3 Sheets—Sheet 1.

L. A. SPRAGUE.

Machine for Making Buckle-Levers.

No. 228,136. **Patented May 25, 1880.**

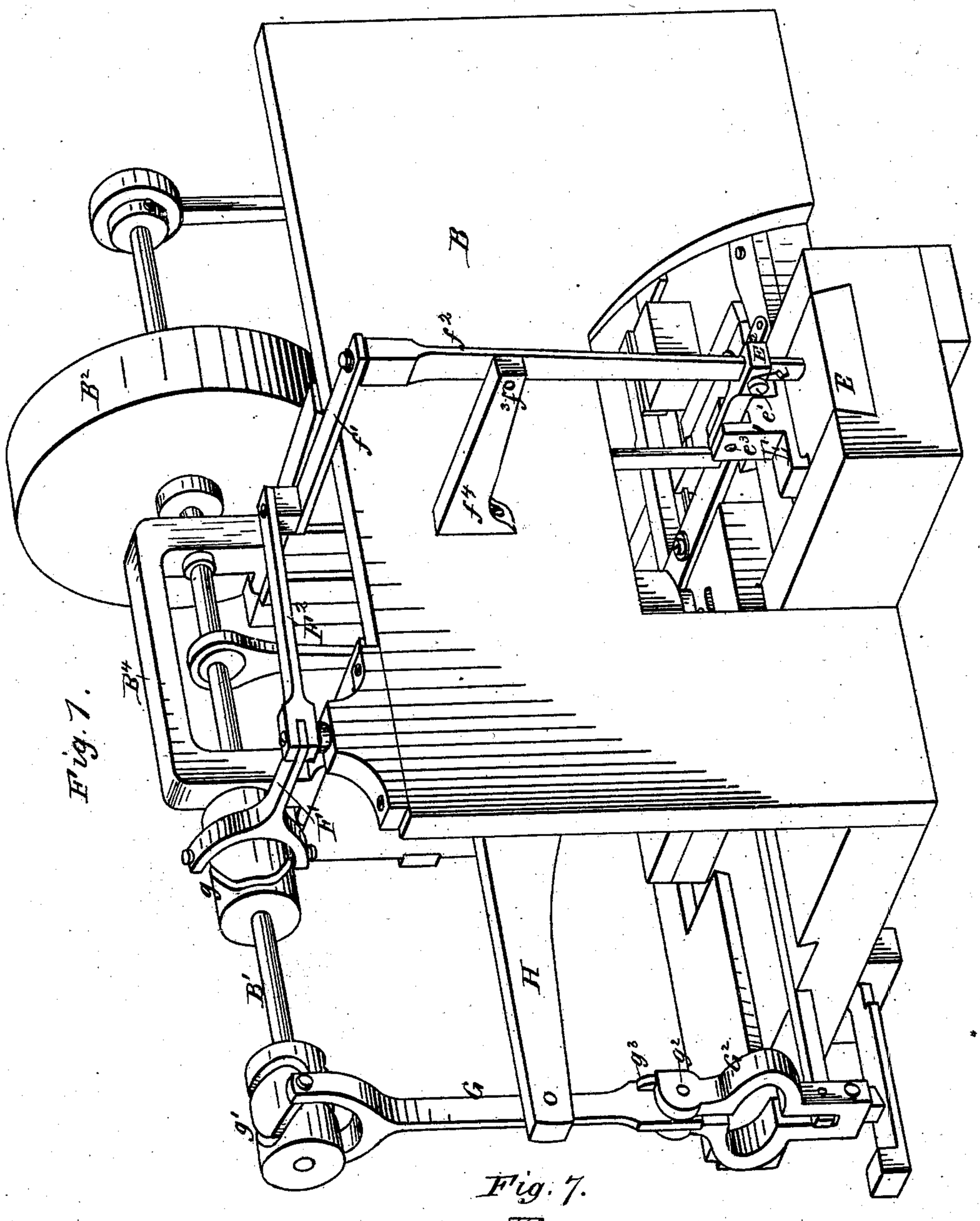
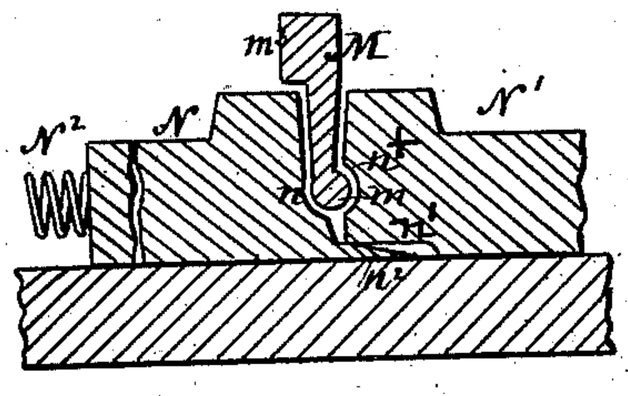


Fig. 7.



Witnesses:

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J. S. Barker.

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3 Sheets—Sheet 2.

L. A. SPRAGUE.

Machine for Making Buckle-Levers.

No. 228,136. Patented May 25, 1880.

Fig. 2.

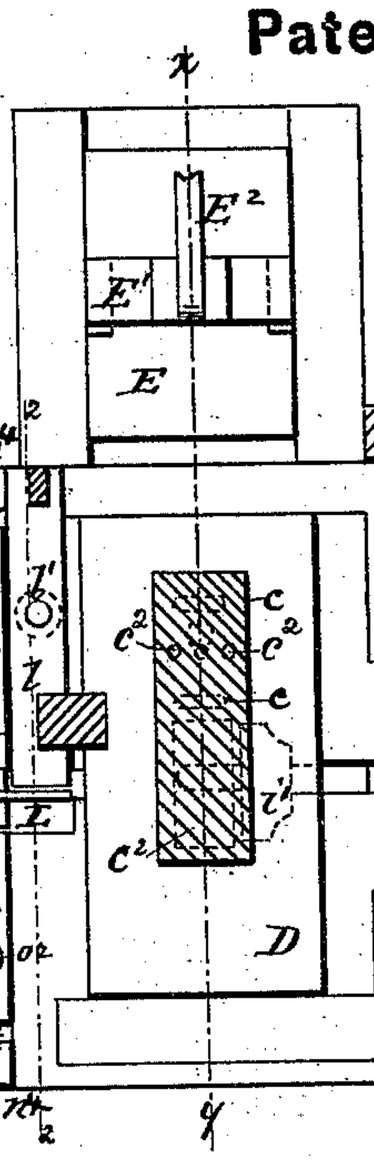


Fig. 3.

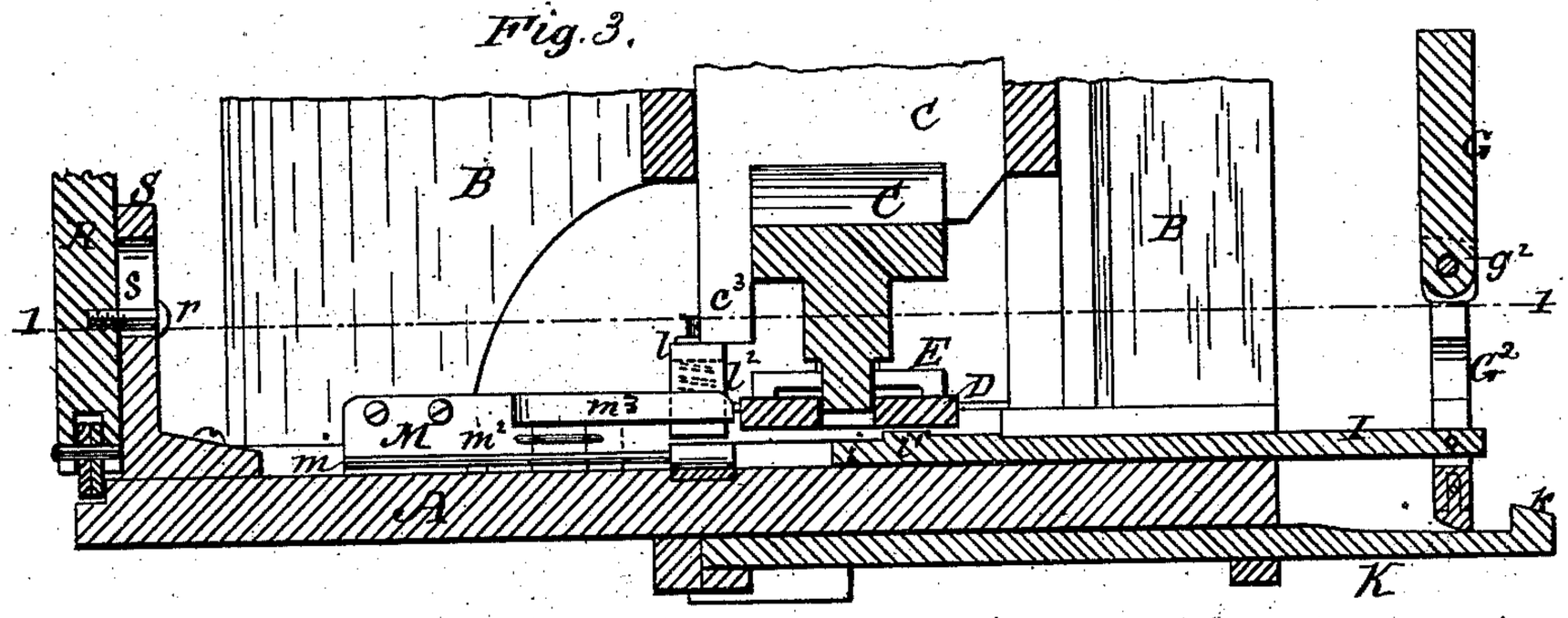


Fig. 4.

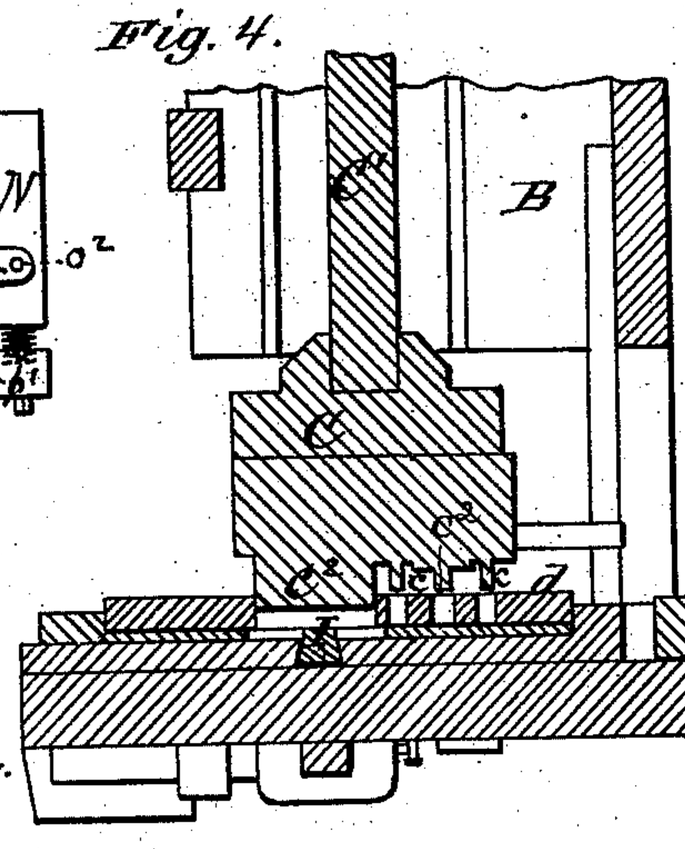


Fig. 16.

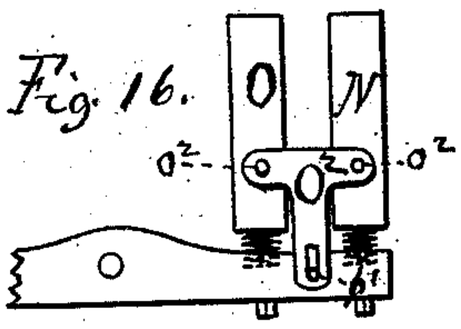


Fig. 17.

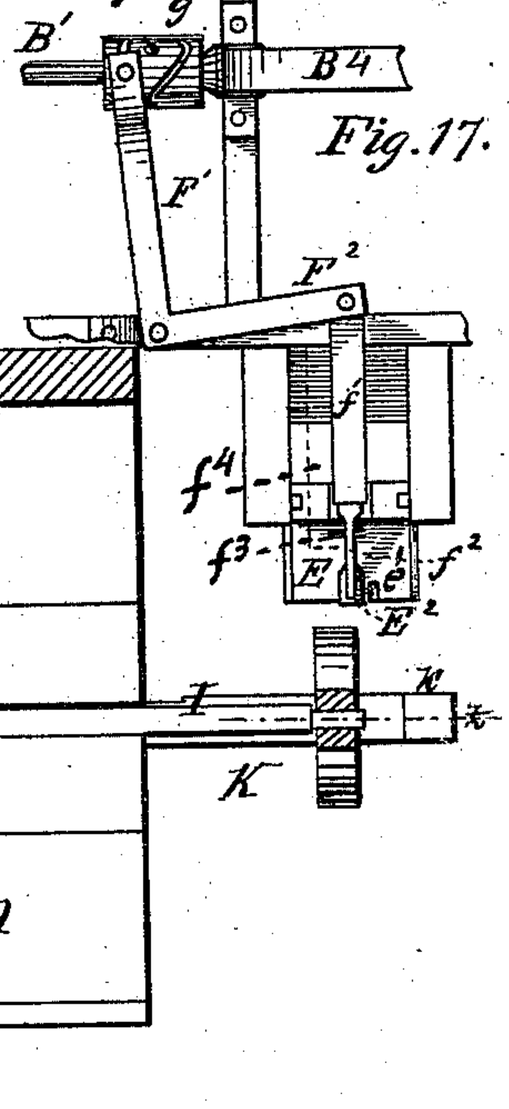
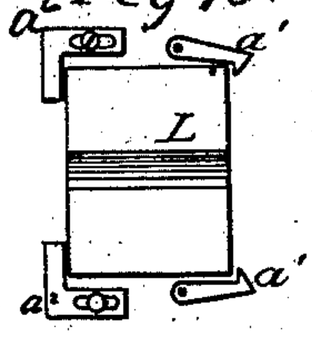
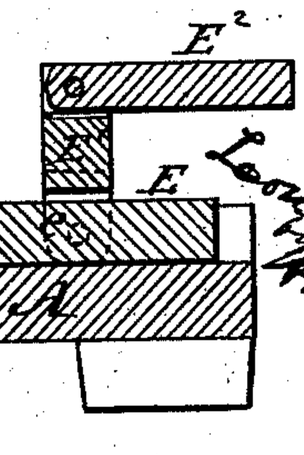


Fig. 15.





Witnesses

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3 Sheets—Sheet 3.

L. A. SPRAGUE.

Machine for Making Buckle-Levers.

No. 228,136. **Patented May 25, 1880.**

Fig. 5.

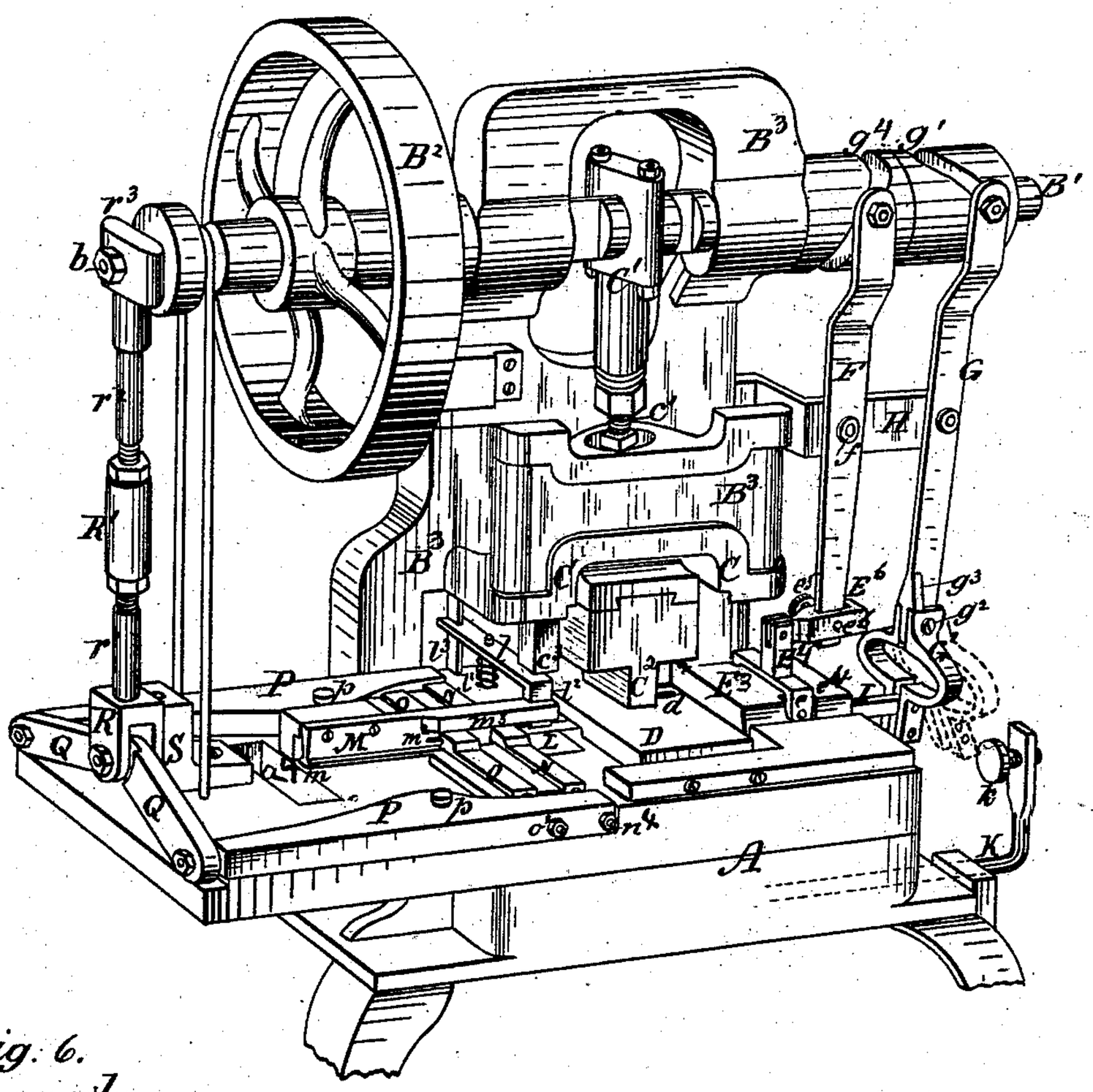

Fig. 6.

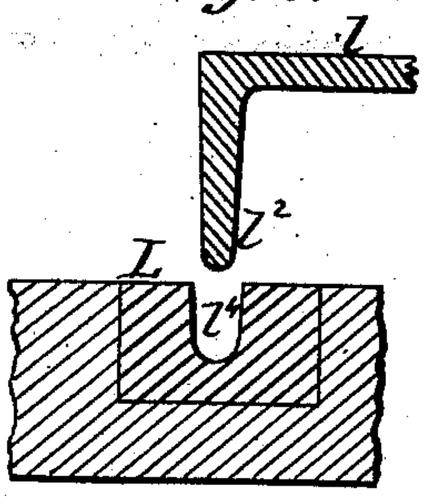

Fig. 11.

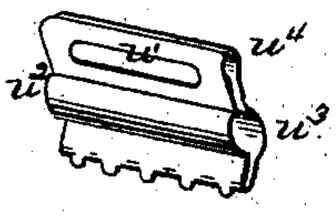

Fig. 12.

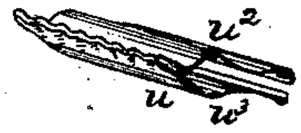

Fig. 8.

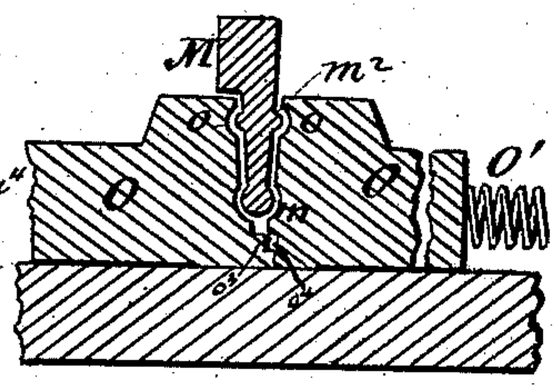

Fig. 9.

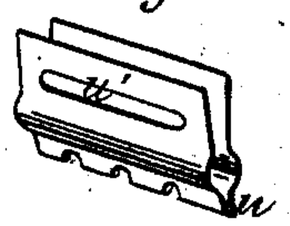

Fig. 10.

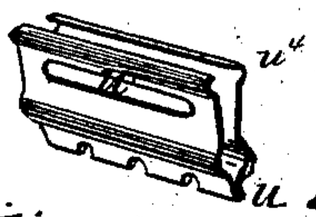

Fig. 14.

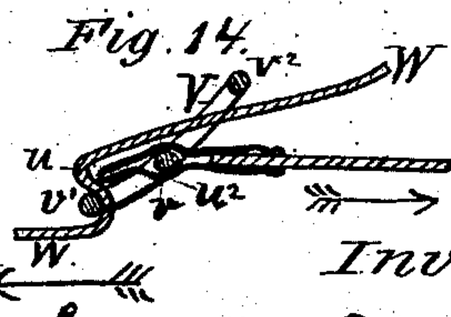

Fig. 13.

Witnesses
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UNITED STATES PATENT OFFICE.

LEONARD A. SPRAGUE, OF BROOKLYN, E. D., NEW YORK.

MACHINE FOR MAKING BUCKLE-LEVERS.

SPECIFICATION forming part of Letters Patent No. 228,136, dated May 25, 1880.

Application filed November 11, 1879.

To all whom it may concern:

Be it known that I, LEONARD A. SPRAGUE, of Brooklyn, E. D., in the county of Kings and State of New York, have invented certain new and useful Improvements in Machines for Making Buckle-Levers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 is a rear view of a machine constructed to carry out my invention. Fig. 2 is a plan view of the lower part of my machine, the upper portion having been removed to show more plainly the details of construction. Fig. 3 is a vertical longitudinal section. Fig. 4 is a vertical transverse section. Fig. 5 is a perspective view of a modification of the machine represented in Figs. 1, 2, 3, and 4, the modification consisting in a different arrangement of the feeding mechanism and punching-dies, whereby the machine is adapted to receive a ribbon of metal on a line parallel with the mandrel. Fig. 6 is a detached view enlarged of the folder and matrix which bend the blank into U shape. Fig. 7 is a transverse section enlarged of the die and mandrel which perform the next operation in the formation of the lever. Fig. 8 is a transverse section enlarged of the die and mandrel which complete the formation of the lever. Fig. 9 is a perspective view of the lever after it has been acted upon by the dies shown in Fig. 7. Fig. 10 is a perspective view of the completed lever. Figs. 11 and 12 show modified forms of the lever. Fig. 13 is an end view of a buckle-lever made by my machine. Fig. 14 is an end view, partly in section, of a buckle having one of my improved levers applied thereto, and showing also the straps connected by the buckle. Fig. 15 is a plan view of the matrix and its accompanying stops and detents. Fig. 16 is a detached view of two of the dies and their actuating mechanism. Fig. 17 is a plan view of the mechanism for communicating motion to the devices which feed the metal to the machine, as represented in Figs. 1, 2, 3, and 11.

Referring to Figs 1, 2, 3, and 4 in the drawings, A represents the bed-plate of the machine, which may be supported in any approved or desired manner.

B is a standard rising from the bed-plate A, and may be either cast in one piece with the bed-plate or firmly attached thereto. B′ is a driving-shaft mounted in suitable bearings in the standard B. B^2 is a driving-wheel connected with the driving-shaft B′ by any suitable clutch mechanism.

C is a punch-stock or punch-carrier mounted in or upon the standard B in such a manner as to rise and fall when actuated by means of the connecting-link C′, the upper end of which is mounted upon a crank or eccentric upon shaft B′, the lower end of the link being adjustably connected with the punch-stock by means of the screw *c′* (see Fig. 5) in such manner that the throw or travel of the pump-stock may be regulated at will. Attached to and moving with the punch-stock are two punches, *c*, their position being shown in dotted lines in Fig. 2.

c^2 c^2 c^2 are punches arranged to punch a series of holes through the blank in such position that when the lever is formed the extreme end of the bit is bent on a line crossing these holes diametrically. The punches *c* punch holes through opposite ends of the blank.

C^2 is a punch, also attached to and carried with the punch-stock C, for the purpose of striking the blank from the ribbons, the bed-plate being provided with throats *d*, corresponding in size and position to the punching-dies.

E E′ E^2 constitute a feeding mechanism, in which E is a block sliding in a suitable groove or way formed for its reception in or upon the bed-plate. E′ is a clamp, the ears *e* of which are pivoted upon opposite sides of the block E, leaving room for the ribbon of metal to pass freely between the clamp and the upper face of said block. E^2 is an arm pivoted to the clamp E′, and connected with the lower end of the lever f^2 by means of the set-screw *e′*.

This feeding mechanism is actuated as follows: *g* is a cam-groove formed upon the outer circumference of a cam secured upon the driving-shaft B′. F′ F^2 is a bell-crank lever pivoted at its angle to any suitable support projecting from the frame, and actuated by the cam-groove *g* so as to vibrate in a horizontal

plane. f' is a horizontal link connecting the arm F^2 with the bell-crank lever, with an upright lever, f^2, which is pivoted at f^3, and a support, f^4, which projects from the upright or standard B, the lower end of the lever f^2 being connected with the arm E^2 by means of a set-screw. Thus it will be understood that a reciprocating motion will be communicated from the driving-shaft B′ to the feeding mechanism at each revolution of said shaft.

In Fig. 5 the feeding mechanism consists of a lever, F, pivoted at f, and taking into the cam-groove g^4, a block, E^3, recessed on each side, as at e^4, a clamp, E^4, having its ears e pivoted to block E^3, an arm, E^6, pivoted to clamp E^4 and secured to the lever by a set-screw, e^5, all these parts except the lever being the same in construction as the corresponding parts in the other figures, the clamp being arranged in such relation to the walls of said recesses that as the clamp is thrown forward or toward the dies it (the clamp) is turned upon its pivots in such manner as to gripe the ribbon between the clamp and the upper face of the block, and thus feed the ribbon forward toward the dies; but when the upper end of the clamp is moved backward—that is, away from the dies—it is rocked upon its pivots so as to release the ribbon, and when the ribbon is thus released the ears engage with the rear walls of the slots and move the block E backward with the clamp without disturbing the position of the ribbon.

G is another lever pivoted upon the bracket or arm H, and actuated by means of a cam-groove, g', on shaft B′.

G′ is a loop, pivoted at g^2 upon the lower end of the lever G.

g^3 is a stop formed upon lever G, near its lower end, against which the upper end of the loop G′ engages to form a practically rigid connection between the loop G′ and the lever when the lower end of the lever is moving backward—that is to say, from the dies; but the connection between the loop and the lever by means of the pivot g^2 is a yielding frictional one, which permits a movement of the loop upon its pivot under certain circumstances, as will be hereinafter explained.

It will, of course, be understood that in the machine represented by Figs. 1, 2, 3, and 4 the upright or uprights B subserve substantially the same purpose as the upright marked B^3 in Fig. 5, or any other convenient or approved structure may be employed to support the driving-shaft, driving-wheel, crank, and pitman.

The machine represented in Fig. 5 being identical with that shown in Figs. 1, 2, 3, and 4 in all essential parts, except that in the machine represented in Fig. 5 the strip of metal is fed in on a line substantially parallel with the axis of the mandrel, whereas in the machine represented in Figs. 1, 2, 3, and 4 the metal is fed in on a line substantially at right angles to the axis of the mandrel, the position of the punches is changed to correspond therewith, the standard-shaft and driving-wheel being left off from Fig. 2 in order to show more clearly the position and relation of the punching and bending mechanism, these parts being left off in Figs. 3 and 4 because they are not essential to a clear understanding of the inventions claimed in this case.

I i i' constitute a carrier, constructed to slide freely in a groove formed in the bed-plate A, the inner end, i, and transverse plate i' being arranged to move immediately below the plate D and in close proximity thereto, as is plainly shown in Figs. 2 and 3.

K k is a tripping-bar, connected with mechanism for shipping the belt from the wheel B^2 to a loose pulley on the driving-shaft B′ by means of any usual or approved shipping contrivance, which is not shown and need not be described, as I propose to use any of the well-known devices which are employed for that purpose in machines of this class. The projecting upper end, k, of this tripping-bar is arranged in a line coincident with the path traveled by the lower end of the loop G′, in order that said loop may engage with and actuate the shipping-bar under certain circumstances, which will be hereinafter referred to.

l^2 is a folder projecting forward from the front end of the horizontal carrier-bar l.

l' represents a stud and spiral spring rising from the bed-plate A, the stud projecting through the central part of the horizontal bar l, to the front edge of which the folder l^2 is attached, the rear end of said bar being forked and engaging with and sliding upon an upright post, l^3.

A pusher-pin, c^3, projects downwardly from the punch-carrier C, and engages with the front end of the bar l in such manner as to thrust the folder l^2 down into the recess l^4 formed in the matrix at each downward movement of the die-carrier.

N N′ are dies sliding in suitable grooves or ears in or upon the upper side of the bed-plate A, the inner faces of these dies being formed in substantially the shape shown in Fig. 7—that is to say, their grooves to correspond with the rib m at the lower edge of the mandrel M. The lower corner of the die N′ is recessed, as at n', while the die N is provided with a wedge-shaped tongue, n^2, which enters the recess n'.

m^3 is a rib projecting from the upper part of the mandrel M.

As represented in Fig. 7, the rib m, at the lower edge of the mandrel, is circular in cross-section, and is arranged eccentric to the vertical shank of the mandrel—that is to say, the rib projects farther upon one side of the mandrel than it does upon the opposite side, and the groove $n^\times$, which is formed in the working-face of the die N′, is deeper than the corresponding groove m, which is formed in the working-face of the die N, for a purpose which will be hereinafter explained.

The dies N N′ are forced toward the man-

drel by means of the levers P P, which are pivoted to the bed-plate at *p*, the toggle-levers Q Q, and the link R R′, which is connected by means of a coupling or box, r^3, with a crank, *b*, on the shaft B′, the forked end of this link being connected with the standard S by means of a bolt, *r*, which moves in a slot, *s*, in said standard, the standard being bolted to the bed-plate, the nearness with which the dies N N′ approach the mandrel being regulated by set-screws n^4. (See Figs. 2 and 5.)

A spiral or other spring, N^2, is interposed between the outer end of each of the dies N N′ and the inner face of each of the levers, thus insuring that when the set-screws are withdrawn from the ends of the dies the dies shall still be thrust toward or upon the mandrel with a yielding pressure.

As shown in Fig. 7, the parts of the dies between the lower edges of the grooves and the tongue n^2 and recess *n′* are so shaped as to form the lower end or bit of the lever. (See also Fig. 13.)

O O are a second pair of dies, arranged to slide in or upon the bed-plate, and provided upon their inner ends with grooves *o o*, which correspond to ribs m^2, formed upon the mandrel a short distance above the rib *n*, these dies O O being adjusted by set-screws *o′ o′* in levers P, and also provided with spiral or other springs surrounding the set-screws between the levers P and the outer ends of the dies. These dies are also constructed at or near their lower edges with spurs o^3 and corresponding depressions o^4, or with waved surfaces, or are otherwise similarly shaped, so as to notch, indent, corrugate, or wrinkle the bits of the levers, as indicated in Figs. 10, 11, 12, the object being to insure that the engaging edge of the bit shall take a firm hold of the strap with which it is in contact. As these levers are sometimes subjected to a heavy strain—as, for instance, when used on skate-straps the ends of which are passed through the slots *u′*—I have found it desirable to groove or corrugate the ends, as at u^4, in order to increase their strength and rigidity at this point, and thus enable them to sustain without injury the strain in various directions which is applied to them.

O^2 O^2 are **S**-shaped draw-bars or links, adjustably connected with levers P P by means of set-screws *p′*, and also attached to the dies N N′ O O by means of set-screws o^2.

From the above description it will be seen that as the levers P P are withdrawn from the mandrel M the dies are also drawn back slightly from the buckle-levers with a positive movement by the links O^2, but are held forward—that is, against the buckle-levers—with a yielding pressure by springs O′, in order that a slight looseness of the operating parts shall not permit the dies to be so far thrust backward as to permit the buckle-levers to telescope or overlap each other as they push each other forward upon the mandrel.

a^2 a^2, Fig. 15, are guides adjustably secured upon the bed-plate or upon the matrix by means of set-screws in such manner that their inner ends can be set as desired to determine the point to which the blank shall be pushed by the carrier.

a′ a′ are spring latches or stops attached to the bed-plate with their free ends toward the punching-dies.

My machine may be operated as follows: Referring to Figs. 1, 2, 3, and 4, the metal ribbon is passed in under the clamp E′ of the feeding mechanism, thence under the punches *c* c^2, and during the backward movement of the feeding mechanism these punches *c* c^2 punch holes through the metal. The next forward movement of the feeding mechanism thrusts the ribbon under the punch C^2, which punches the blank from the ribbon, and after the punch has been raised above the ribbon the carrier I *i i′* thrusts the blank upon the matrix L, the position of the cam-grooves *g g′* upon the shaft B′ relative to the position of the crank or the cam which operates the punches being so timed as to move the ribbon and blank while the punches are up out of the way.

The blank is thrust upon the matrix by the transverse plate *i′* of the carrier, the part *i* of the carrier entering the seat in the matrix, and after the carrier is returned to the position shown in the drawings the pusher-pin c^3 thrusts the folder l^2 into the matrix, forming the blank into **U** shape. As the blank is thus thrust upon the matrix it (the blank) separates the free ends of the springs or detents *a′*, which yield, but close their hooked ends upon the rear side of the blank, so as to prevent its being withdrawn by the backward movement of the carrier, which would sometimes occur were it not for these springs, especially in case the carrier has a little oil upon it. As a blank is thus formed into **U** shape one of its ends is turned upward against the mandrel immediately below the rib m^3, so that when the folder l^2 is withdrawn into the position shown in the drawings the partially-formed blank remains in the matrix, the rib m^3 serving as a stop, against which the end of the blank strikes. Were it not for this stop m^3 the blank would be liable to be withdrawn with the folder to such distance that the carrier would not push it (the blank) upon the mandrel.

The next forward movement of the carrier, bringing with it a new blank, pushes the **U**-shaped piece upon the mandrel, the part *i* of the carrier being a little longer than the blank is wide, so that it projects in front of the blank and pushes the **U**-shaped one upon the mandrel and between the dies N N′ without the new blank coming in contact with this partially-formed **U**-shaped one. As the carrier is again withdrawn the folder l^2 presses the new blank into the matrix L, and the dies N N′ compress the **U**-shaped blank upon the mandrel, thus forming it into the shape indi-

cated in Fig. 9, during which operation the wedge-shaped tongue is thrust under the part *n* and presses it firmly against the under side of the rib *m*, as will be readily understood by an examination of Fig. 7.

The dies N N′ O O are advanced toward the mandrel by the action of the toggle-joint Q Q and levers P P, the advance of these dies being regulated at will to correspond with the thickness of the metal by means of the set-screws n^4; and in order to facilitate the forcing of the U-shaped blank upon the mandrel and the dies N N′, it may be found desirable to bevel or chamfer slightly the corners of the ends of these dies upon that side toward the advancing blank.

The next revolution of the shaft B′ and second advance of the carrier places a new blank upon the matrix and another partially-formed one, or a U-shaped one, upon the mandrel, and forces the one which has been acted upon by the dies N N′ forward upon the mandrel between the dies O O, so that when these dies are advanced toward the mandrel the upper edges of the metal are compressed upon the ribs m^2, the formation of the lower portions of these dies swaging or punching the notches, indentations, or wrinkles into the engaging-edge of the bit, thus completing the formation of the lever; and each subsequent revolution of the shaft B′ repeats these operations substantially as described, and advances the levers to completion and until they drop off the end of the mandrel and fall through the opening a^4 in the bed-plate.

It will be seen that from the fact that the central part of the buckle-lever fits closely around the lower part of the mandrel while the upper edges are being compressed upon the ribs m^2, said part *m* of the mandrel serves to support the lever against the downward thrust of the upper part of the dies O O, thus insuring the proper formation of the said upper parts of the lever.

In order to prevent the blanks from telescoping or sliding past one another upon the mandrel as they are pushed forward by the end *i* of the carrier, I employ springs N^2 O′, interposed between the outer ends of the dies and the levers P P, these springs acting to press the dies firmly against the blank upon the mandrel during a portion of the movement of the levers P P outward, thus permitting the dies to yield sufficiently to allow the blank to be advanced upon the mandrel.

If from any cause the carrier fails to push the blank upon the mandrel properly, or if any other irregularity in the movement of the blank occurs in such manner as to interpose any unusual resistance to the forward movement of the carrier, the loop G^2 will swing upon its pivot g^2, thus allowing the lower end of the lever to advance without moving the carrier, the position of the loop relative to the lever under these circumstances being shown in dotted lines, Fig. 5, the result being that upon the backward movement of the lower end of lever G the lower end of the loop will engage with the tripping-bar K *k* and disconnect the driving-shaft from its actuating power, thus stopping the machine and avoiding any injury to parts which would be likely to result from the machine continuing in motion after an irregularity in its operation had occurred.

Referring to Fig. 7, it will be understood that the tongue n^2 supports the lower end of the part *u* of the lever firmly while the dies N N′ are compressing the metal upon the mandrel; but owing to the wedge shape of this tongue, when the die N is withdrawn from the mandrel the blank is released from upward pressure against the mandrel, so that it can be readily fed forward to the dies O O.

In Fig. 5, which is a modification of the machine shown in Figs. 1, 2, 3, and 4, I have shown a construction in which the metal ribbon, instead of being fed to the machine upon a line at right angles to the carrier I *i i′* and the mandrel, is fed upon a line substantially parallel to the path traveled by the carrier, the ribbon in this instance passing through the loop G^2 and under the clamp E′ of the feeding mechanism.

By an examination of this Fig. 5 it will be understood that the position of the punches *c* c^2 and C^2 has been changed to correspond with this change in the direction of feeding the ribbon, so that as the ribbon is fed forward by successive impulses the punches punch holes in the blank, and then the punch C^2 punches the blank from the ribbon, and the skeleton which is left after the blanks have been punched passes over the bar *l*, which carries the folder l^2, the pusher-pin c^3 being so located as to pass through the open places in the ribbon-skeleton from which the blanks have been punched. The skeleton passes over the mandrel M and down through the opening a^4 in the bed-plate.

By an examination of Figs. 7, 11, 12, 13, and 14 it will be seen that the buckle-lever is adapted to be used upon a buckle-frame constructed of two side bars, V, (one only being shown in Fig. 14,) the side bars being tied together by two end bars, v' v^2, and a central bar, *v*, the lever being mounted upon the central bar, *v*, by means of the central groove or seat, u^2 u^3, the groove u^2 being of greater depth than the groove u^3 upon the opposite side of the lever.

The object in forming the lever with the groove eccentric thereto—that is to say, with the groove u^2 deeper than the groove u^3—is to insure that the central bar, *v*, of the buckle-frame shall not spread the sheet of metal of which the lip or bit *u* is made when the straps which the buckle unites are under tension. In Fig. 14 I have illustrated this feature of my invention, as follows:

W′ is a strap attached to the open or forked end of the buckle-lever. W is another strap passing inside the end bar, v', thence around the

end of the bit or lip of the lever, thence under the end bar, v^2, of the buckle-frame, the direction of pull upon the straps being indicated by the arrows; and from an examination of this figure it will be readily seen that in consequence of the bar v being seated in the deep groove u^2 of the lever the tension or draft upon the straps has but little tendency to spread the lever at the lip or bit u. When preferred, however, a strap, instead of being inserted between the ends of the legs of the buckle, may be passed through the slots u', as is customary in this class of buckles.

I have shown in the drawings three forms of my improved buckle-lever bit.

In Fig. 10 the irregularity in outline of the bit is produced by the holes punched by punches c^2 at that point where the metal is doubled back upon itself, while in Figs. 11 and 12 the engaging-edge of the bit is struck into shape after it has been acted upon by the dies N N'.

In view of the fact that my buckle-lever may be made by the method herein described and upon two or more machines, it will be readily understood that it may be found desirable to sell the blanks in the shape in which they leave the punching-dies as an article of commerce, said blanks to be afterward manufactured into levers by machines which are organized differently from that which forms the subject of this patent; and it will be seen that a blank which has the slots u' and the holes punched by the punches c^2, which holes form notches when the lever is completed, is particularly adapted to be bent into a lever.

I do not in this application claim the combination, with the matrix L, the folder l^2, and the carrier I i i', of the adjustable stops a a; nor do I claim, as a new article of manufacture, a buckle-lever formed from a single piece of sheet metal folded back upon itself, the fold being made upon a line transverse to the side of the strip or sheet of metal from which the lever is made, preferring to claim these matters in another application which I have filed; nor do I claim the notched or pointed or corrugated end or bit of the lever, nor the method or sequence of operations by which I produce the same, as I propose to make these features the subject of another application which I am preparing to file. In this case I do not claim any feature of invention shown or described herein except those which are specifically embraced in the following claims:

Having thus described my invention, what I claim is—

1. In combination with the mandrel M, provided at its lower edge with the rib m and with the short ribs m^2 m^2, the dies N N' O O, whereby, after the partially-formed lever has been acted upon by dies N N', the rib m serves as a support or guide over which said lever may be moved to a proper position relative to dies O O, substantially as set forth.

2. In a machine for making buckle-levers, the combination of the mandrel M, the dies N N', advanced on planes substantially at right angles to the planes of the partially-formed buckle-lever, and the tongue n^2, attached to the die N, substantially as set forth.

3. In a machine for making buckle-levers, the combination, with the mandrel, the punch which punches blanks from a continuous sheet of metal, and two or more dies which successively form the metal into the desired shape, of a carrier which moves a blank from the punches to the forming-dies and advances the partially-formed levers against the preceding lever, substantially as set forth.

4. In a machine for making buckle-levers, the combination, with the matrix L and folder l^2, of the dies N N', the mandrel arranged to receive the blank from the matrix, and the carrier, substantially as set forth.

5. In a machine for making buckle-levers, the combination, with the mandrel M and dies N N', of the springs N^2 N^2, to press the dies forward into proper position relative to the mandrel, substantially as set forth.

6. In a machine for making buckle-levers, the combination, with the folder l^2, of the pusher-pin c^3, attached to and moving with the punch-stock C, and a returning-spring, which lifts the folder, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 15th day of October, 1879.

LEONARD A. SPRAGUE.

Witnesses:

H. H. DOUBLEDAY,

H. VAN RODER.