINEAS F. KING, OF CLEVELAND, OHIO, ASSIGNOR TO THE KING FASTENER COMPANY, OF SAME PLACE.

MACHINE FOR MAKING FASTENERS.

SPECIFICATION forming part of Letters Patent No. 648,667, dated May 1, 1900.

Application filed January 3, 1899. Serial No. 700,900. (No model.)

To all whom it may concern:

Be it known that I, PHINEAS F. KING, a citizen of the United States of America, and a resident of Cleveland, Cuyahoga county, Ohio, have invented certain new and useful Improvements in Machines for Making Fasteners, of which the following is a specification.

My invention relates to certain improvements in a machine designed for automatically producing fasteners of the character illustrated and described in an application filed by me June 1, 1898, Serial No. 682,285.

The object of my invention is to produce a machine which shall automatically and continuously act upon a strip or continuous length of metal to produce the completed fastener and to accomplish this result with one machine, the various members of which, acting upon the strip of metal, operate simultaneously and conjointly to form a completed fastener and also preliminarily act upon the strip and prepare it for the ultimate formation of other fasteners.

My invention therefore consists in certain features of construction, combinations and arrangements of parts, and detail construction to be described, and pointed out in my claims, reference being now had to the accompanying drawings, in which—

Figure 1 is a front elevation of the completed machine. Fig. 2 is an enlarged front elevation of the machine with the dies and forming mechanism in section. Fig. 3 is an end elevation in the direction of the arrow A on Fig. 2. Fig. 4 is a sectional view on the line *a a* of Fig. 2. Fig. 5 is a sectional view on the line *b b* of Fig. 2. Fig. 6 is an enlarged sectional view on the line *d d* of Fig. 2 in the direction of the arrows D. Fig. 7 is a like view on the same section-line as Fig. 6, in the direction, however, of the arrows E E. Fig. 8 is an enlarged section through the upper and lower portions, respectively, of the dies and forming mechanism, showing a strip acted upon to preliminarily form the fasteners and also showing a fastener formed and completed just before expulsion from the machine. Fig. 9 is a detailed enlarged perspective view of the loop-bending die-plate. Fig. 10 is a perspective detailed view of the dies for cutting the blank, the die-bed being removed. Fig. 11 is a like view broken away in section, showing the die-bed within the die-block. Fig. 12 is a like view of these parts, showing a strip of metal being acted upon by the die-blocks and die-bed to cut and form the blank. Fig. 12ª is a perspective detailed view showing the knives for severing the blanks. Fig. 13 is a vertical sectional view of the mechanism for forming the fastener into its completed condition, this view illustrating the preliminary position of the looped blank just as it is about to be acted upon by the mechanism to effect the bending of the fastener. Fig. 14 is a like view illustrating still further the formation of the completed fastener, showing the manner in which the fastener is bent into its completed form. Fig. 15 is a like view showing a still further stage of action in the formation of the fastener and just as the hammer-head is about to drive the locking-stud into engagement with the upper die in order to withdraw it into a position for expulsion. Fig. 16 is a perspective view of the expelling mechanism, showing the fastener held suspended in the die-plate and just as the ejector is about to strike and expel the fastener from the machine. Fig. 17 is a perspective view of a strip of metal, showing the blank formed and looped, the eyelet completed, and the socket formed for another eyelet. Fig. 18 is an enlarged perspective view of the completed fastener.

In the production heretofore of shoe-hooks, fasteners, and like articles it has been usual to feed the strip of metal to a machine which acts upon the same in the preliminary formation of the blank. The blank so formed is then delivered to a machine which accomplishes the operation of bending and formation into the completed article.

I propose to subject the strip of metal to action for preliminarily forming the means by which the completed fastener is to be secured, to cut and bend the blank, to complete the fastener, and to expel or discharge it from the machine by instrumentalities embodied in a single machine and operating simultaneously and synchronously.

It will be understood that the primary object of my invention is to provide means in

one unitary machine by which to thus prepare or form one or more blanks for ultimate completion as fasteners by members or parts which act simultaneously and synchronously to accomplish this result. In my machine I provide dies with suitable propelling or actuating mechanism which are adapted to act upon a continuous strip of metal to form the eyelet or other means for securing the completed fastener to an article or object, to cut out or form the blank, which consists of the base portion and an offset or stud constituting a part of the completed fastener, and also at the same time bend and form the completed fastener and expel it from the machine, these various steps in the process of preparation and formation being accomplished by one and the same movement of the parts simultaneously applied to and upon the continuous strip.

My invention also has for its object the provision of means by which to effect a positive forward step-by-step feed of the continuous strip for certain predetermined and necessary equal distances in order that the dies and forming mechanism may act upon the continuous strip at the proper points.

Referring now to the drawings, and particularly to Fig. 1, it will be observed that the machine is driven from a drive-wheel 20, operating a pinion 21, which is meshed with a gear-wheel 22, in turn meshing with the gear-wheel 23. The gear-wheels 22 and 23 are mounted, respectively, upon cam drive-shafts 24 and 25. As a detail of construction (constituting no part of my invention, however) a clutch is provided, (designated generally at 26,) by which the drive-wheel 20, loosely mounted upon its shaft, may be fixedly connected to its shaft in order to drive the pinion 21, thus providing means whereby to start and stop the operation of the machine.

Generally the machine comprises in its construction a number of dies; also, mechanism for bending and forming the fastener and for discharging it when completed from the machine. Mechanism for preparing the securing means, for cutting and bending the blank and for completing the fastener and expelling it from the machine is arranged on either side of the strip of continuous metal as it is fed into the machine. The feed mechanism is located at one side of the machine and is adapted to act upon the continuous strip to advance it with a step-by-step movement at equal intervals through the machine and between the dies and forming mechanism. The dies and bending and forming mechanism, as well as the cut-off, are driven by cams mounted upon the shafts 24 and 25, and these cams will be particularly described and pointed out as each member is described in connection with its operation upon the continuous strip.

I shall proceed to describe particularly at the outset the mechanism by which the continuous strip of metal (designated at J) is fed through the machine with a step-by-step movement. Mounted upon the cam drive-shaft 24 is a feed drive-cam 25^a, which operates to vertically reciprocate a connecting-frame and feed drive-rod 26, Figs. 2 and 3, to which the depending spring-fingers 27 and 28 are secured. The spring-finger 27 carries a lug or head 29, which is adapted to engage, one by one, the pins 30, projected from the face of the feed-wheel 31, near the periphery thereof. The spring-finger 28 also has a like lug or head 32 projecting from its lower end, which is adapted to engage one arm of the pivoted bell-crank dog 33, the end of the other arm of which is held, by means of the spring 34, normally in engagement within some one of the notches 35 on the periphery of the feed-wheel 31. By this means the feed-wheel 31 is positively withheld from any movement except when the lock of the bell-crank dog 33 is withdrawn and the wheel released. This releasement is effected by the vertical reciprocative movement of the drive feed-rod 26, which causes the head 32 of the spring-finger 28 to engage one of the arms of the bell-crank dog 33 and withdraw its other end from locking engagement within one of the notches 35 of the feed-wheel. It will be observed that the head 29 of the spring-finger 27 is removed a short distance from engagement with any one of the pins 30 when the feed-wheel is not in operation, and as the drive feed-rod moves upward the head 29 has a preliminary movement before engagement with one of the pins 30. By this means the spring-finger 28 and its head 32 insure, first, the withdrawal of the locking-dog 33 to release the wheel 31, and when this is accomplished then the head 29 of the spring-finger 27 engages one of the pins 30, and in the further upward movement of the drive feed-rod the feed-wheel 31 is rotated for a given predetermined distance until the pin 30 engaged has moved out of engagement with the head 29, and then the locking-pawl 33 again engages a notch in the periphery of the feed-wheel to hold it securely against further feed. Before the head 29 is disengaged from the pin 30 the lug 32 has moved out of engagement with the locking-dog and the latter has closed against the periphery of the wheel 31, ready to drop into the first notch brought beneath it. Therefore the release of the pin 30 and positive locking of the wheel occur simultaneously and the dog checks against overdrive. In the return movements of the sliding frame the lug 32 rides over the locking-dog without affecting it. The feed-wheel 31 is mounted upon a short counter-shaft 36, upon which the lower one of a pair of gripping feed-wheels is mounted, (designated at 37,) the upper one being designated at 38. These gripping feed-wheels are adapted to bite and grip the strip J of metal between them and as they are rotated feed the strip intermittently through the machine by virtue of the movement imparted to the lower grip feed-wheel 37 by the feed-wheel 31. The grip feed-wheel 37 is mounted with-

in a housing 39, through which the strip-guide 40 is projected, this strip-guide serving to receive the strip of metal and guide the same in its passage between the two feed grip-wheels 38 and 39. A presser-shoe 41 bears upon the upper portion of the periphery of the grip feed-wheel 38, which is controlled by a spring 42.

I will now proceed to describe the means by which the dies form the eyelet and also the mechanism for forming the blank, cutting off the blank, bending and forming the completed fastener, and expelling it from the machine. The eyelet die-blocks 45 and 46 are mounted to reciprocate vertically toward and away from the common center upon either side of the continuous strip of metal J. The die-block 46 carries the female members of the die, and the die-block 45 carrries the male members. The cam 47 on the cam-shaft 24 serves to drive the lower die-block 46, and the cam 48 on the shaft 25 operates to drive the upper die-block 45. The cams, it will be observed, bear directly against the head of an adjusting-screw 49. The cams 47 and 48 serve to move the die-blocks 45 and 46 vertically in one direction to perform the work upon the strip of metal J, and then the cams release the die-blocks and springs, to be designated, which act upon the die-blocks to move them in the opposite direction away from the strip of metal. These springs are more clearly shown in Fig. 4 and are designated at 52 and 53, held in back pieces of the frame, (designated at 54.) These back pieces are recessed at 55 and 56, the springs 52 being disposed within the recesses 56 and bearing against stud-bolts 57, threaded to each of the die-blocks.

The punch 58 is carried on the upper die-block 45 and is instrumental in forming the eyelet of the completed fastener. This punch 58 serves to preliminarily form the eyelet of the fastener, and the punch 59 on said die-block 45 completes the formation of the eyelet 69, as hereinafter explained.

It may be stated in passing that although the various members of the machine act simultaneously, as outlined, to form the eyelet, cut the blank, sever and bend the blank, and complete the formation of the fastener it is necessary to describe the operation of the parts successively and then point out that the parts operate simultaneously to accomplish these various parts of the work.

When the die-blocks 45 and 46 have been operated and the punch 58 has indented the strip J in order to preliminarily form the eyelet and the said die-blocks have receded and disengaged the strip, the feed mechanism is operated to advance the strip a sufficient distance to bring the indented portion of the eyelet (designated at 61, Figs. 8 and 17) into position beneath the punch 59 and that part which afterward becomes the crown 60^a somewhat in advance of said punch.

It will now be necessary to describe the construction by which the female member of the die 46 operates in conjunction with the peculiar eyelet-forming punch 59. A recess is formed within the die-block 46, having disposed therein the slidable block 62. A tapering channel or perforation 63 extends completely through the slidable block 62. The upper portion of the recess in the die-block 46 is contracted to form a receiving-socket 64, slightly larger than the diameter of the larger portion of the eyelet-forming punch 59. A spring 65 is disposed within the recess in the block 46 and is held fast at one end and bears at the other end against the slidable block 62. The eyelet-forming punch 59 is shown more clearly in Fig. 8, and consists of the head 66 and perforating-pin 67, projected from the head 66. The preliminarily-formed eyelet 61 is advanced by the feed and rests within the socket 64 in the die-block 46, and its imperforate surface rests directly upon the upper end of the slidable block 62. As the punch 59 descends the perforating-pin 67 thereof strikes the metal of the imperforate preliminarily-formed eyelet 61 and forms therein a perforation, and the head 66 of the punch 59 also at the same time draws the metal of the eyelet as the slidable block 62 descends under the pressure of the downwardly-moving die-block 45 and punch 59. The small portion of the metal cut out by the pin 67 falls through the channel 63 in the slidable block 62, and as the opening is continuous through the spring 65 this metal is discharged from the machine. Thus the eyelet (designated at 69, Fig. 17) is completely formed.

It is evident that the eyelet is preliminarily formed by the punch 58 and its predecessor completely formed by the punch 59 by one and the same movement of the dies 45 and 46 after the first formation.

I will now proceed to describe the mechanism and means for cutting and forming the blank out of the strip of metal. I provide a stationary die formed in two parts and designated, respectively, at 70 and 71, located above the strip of metal and adjacent to the movable die 45. The two-part die-block 70 71 serves as an anvil to perform, in conjunction with the movable die-block 72, the operation of cutting out and forming the blank. The stationary die-block 70, Fig. 10, carries the male portion of the die 73, and it is of an outline conforming to the shape of the completed but unsevered blank and of the crown 60^a of the next succeeding blank. The movable die-block 72 has its upper surface formed to provide the female member 74 of the die, as shown more clearly in Figs. 10 and 11. A movable die-bed 75 of the outline of the completed die is normally within the concavity or recess of the die-block 72, Fig. 11, its upper surface being flush with the surface of the said die-block. This die-bed 75 is mounted upon the slidable stem 76 within a recess in the die-block 72, and the said slidable stem is in turn mounted and held upon a spring 77,

seated at its lower end and bearing at its upper end against the under end of the said slidable stem. A pin 78, fixed in the die-block, Figs. 5 and 11, is projected into an opening 79 in the slidable stem 76, and thus serves to hold the die-bed 75 in the proper position against the influence of the spring 77. The part 71 of the stationary die-block is bossed or convexed to form the depression 80 of the blank, Fig. 17, and this bossed or convexed portion is provided with the concavity or socket 81, Fig. 7. The die-bed 75 on its surface just below the part 71 of the stationary die-block has a concaved or recessed portion with a projection 82 corresponding to the recess 81 in the stationary die-block. This socket 81 and the convexed portion on the part 71 of the stationary die-block with the concavity and projection 82 of the die-bed 75 together form the depression 80 in the blank and the small projecting stud 83, which stud constitutes a locking part of the completed fastener. A spring 84 bears against and supports this portion of the die-bed 75. A recess 85 in the die-bed receives the completed eyelet as and when the strip is advanced in order that it may rest flush and in line upon the dies.

It will be understood that the crown 60^a of the first blank is cut out upon one movement of the die-block 72 while the eyelet is being completed or is still resting in socket 64 and that then the metal strip, with the partially-formed blank, is moved along by the feeding device, bringing the completed eyelet into position to enter recess 85 and an incomplete eyelet above socket 64, and in the next movement of the die-block the neck 86, depression 80, and stud 83 of the blank are formed, together with the crown of the succeeding blank, and the rim of the completed eyelet 69 is cut around, except a web, whereby it is left attached to said crown and held to the strip. When the die-block 72 is moved upward by its cam 72^a, the die-bed 75, having the female die, engages the under side of the strip of metal and is held in this position. As the die-block 72 has a movement independent of the die-bed 75, it continues its upward movement, the die-bed remaining stationary. The female member of the die-bed and the male member of the stationary die-block 70 71 hold the metal while the die-block 72 in its independent movement cuts out the crown 60^a of the first blank, the eyelet of which has just been or is being concurrently completed. The die-block 72 now recedes, and the strip of metal, with the cut-out crown and the completed eyelet, is fed forward until the crown 60^a is positioned between the members for forming the depression or cavity 80 and striking up the locking-stud 83 and the completed eyelet is over the recess 85. The die-block is now moved upward by its cam and the die-bed engages the cut-out crown 60^a, compressing and forming the concavity 80, while the projection 82 and socket 81 together shape the locking-stud 83, of the completed fastener, and concurrently therewith the shearing edges of the die cut out the neck 86, the rim of the completed eyelet, and the crown 60^a of the next succeeding blank. The blank is now completely cut out as to its longitudinal outline, but still unsevered from the strip, and it remains to perform first the operation of bending the neck 86.

I will now proceed to describe the mechanism and manner of bending or looping the neck 86 of the blank and also cutting off a blank in advance of the one to be looped, the neck of which has already been bent or looped, it being understood that the feeding mechanism has advanced the cut-out blank into a position to be acted upon in order to form this loop or bent portion. The cam 87 on the cam-shaft 24 moves the loop-bending die-block 88 vertically in the same manner as the other die-blocks are moved. The block 88 has a socket 89 for the reception of the completed eyelet, and thus permits the blank to lie flat and in line upon the face of the die-block. As the die-block 88 ascends, the upper die-block 90 is caused to descend by the cam 91 on the cam-shaft 25. The die-block 88 carries a loop-former 92, pivoted at 93 within a recess of the die-block 88, and this bending punch or head 92 is held normally against the side of the recess by means of the spring 94. The upper die-block 90 is recessed to receive a swinging carrier 95, pivoted at 96, the carrier 95 depending from said pivot 96 within the recess of the die-block. This carrier is also recessed to receive the movable die-plate 97, which has a slight movement independent of the carrier 95, and it is connected to a slidable stem 98, against which bears the spring 99. A pin 100 engages within a slot 100^a, Fig. 9, of the movable die-plate 97, and thus is adapted to limit the movement of said die-plate independent of its carrier 95. The die-block 90 also carries the severing-knife 101. The die-plate 97 has a concaved face to bend the loop in conjunction with the loop-former 92.

I will now describe the operation of the parts by which the loop is formed or bent in the neck 86 and the advanced blank, with the neck formed, cut off or severed. It is evident that the advanced blank, with its formed neck, must be cut off or severed from the continuous strip of metal before the loop can be formed in the neck, as the metal of the neck must be permitted to move laterally in order to form the loop therein, since the blank is held on the other side of the neck by the engagement of the eyelet in its socket 89. As the die-block 88 ascends and the die-block 90 descends the metal of the neck is gripped or nipped between the upper end of the loop-former 92 and the die-plate 97. At this point the severing-knives 101 and 101^a, respectively, Fig. 12^a, upon the upper and lower die-blocks, with the upper knife 101 slightly

in advance of the die-plate 97, are brought together, cutting the metal, thus severing the already-advanced bent or looped blank and now permitting the movement of the metal of the unlooped neck laterally at one end in order to form the loop. At this stage of the operation the upper die-block 90 assumes a stationary position and the die-block 88 continues to ascend, forcing the metal of the neck by the loop-former 92 into the concavity of the die-plate 97, thus forming the bend or loop 102, as shown in Fig. 17. It will be understood that in the formation of the loop the die-plate 97 recedes within its recess against the resisting influence of the spring 99 and when seated performs the operation of bending the loop. As soon as the loop is bent and the die-block 90 rises the spring 99 moves the die-plate 97 downward, and thus expels the formed loop from the recess and from its contact with the die-plate 97. Having now formed the loop 102 in the neck of the blank, the strip of metal is advanced again by the feed and it becomes necessary to bend the blank, with its formed loop, into the completed fastener. I will now proceed to describe the mechanism and means by which this result is accomplished. The block 103 is vertically moved by the cam 104 on the cam-shaft 24, and it is provided with a socket 105 for the reception of the completed eyelet as the blank on the strip, with the loop formed, is fed along into a position to bend or form the looped blank into the completed fastener. This die-block 103 is recessed to receive the slidable stem 106, pivoted at 107, which stem is mounted upon the spring 108. A spring 109 serves to press the stem 106 against the side of the recess. The loop-holder 110 is carried on the slidable stem 106, and it is adapted to act in conjunction with the die-plate 111, having the transverse groove 112, to hold the loop and blank while the upsetting and forming of the blank into a completed fastener takes place. This die-plate 111 is held within the die-block 113, operated by the cam 114 on the cam-shaft 25. A hammer-head 115 is pivoted at 116 within the die-block 103, and an actuating-rod 117 operates said hammer-head. This rod 117 is mounted within a recess in the die-block 103 and is adapted to have a movement independent thereof. The cam 118, mounted upon the cam-shaft 24, operates to vertically move the said rod 117. This cam 118 is provided with an offset 118^a, Fig. 4, which gives a sudden movement to the rod 117. The upper end of the said rod 117, which is beveled or rounded, bears against the inclined face 119 on the hammer-head 115, and a spring 120, fixed at one end and secured at the other end to the hammer-head 115, serves to retract the latter from an operating position. The operation of this portion of my device is as follows: The loop 102 is engaged first by the loop-holder 110 and the die-plate 111 as the die-blocks 103 and 113 are moved by their cams toward one another. When the loop is so engaged and held in position by the loop-holder 110 and the die-plate 111, the completed eyelet is within its socket and the now-severed blank rests upon the shoulder 121 and the upper face 122 of the hammer-head 115, as shown more clearly in Fig. 13. Just as soon as the die-plate 111 engages the top of the loop 102, in conjunction with the loop-holder 110, the die-block 103 ceases to ascend, and, the upper die-block 113 continuing to descend, the die-plate 111 exerts a downward pressure upon the loop-holder 110 against the resistance of its spring 108. The loop-holder then descends or sheaths within the recess of the die-block 103 into the positions shown in Figs. 14 and 15. As the looped blank rests upon the shoulder 121 and upon the face 122 of the hammer-head 115 the downwardly-forced movement of the loop 102 upsets or bends the blank upwardly into the intermediate position, as shown in Fig. 14. In the continued descent of the die-plate 111 and the loop-holder 110 the loop is still farther thrust downward until the eyelet assumes the position, as shown in Fig. 15, with the locking-stud 83 in a position opposite the transverse groove 112 of the die-plate 111. At this point both the upper and the lower dies are in a stationary position. At this moment the cam 118 operates to thrust the rod 117 upwardly and advance the hammer-head 115 upon its pivot 116 in a direction toward the loop-holder, thus forcibly striking the upturned portion of the blank carrying the stud 83 and driving said stud into the groove 112 of the die-plate 111, and by this means finishing and completing the formation of the fastener. The upper and lower dies then separate, and the die-plate 111 of the upper die carries with it as it recedes the completed fastener suspended to said die-plate by the engagement of the stud 83 of the fastener in the groove 112 of the die-plate, as shown in Fig. 16, in readiness to be ejected from the machine. It remains now to release the completed fastener from its engagement with the groove 112 of the die-plate 111 and eject it from the machine.

In order to expel or discharge the completed fastener, I provide the mechanism more clearly shown in Figs. 4 and 16. Pivoted to the front face of the upper die-block 113 is a lever 128, linked at its lower end to the ejector-head 129. This ejector-head slides on the track 130, which latter is fixed on the die-plate 111 and extended outward therefrom. Secured to the frame 131 is an abutment 132, which projects forwardly from the frame into a position adapting it for engagement by the upper curved end 133 of the ejector-lever 128. This abutment 132 therefore maintains a stationary position at all times. A spring 134 serves to return the ejector-rod 129 and lever 128 into a normal position. The operation of this portion of my device is as follows: As previously stated, the completed fastener is now held within

the transverse groove 112 of the die-block 111. As the ejector mechanism is carried upon the face of the die-block 113 in the further ascent of said die-block the upper curved end 133 of the ejector-lever 128 engages the stationary abutment 132, and, forcing the upper end of said lever 128, outward its lower end is moved inward toward the face of the die-block 113. In so doing the ejector-head 129 is also thrust inwardly toward the die-block, traveling upon its track 130, and strikes forcibly against the completed fastener suspended within the groove of the die-plate. This forcible impact of the ejector-head against the fastener pushes the finished and completed fastener out of the groove and discharges it from the machine into any suitable receptacle adapted to receive it.

It should be clearly understood that these "steps," so called, successively described, are each performed simultaneously—that is, these members for forming the eyelet, cutting the blank, severing and bending the blank, and completely forming the fastener act simultaneously and not successively one after the other. It is further evident that when the end of a continuous strip is inserted into the machine under the specific arrangement chosen for the purposes of this description the first punch will form the socket of the eyelet and that as the strip is fed along the eyelet will be completely formed, the crown cut, and the socket of another eyelet punched at the same time, and that with a still further feed the blank is trimmed and shaped and a punched socket completed into an eyelet and another socket formed. It is further evident that as the strip is fed forward again the loop of the blank is formed, another blank is trimmed and shaped, and another eyelet finished and another socket for an eyelet formed. By a still further feed the completed and looped blank is severed and completed into a fastener, and at the same time another blank is cut and looped, another eyelet completed, and another eyelet-socket punched. This action continues as the strip is fed forward into and through the machine, each completed fastener being discharged in the manner described.

It will be observed that the successive punches, cutting or shearing devices, stamps, bending mechanisms, blank-severing knives, and finishing-hammer are arranged in line, with the longitudinal axis of the shearing instrumentalities coincident with the longitudinal axis of the strip from which the blanks are cut, the planes of the bending and blank-severing mechanisms transverse to said axis, and the fastener-finishing hammer swinging parallel with said axis; that the feed-rolls and strip-guides are adapted to feed a strip of metal of width corresponding with the width of the widest part of the blank at any stage in the operation; that the successive blanks are formed heel to toe by shearing off the lateral edges of the strip only where shearing is required, and that the ultimate separation of the blank from the strip is by a single cut on the line separating its heel from the toe of its successor. Thus great economy of material is effected, the waste to be returned to the melting-pot or sent to the scrap-heap being reduced to a minimum.

I do not intend to be understood as limiting myself to the specific order of succession of the instrumentalities herein described, since it is evident that within restricted limits certain of them may be transposed without affecting the mode of operation of the machine or departing from the spirit of my invention; nor do I limit myself to the specific construction or outlines of such instrumentalities except as hereinafter definitely expressed.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a machine for making shoe-fasteners from a continuous strip of metal, the combination of forming members for producing the securing part of the ultimately-completed fastener, and cutting or shearing dies to form the blank, having their longitudinal axis in line with an axis of the forming members and coincident with the longitudinal axis of the strip of metal to be operated upon, blank bending and severing mechanisms working in planes transverse to the length of said strip, a finishing-hammer for setting the crown of the fastener, swinging in a plane parallel with the length of the strip, and feeding mechanism actuated to advance the strip the length of one blank at each impulse.

2. In a machine for making fasteners from a continuous strip of metal, the combination of forming members to produce the securing part or parts of the ultimately-completed fastener, cutting-dies to form the blank, blank-severing mechanism, loop-bending mechanism for bending inwardly a loop in the neck of the blank, and fastener-forming members for bending and forming the completed fastener, which parts are arranged to operate simultaneously upon the continuous strip, together with feeding mechanism for advancing the strip predetermined distances, and mechanism for expelling the completed fastener from the machine.

3. In a machine for making fasteners from a continuous strip of metal, the combination of independently-operable sets of mechanisms for actuating the members of the machine which complete the fastener, arranged on either side of the continuous strip as it is fed into the machine, driving mechanism for operating said sets, forming members to produce the securing part or parts of the fastener, cutting-dies to form the blank, blank-severing mechanism, loop-bending mechanism for bending inwardly a loop in the neck of the blank, fastener-forming mechanism for bending and forming the completed fastener, feed mechanism for advancing the strip pre-

determined distances, and mechanism for expelling the completed fastener from the machine, the independently-operable sets of mechanism actuating the aforesaid parts, with the exception of the expelling mechanism, and adapted to advance the parts or members for forming the completed fastener simultaneously, whereby said parts or members act simultaneously upon the continuous strip to produce the complete fastener.

4. In a machine for making fasteners, the combination, with means for feeding a continuous strip of metal, of mechanism for severing and looping or bending the blank, comprising severing-knives adapted to cut and sever the blank, and mechanism for looping the neck of the blank, consisting of a loop-former, a die-block in which said loop-former is mounted, a die-plate having a concaved edge, a die-block in which said die-plate is mounted to move independently thereof, means for moving the die-block carrying the die-plate a predetermined distance and then causing it to assume a stationary position, and means for operating the die-block carrying the loop-former whereby the latter engages the neck of the blank and, in coöperation with the die-plate, forms a loop or bend therein after the blank is severed.

5. In a machine for making fasteners, die-blocks movable toward and away from a continuous strip of metal carrying, respectively, male and female members for preliminarily forming and completing the eyelet, said male and female members comprising a socket-punch and socket, an eyelet perforator and former, a socket receiving said perforator and former, a slidable block mounted in the die-block, a channel extended through said slidable block and coöperating with the perforator and former to seat the unperforated eyelet-socket and form and perforate the same, and a yielding pressure device acting to hold the slidable block in a position to seat the unperforated socket of the eyelet and permit the slidable block to move, whereby the socket is drawn and formed into a completed eyelet.

6. In a machine for making fasteners, bending or forming mechanism for looping or bending the neck of the blank, comprising die-blocks movable toward and away from a continuous strip of metal, a loop-former pivoted or hinged in one of the die-blocks, a die-plate movably mounted in the other die-block, a yielding pressure device acting upon the die-plate, and means for actuating said die-blocks whereby the one carrying the die-plate advances a predetermined distance and then assumes a stationary position, and means for advancing the other die-block carrying the loop-former, whereby the loop or bend is formed in the neck of the blank.

7. Means for bending and forming the blank into a fastener, comprising die-blocks movable toward and away from a strip of metal, a loop-holder movably mounted within one of said die-blocks and adapted to engage and hold the loop previously formed in the neck of the blank, seats on the die-block upon which the blank rests, a die-plate carried in the other die-block and adapted to exert a downward thrust upon the loop of the blank held by the loop-holder, and means for advancing the die-block and die-plate.

8. In a machine for making fasteners, a pair of die-blocks movable toward and away from a strip of metal, a loop-holder pivotally mounted in one of said die-blocks and movable independent thereof, a yielding pressure device acting upon said movable loop-holder, seats upon which the looped blank rests, and a die-plate in the other block coöperating with the loop-holder to bend and form the fastener, together with means for moving the die-blocks.

9. In a machine for making fasteners, die-blocks movable toward and away from each other, a loop-holder mounted in one of the die-blocks and adapted to engage the previously-formed loop of the blank, seats upon which said blank rests, a transversely-grooved die-plate in the other die-block which engages the top of the loop of the blank and exerts a downward thrust thereon to bend the blank into the fastener, a striker adapted to strike the bent fastener and to complete the formation of the fastener and engage it with the grooved die-plate, whereby the completed fastener is drawn into a discharging position in the movement of the die-block carrying the die-plate away from the continuous strip.

10. In a machine for making fasteners, the combination of die-blocks movable toward and away from a strip of metal, a loop-holder pivoted in one of said die-blocks and movable independent thereof, a yielding pressure device acting upon said loop-holder, seats upon which the looped blank rests, a die-plate carried by the other die-block, a pivoted striker adapted to strike the bent fastener and complete the formation thereof, a groove in the die-plate into which the fastening-stud of the fastener is forced by the striker, and means for actuating said striker.

11. In a machine for making fasteners, means for ejecting the completed fastener from the machine, comprising a grooved die-plate with which said fastener is engaged in the finishing operation and by which it is temporarily supported away from interfering mechanism, a stripper sliding upon said die-plate longitudinally of the groove, and mechanism for actuating said stripper.

12. In a machine for making fasteners, means for ejecting the completed fastener from the machine, comprising a die-plate supporting the fastener, an ejector slidably mounted adjacent to the die-plate and adapted to strike the completed fastener, a pivoted lever, and an abutment engaging said pivoted lever to actuate the ejector.

13. In a machine for making fasteners, means for holding and ejecting the completed

fastener from the machine, comprising a die-block, a grooved die-plate, the fastener being held supported in the groove of the die-plate, an ejector slidably mounted adjacent to the die-plate and groove thereof, a pivoted lever connected with said ejector, and an abutment acting upon said lever to operate the ejector.

14. In a machine for making fasteners, die-blocks movable toward and away from a continuous strip of metal, a severing-knife carried by one of said die-blocks and a severing-knife carried by another die-block, which severing-knife also constitutes a seat for the looped blank when being bent into a completed fastener, a striker adapted to complete the formation of the fastener and also providing the other seat for the looped blank, and means for bending the looped blank into a completed fastener.

15. In a machine for making fasteners from a continuous strip of metal, a feeding mechanism comprising in its construction a reciprocated drive member, feed gripping-wheels for engaging the continuous strip, automatically-engaging locking mechanism for holding the feeding mechanism stationary while the mechanism for acting upon the strip is in operation, and means carried by said reciprocated drive member, operating in the advancing stroke to disengage said locking mechanism and actuate the feed mechanism, and to release said locking mechanism and allow it to assume position for reëngagement before said stroke is finished.

16. In a machine for making fasteners from a continuous strip of metal, a feeding mechanism comprising in its construction a reciprocated drive member, feed gripping-wheels for engaging the continuous strip, a bell-crank, dog-engaging sockets in a feed-wheel, and yielding lugs or heads carried by the reciprocated member, one of which engages one arm of the bell-crank dog, to open the latter, and then passes beyond said arm, permitting the dog to close in readiness to engage, and the other of which, in the same stroke, engages projections on said wheel to move it.

17. In a machine for making fasteners, the combination with mechanism for cutting out the blank, of mechanism for forming a loop in the neck of said blank, mechanism for holding and supporting said loop previously formed, and mechanism for bending the base and crown of the fastener over toward said loop.

18. In a machine for making fasteners the combination with the pivoted and yielding loop-holding stem, of the opposing movable die, and the hammer or striker.

19. In a machine for making fasteners from a continuous strip of metal, the combination with the punch for completing the securing device of the fastener, of a succeeding pair of dies having their longitudinal axis coincident with the longitudinal axis of the strip and having the outline of the blank to be cut, together with the outline of the crown of said blank, at the end adjacent to said punch.

Signed by me at Chicago, Cook county, Illinois, this 21st day of December, 1898.

PHINEAS F. KING.

Witnesses:
CHAS. C. BULKLEY,
L. M. BULKLEY.