3 Sheets—Sheet 1.

L. A. SPRAGUE.

Machine for Making Buckle Levers.

No. 231,199. Patented Aug. 17, 1880.

Fig. 1.

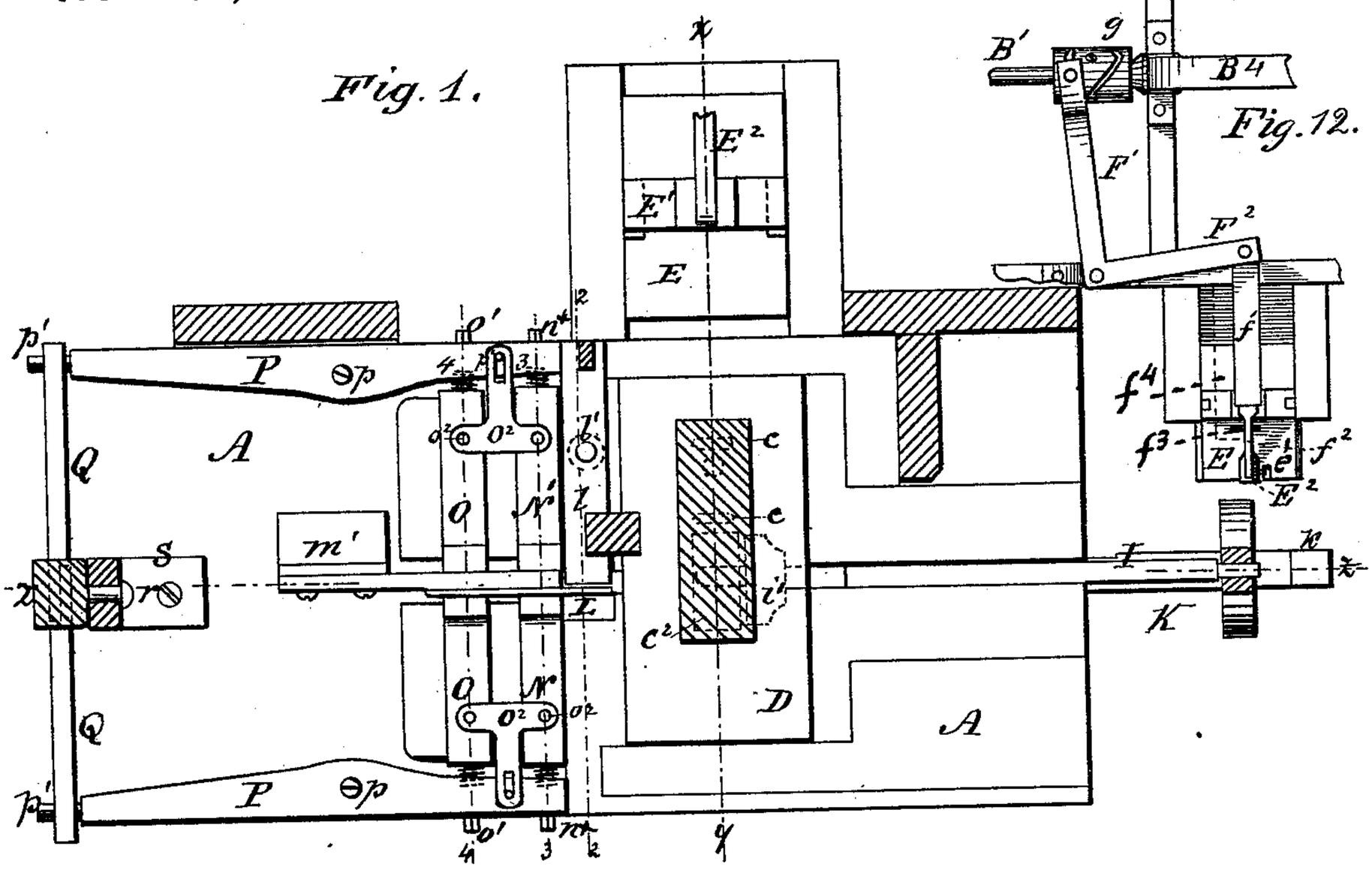


Fig. 12.

Fig. 2.

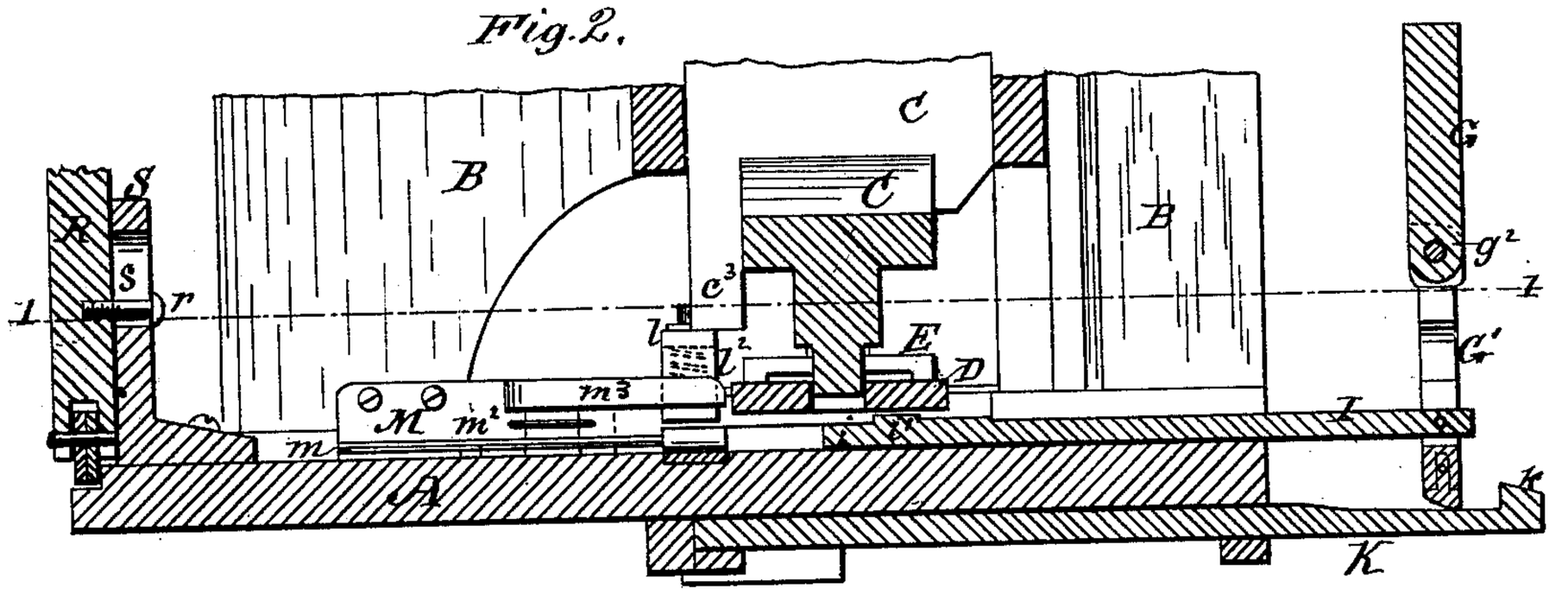


Fig. 3.

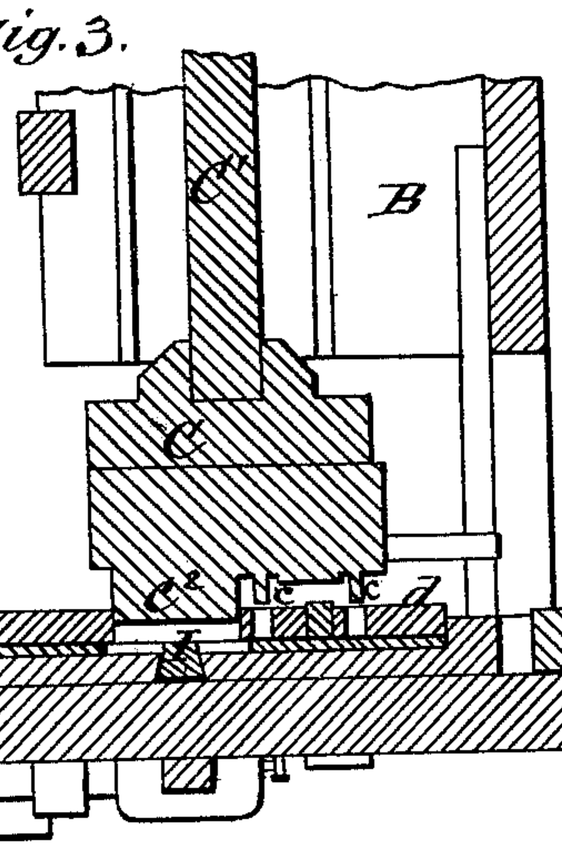


Fig 11

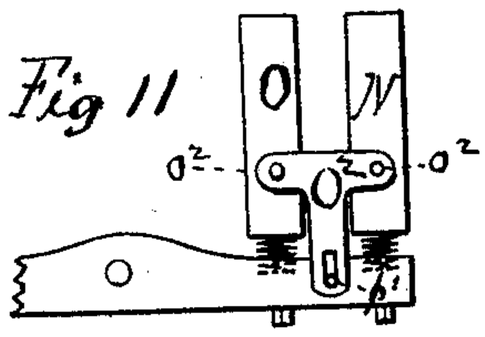
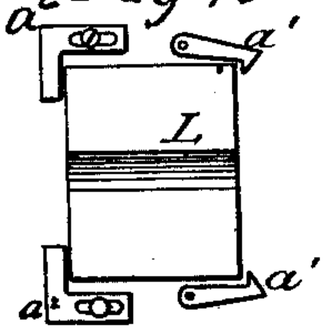


Fig 10



Witnesses

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3 Sheets—Sheet 2.

L. A. SPRAGUE.

Machine for Making Buckle Levers.

No. 231,199. **Patented Aug. 17, 1880.**

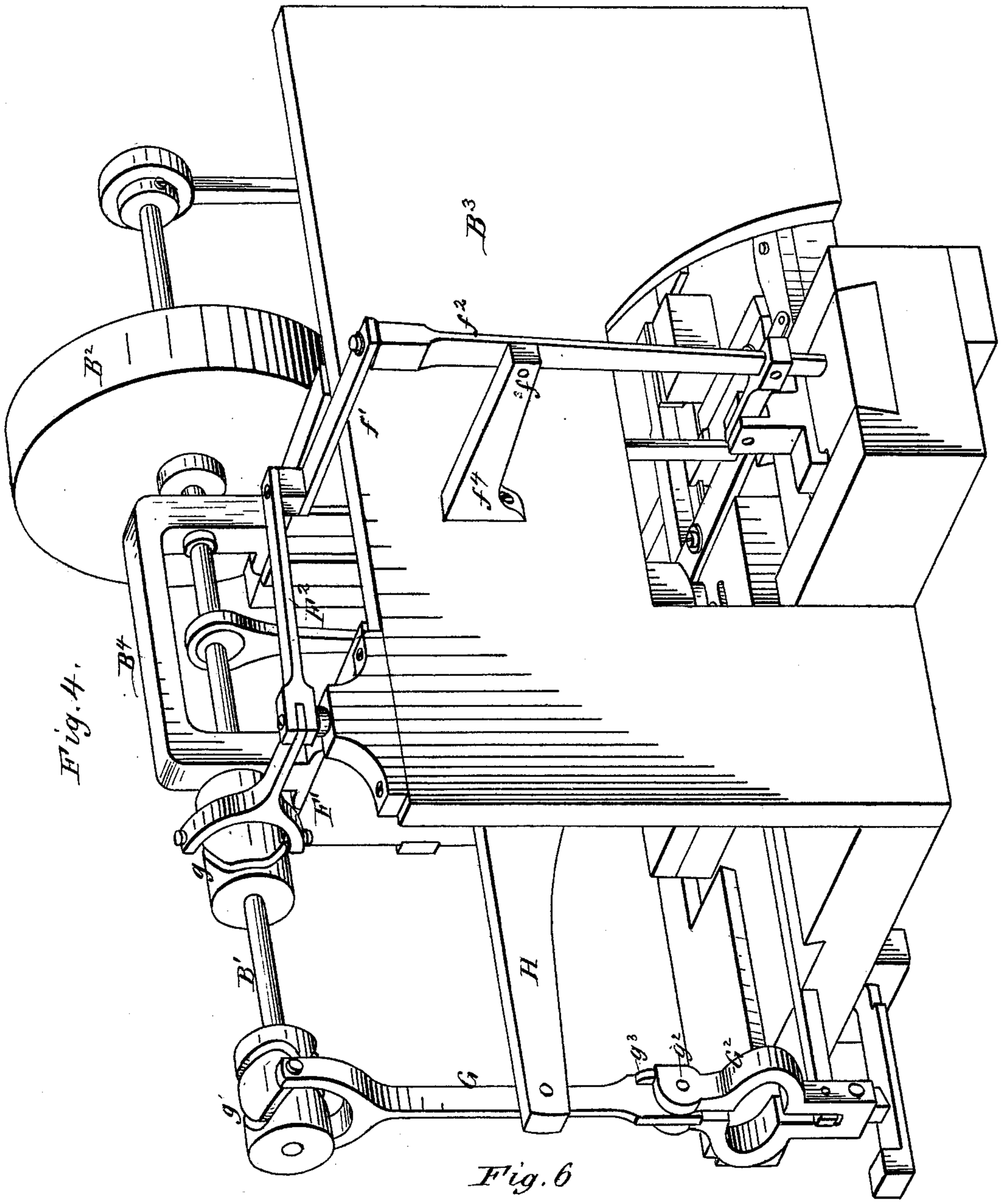
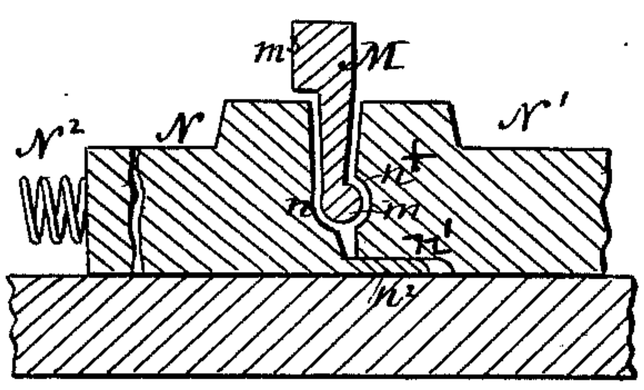


Fig. 4.

Fig. 6



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3 Sheets—Sheet 3.

L. A. SPRAGUE.

Machine for Making Buckle Levers.

No. 231,199. **Patented Aug. 17, 1880.**

Fig. 13.

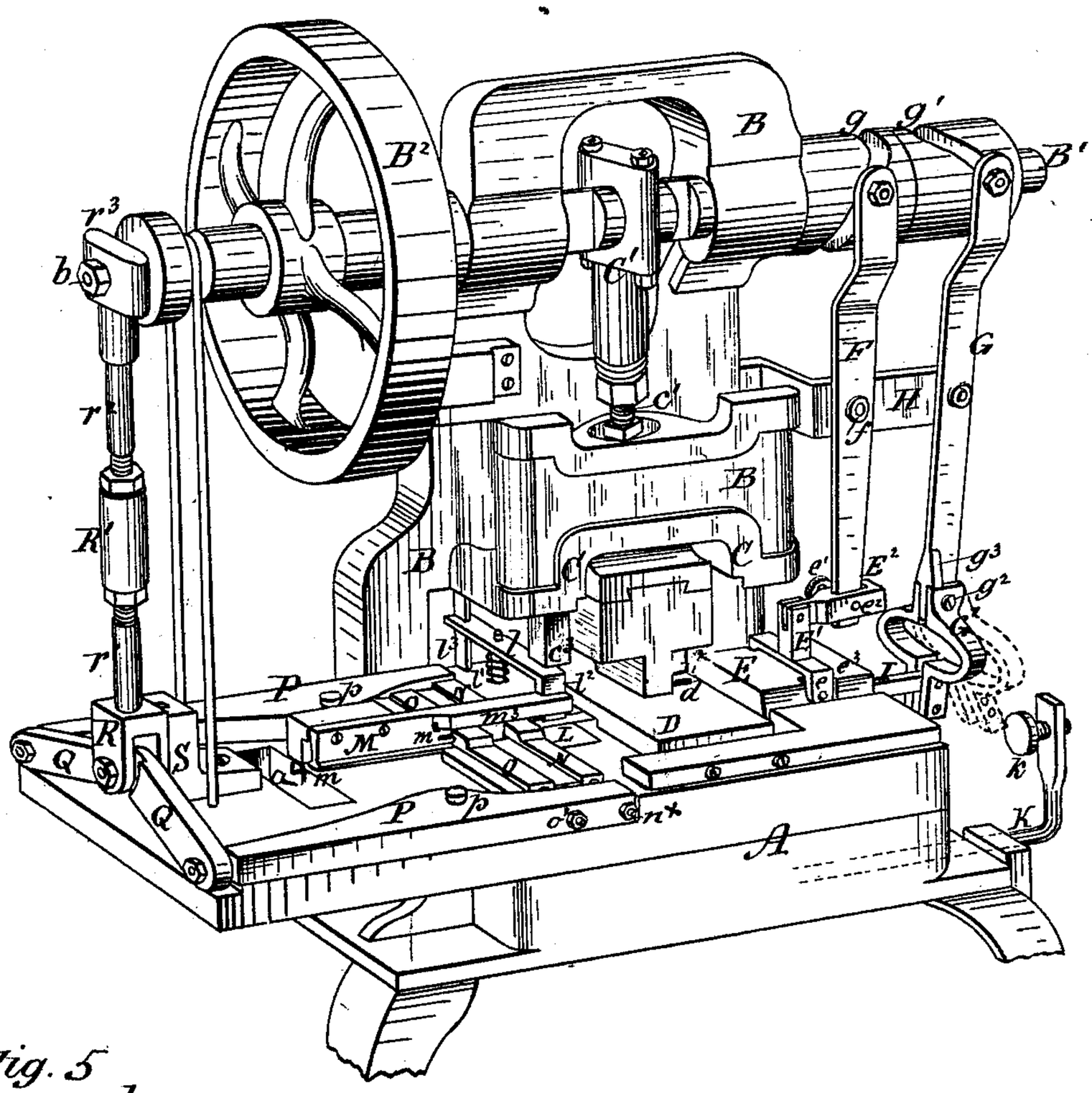

Fig. 5

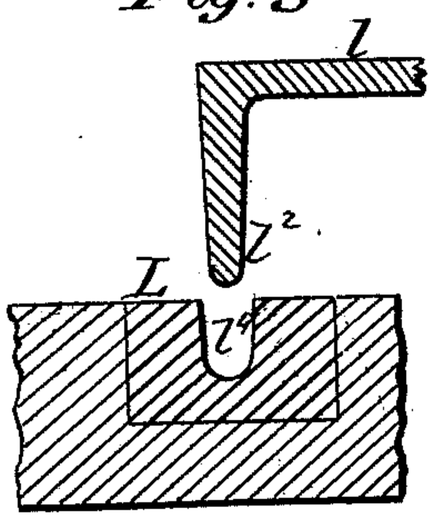

Fig. 7.

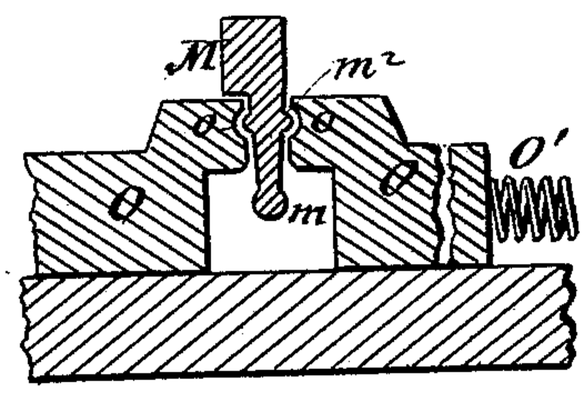

Fig 8

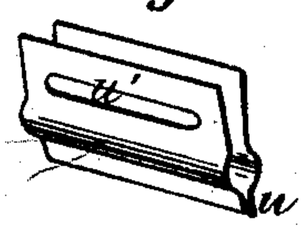

Fig. 9

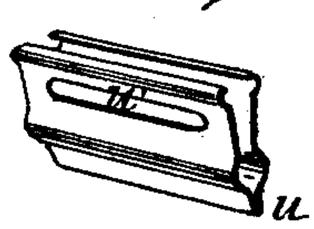

Fig. 15

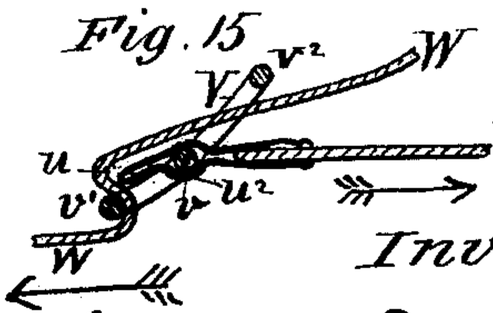

Fig. 14.

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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. 231,199, dated August 17, 1880.

Application filed December 2, 1878.

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 that the following is a full, clear, and exact description of the invention, which 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 plan view, partly in section, of a machine embodying my invention. Fig. 2 is a vertical longitudinal section. Fig. 3 is a vertical transverse section. Fig. 4 is a rear view of a machine embodying my invention. Fig. 5 is a detached view, enlarged, of the die and matrix which bend the blank into U shape. Fig. 6 is a transverse section, enlarged, of the die and mandrel which perform the next operation in the formation of the lever. Fig. 7 is a transverse section, enlarged, of the dies and mandrel which complete the formation of the lever. Fig. 8 is a perspective view of the lever after it has been acted upon by the dies shown in Fig. 6. Fig. 9 is a perspective view of the completed lever. Fig. 10 is a plan view of the matrix and dies accompanying stops and detent. Fig. 11 is a detached view of two of the dies and their actuating mechanism. Fig. 12 is a plan view of the mechanism for imparting motion to the devices which feed the strip of metal to the machine represented in Figs. 1, 2, and 3. Fig. 13 is a perspective view of a modification of the machine represented in Figs. 1, 2, 3, and 4, the modification consisting in arranging the feeding mechanism and punching-dies upon a line at right angles to the position in which they are shown in the other figures, whereby the machine is adapted to receive a ribbon of metal on a line parallel with the mandrel, a single lever being employed to transmit motion from the driving-shaft to the feeding mechanism. Fig. 14 is an end view of a buckle-lever made by my machine. Fig. 15 is an end view, partly in section, of a buckle having one of my improved levers applied thereto, and showing also straps connected by the buckle.

In the drawings, A represents the bed-piece 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 the driving-shaft, mounted in suitable bearings in the standard B. B^2 is the driving-wheel, connected with driving-shaft B′ by any suitable clutch mechanism. C is a die-stock or die-carrier, mounted in or upon the standard B in such 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 on shaft B′, the lower end of the link being adjustably connected with the die-stock by means of the screw *c′* (see Fig. 4) in such manner that the throw or travel of the die-stock may be regulated at will.

Attached to and moving with the die-stock are two dies, *c*, one of which is shown in Fig. 4, the position of both, however, being shown in dotted lines in Fig. 1, which figure represents the machine constructed to feed the ribbon of metal to the punch-dies at a line at right angles to the path of the blank after it has been punched from the ribbon, as and for a purpose set forth, which will be hereinafter explained. These two dies punch small holes or slots through opposite ends of the blanks, as will be readily understood from an examination of Fig. 1.

c^2 is a die, also attached to and moving with the die-stock C, for the purpose of striking the blank from the ribbon, the plate D being provided with two throats, *d*, corresponding in size and position to the two dies *c*, and with another throat corresponding to the die c^2, as will be readily understood from an examination of Figs. 1 and 4.

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 A. 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 easily between the clamp and the upper face of said block.

E^2 is an arm pivoted to the clamp E′, and adjustably connected with the lower end of the lever by means of a set-screw, *e′*, and pivot e^2.

I will now describe the mechanism employed for actuating the feeding-clamp.

Referring to Fig. 12, *g* is a cam-groove formed upon the outer circumference of a cam secured upon the driving-shaft B′.

F′ F² is a bell-crank lever, pivoted at its angle to any suitable support of 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 F² of the bell-crank lever with an upright lever, *f²*, which is pivoted at *f³* to a support, *f⁴*, which projects from the upright or standard B, the lower end of the vertical lever *f²* being connected with the arm E² by means of a set-screw or pivot, *e′*. 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. 13 the same feeding mechanism is employed, and is actuated by a modified construction and arrangement of levers, in which a lever, F, is pivoted at *f* to an arm, H, which projects from the standard B, the upper end of the lever taking into the cam-groove *g*.

The ears *e* are pivoted in recesses formed for their reception in the sides of block E in such relation to the walls of said recesses that as the clamp is thrust forward or toward the dies it (the clamp) is rocked forward 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 released the ears *e* engage with the rear walls of the slots *e³*, and thus 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 *g²* upon the lower end of the lever G². *g³* is a stop formed upon lever G near its lower end, against which stop 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 *g²* is a yielding frictional one, which permits a movement of the loop upon its pivot under certain circumstances, as will hereinafter be explained.

It will, of course, be understood that in the machine represented in Figs. 1, 2, and 3 there is an upright substantially like that represented by B in Fig. 13, with a driving-shaft, driving-wheel, and crank and pitman, (represented by B′, B², and C′ in Fig. 13,) this upright being represented by B⁴ in Fig. 13, the standard, shaft, and driving-wheel being left off from Figs. 1, 2, and 3, in order to show more clearly the position and relation of the punching and bending mechanism, the standard, shaft, and driving wheel or pulley being left off in Figs. 2 and 3, because they are not essential to the clear understanding of the parts more specifically shown and referred to in these figures. And it will be readily understood that the driving-shaft B′, cam-groove *g*, and the part B in Fig. 12 correspond to the similarly-lettered parts in Fig. 13, and occupy the same relation to the mechanism represented in Fig. 1.

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. 1 and 2.

K is a tripping-bar connected with mechanism for unclutching the wheel B² from 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.

l² is a folder projecting downward from the front end of a 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 *l²* is attached, the rear end of said bar being forked and engaging with and sliding upon an upright pivot, *l³*.

A pusher-pin, *c³*, projects downwardly from the die-carrier C and engages with the front end of the bar *l* in such manner as to thrust the folder *l²* down into the recess *l⁴* formed in the matrix L (see Fig. 5) at each downward movement of the die-carrier.

N N′ are dies sliding in suitable grooves or ways 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. 6—that is to say, they are grooved to correspond with the rib *m* at the lower edge of the mandrel M, (see Figs. 1 and 6,) the inner lower corner of the die N′ being recessed, as at *n′*, while the die N is provided with a wedge-shaped tongue, *n²*, which enters the recess *n′*. (See Fig. 6.)

m³ is a rib projecting from the upper part of the mandrel M. As represented in Fig. 6, the rib *m* at the lower edge of the mandrel M is circular in cross-section, and is arranged eccentrically to the vertical shank of the mandrel—that is to say, the rib *m* projects farther upon one side of the mandrel than it does upon the opposite side, and the groove *n* which is formed in the working-face of the die N′ is deeper than the corresponding groove *n*, 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 shaft B′, the forked end R 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 $n^{\times}$. (See Figs. 1 and 13.)

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.

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 *m*, these dies O O being connected by set-screws *o′ o′* in levers P, and also provided with spiral or other springs, O′, surrounding the set-screws between the levers P and the outer ends of the dies.

O^2 O^2 are T-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 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 blanks with a positive movement by the links O^2, but are held forward—that is, against the blanks—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 blanks to telescope or overlap each other as they push each other forward upon the mandrel.

a^2 a^2, Fig. 10, 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, and 3, the metal ribbon is passed under the clamp E′ of the feeding mechanism, thence under the dies *c c*, where it pauses, and during the backward movement of the feeding mechanism these dies punch two holes through the metal. The next forward movement of the feeding mechanism thrusts the ribbon underneath the die c^2, which punches the blank from the ribbon, and after the die c^2 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 punching-dies being so timed as to move the ribbon and the blank while the dies 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 former 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 end 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 former 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 indicated in Fig. 8, as will be readily understood by an examination of Fig. 6. The dies N N′ O O are advanced toward the core 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 $n^{\times}$ and *o′*.

In order to facilitate the forcing of the U-shaped blank upon the mandrel and between the dies N N′, it may be found desirable to bevel or chamfer slightly the corners of the ends of the 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 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, thus completing the formation of the lever, and each subsequent revolution of the shaft B repeats these operations, substantially

as described, and advances the completed levers 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, o, 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 blanks 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 blanks to be advanced upon the mandrel.

If, from any cause, the carrier fails to push the blanks upon the mandrel properly, or if any other irregularity in the movement of the blanks occurs in such manner as to interpose any unusual resistance to the forward movement of the carrier, the loop G' 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. 13, 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 an irregularity in its operation had occurred.

Referring to Fig. 6, it will be understood that the wedging-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. 13 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' and under the clamp E' of the feeding mechanism. By an examination of this Fig. 13, which is a modification of the machine represented in Figs. 1, 2, 3, 11, and 12, it will be seen that the position of the dies c and c^2 have 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 dies c c punch holes in the blank, and then the die 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 are passed. The skeleton passes over the mandrel M and down through the opening a^4 in the bed-plate.

It will be understood that the machines represented in Figs. 1, 2, 3, 4, and 12, and in Fig. 13, are alike in all substantial respects, except that in Figs. 1, 2, 3, 4, and 12 the ribbon or strip of metal is fed to the machine upon a line at right angles to the path of the carrier and the mandrel, whereas in Fig. 13, which represents a modification of the machine represented in Figs. 1, 2, 3, 11, and 12, the ribbon is fed in upon a line substantially parallel to the vertical plane of the mandrel.

By an examination of Figs. 6, 14, and 15 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. 15,) the side bars being tied together by two end bars, r' r^2, and a central bar, r, the lever being mounted upon the central bar, r, by means of the central groove or seat, w^2 w^3, the groove w^2 being of greater depth than the groove w^3 upon the opposite side of the lever, the lip or bit u of the lever being arranged upon a line not radial to the center of the groove or seat, but tangential thereto.

The object in forming the lever with the groove eccentric thereto—that is to say, with the groove w^2 deeper than the groove w^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. 15 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, r', thence around the end of the bit or lip of the lever, thence under the end bar, r^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 r being seated in the deep groove w^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. I have also found that by forming the lip or bit u of the lever upon a line tangential to the opening which receives the central bar, r, of the frame, I am enabled to gripe the strap W more firmly upon the bar r' than could be done were the lip u formed upon a line radial to the central bar, v.

Having thus described my invention, what I claim is—

1. In a machine for making buckle-levers, the combination of the mandrel M, provided

with the ribs m m^3 of the dies N N′ O O, and a support which presses the part u of the lever against the rib m, substantially as set forth.

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

3. In a machine for making buckle-levers, the combination, with the mandrel M, provided with the rib m, of the dies N N′ and a stop adapted to engage with the lower end of the lever and determine the length of the bit u, substantially as described.

4. In a machine for making buckle-levers, the combination, with the mandrel M, having rib m, of the dies N N′ and stops adapted to engage with both ends of the partially-formed lever, to regulate its position relative to the mandrel and dies, substantially as set forth.

5. The herein-described method of manufacturing buckle-levers—that is to say, by bending the blank into U shape, then forming the bit u and seats u^2 u^3, and subsequently forming the grooves u^4, substantially as herein set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

LEONARD A. SPRAGUE.

Witnesses:

H. H. DOUBLEDAY,

CHAS. T. DE FOREST.