(No Model.) 3 Sheets—Sheet 1.

L. P. GARCIN.

MACHINE FOR FORMING BULLETS.

No. 407,343. Patented July 23, 1889.

Fig. 2.

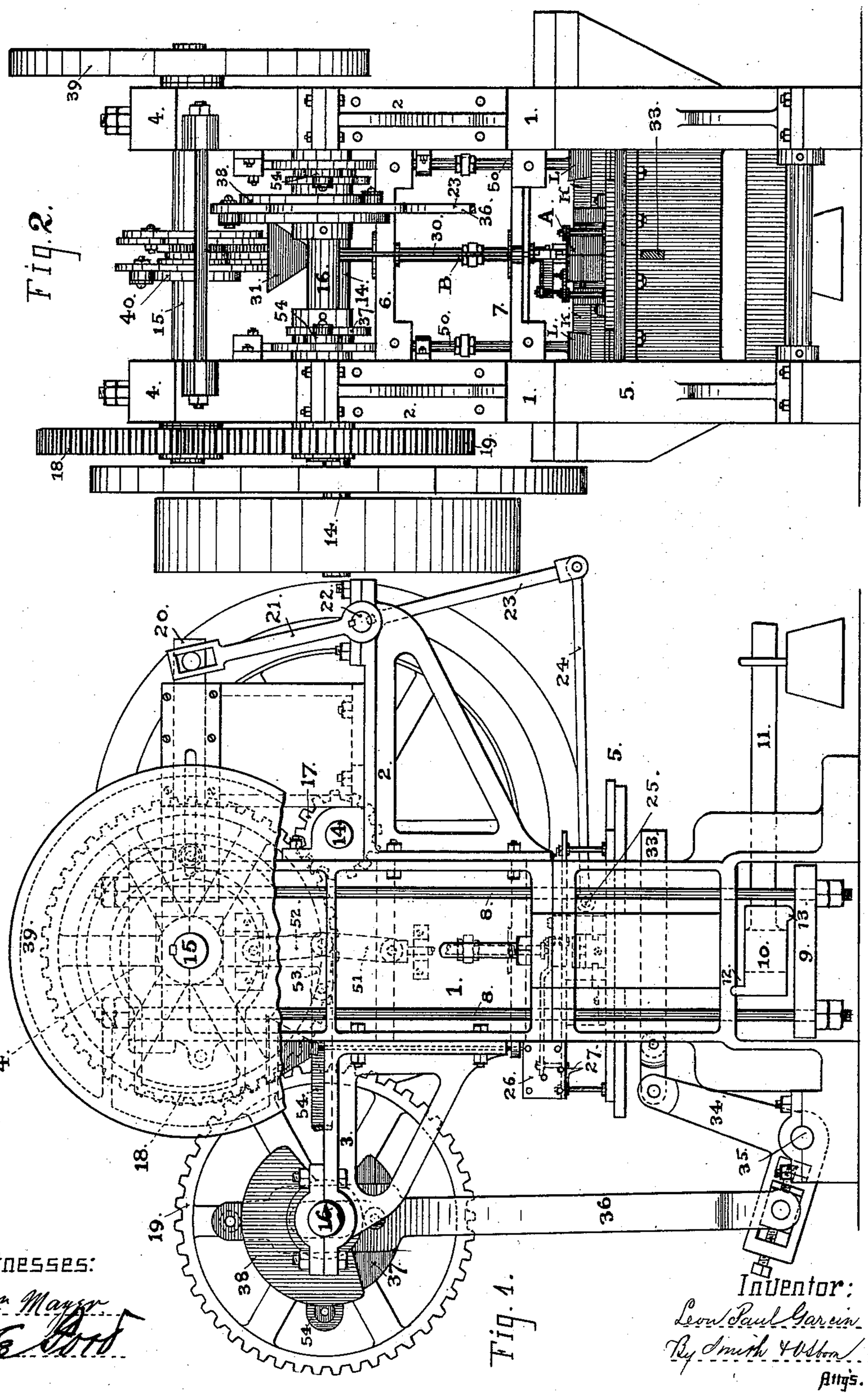

Fig. 1.

Witnesses:

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J. E. Ford

Inventor:

Leon Paul Garcin

By Smith & Olson

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Fig. 3.

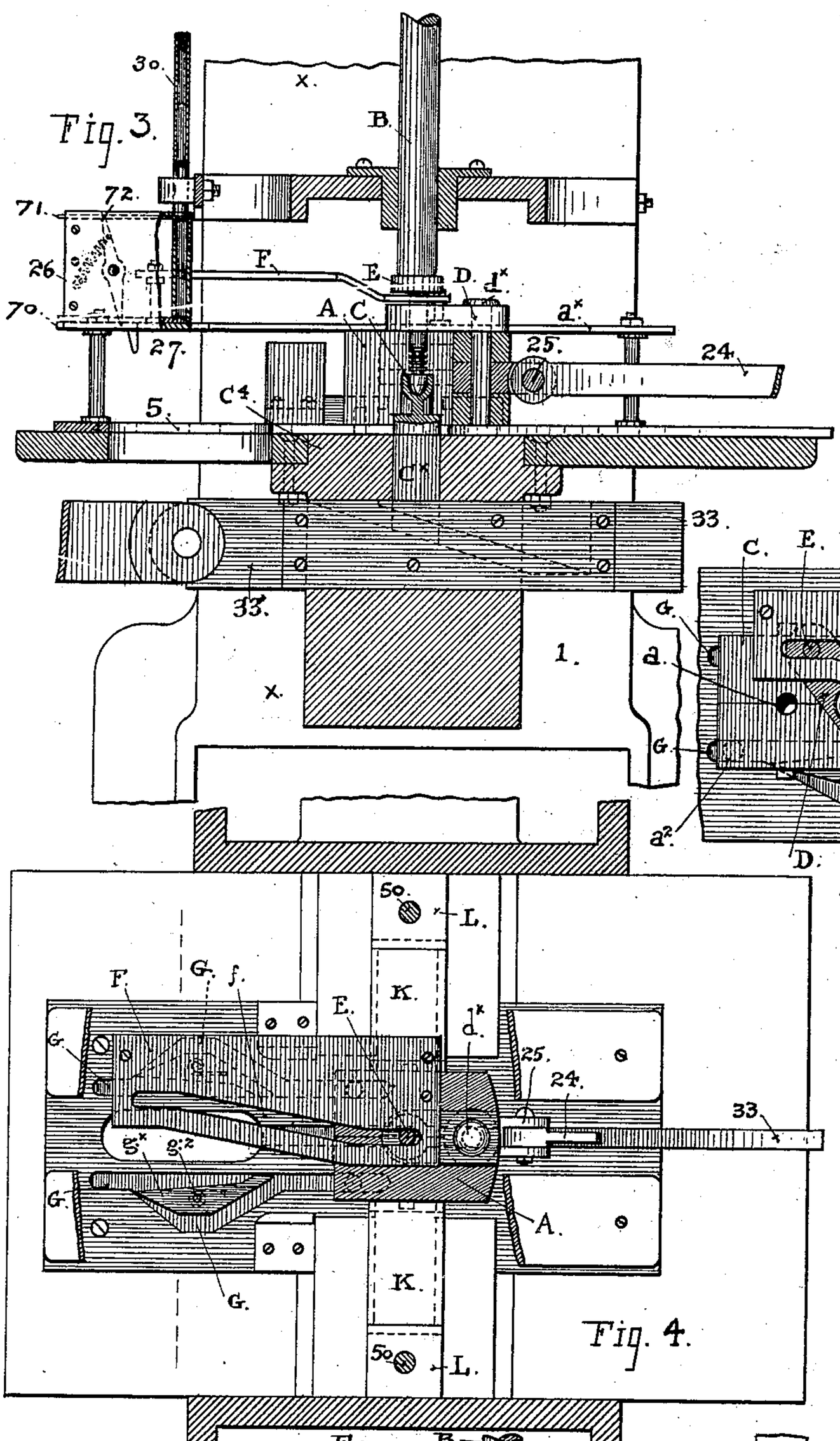


Fig. 6.

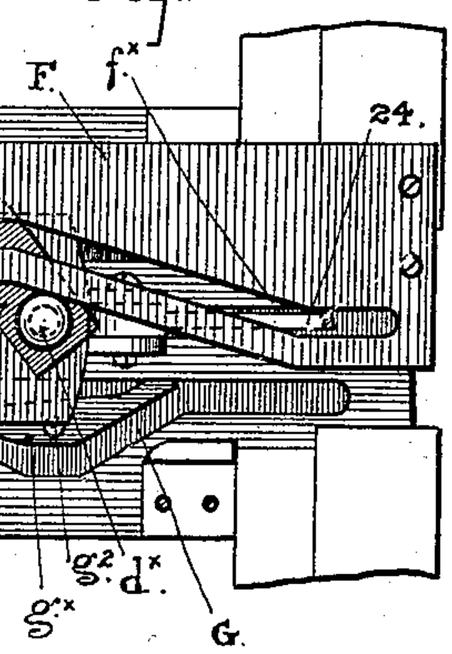
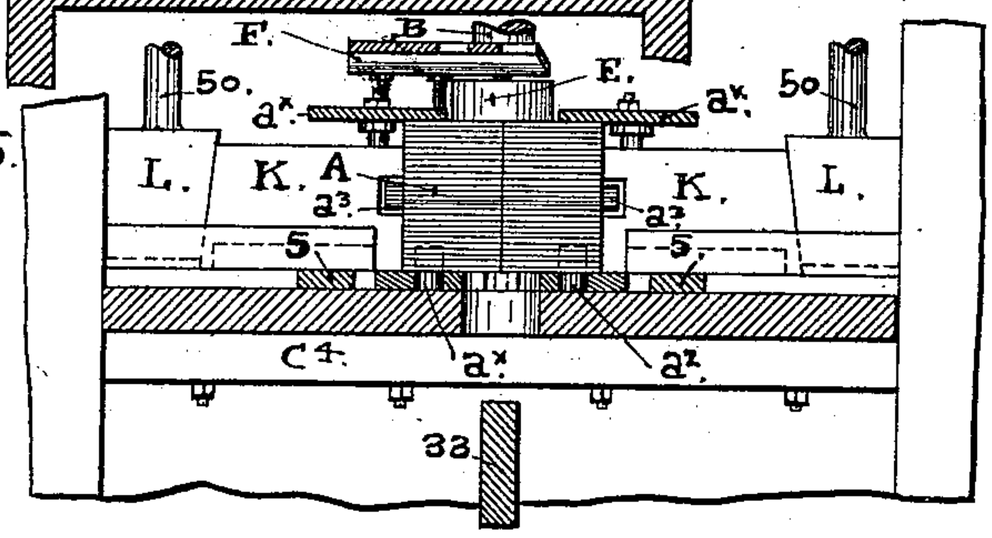


Fig. 4.

Fig. 5.



Witnesses:

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(No Model.) 3 Sheets—Sheet 3.

L. P. GARCIN.

MACHINE FOR FORMING BULLETS.

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Fig. 12

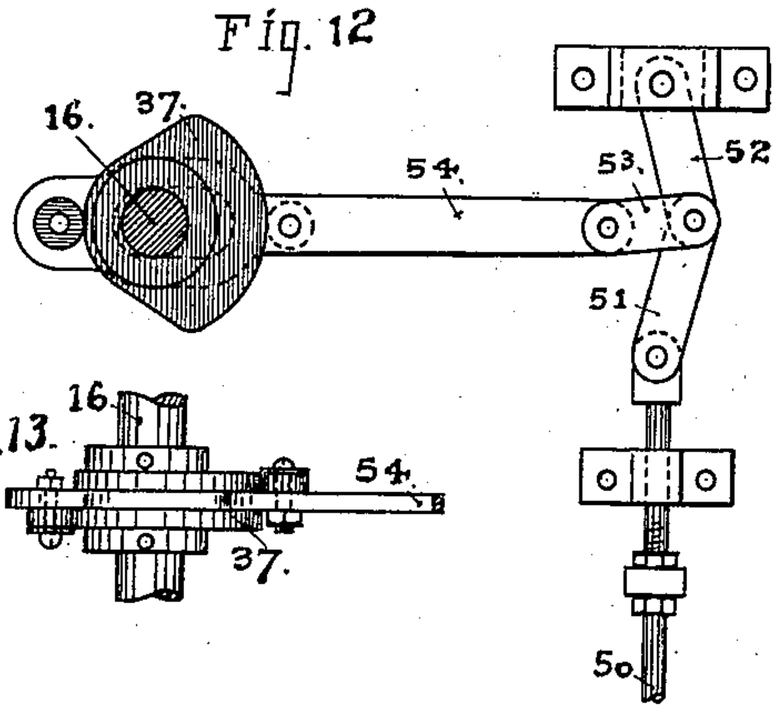

Fig. 13.

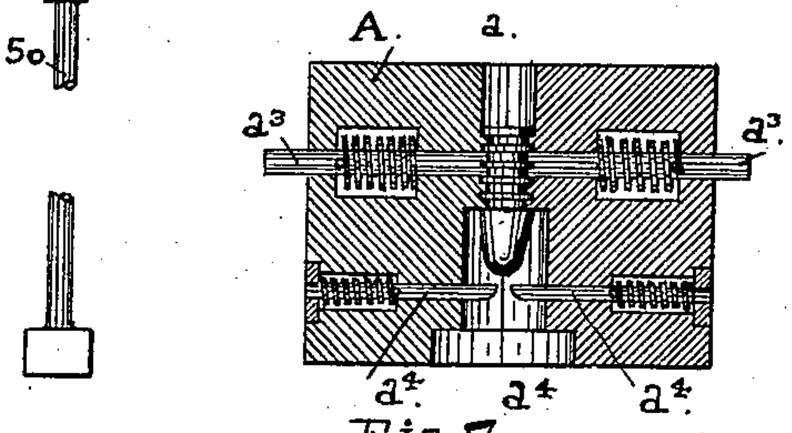

Fig. 7.

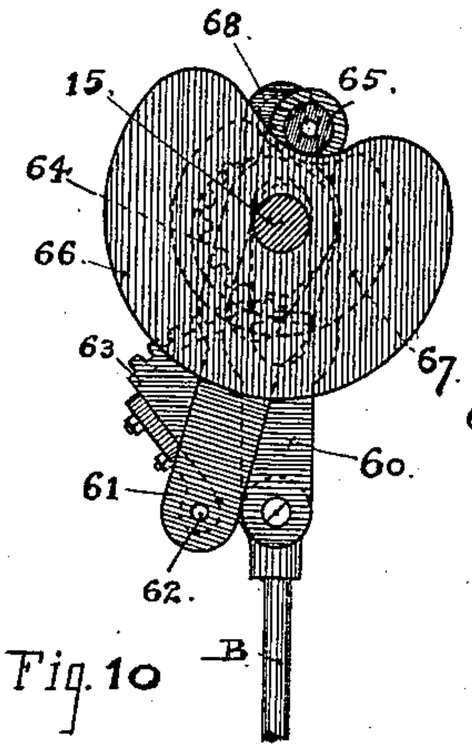

Fig. 10

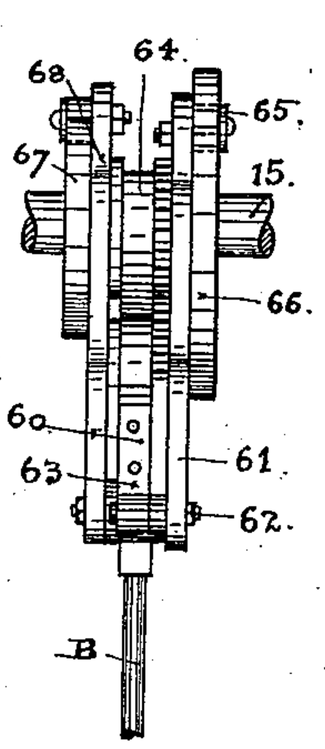

Fig. 11.

Fig. 9

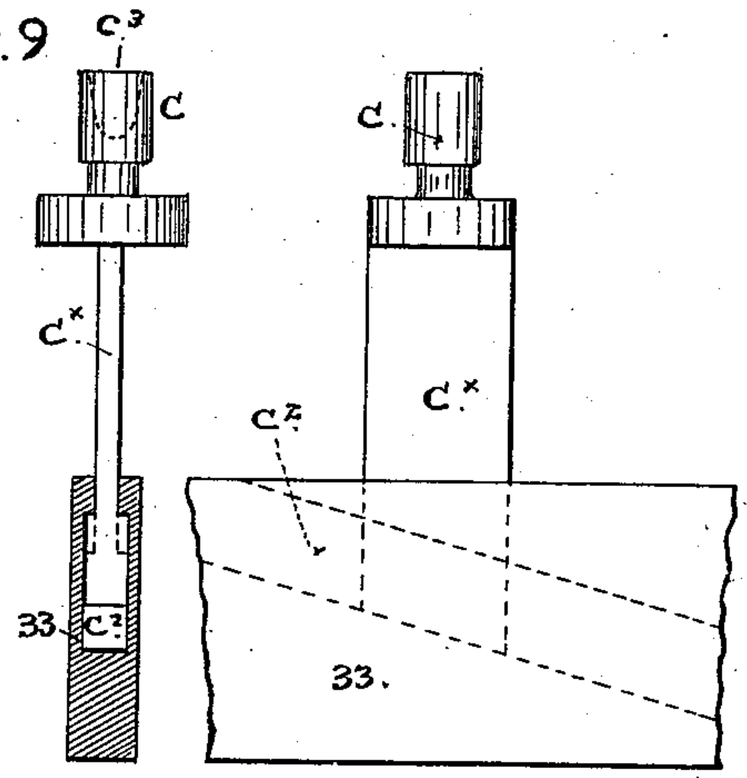

Fig. 8.

Witnesses:

Wm. Mayer

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UNITED STATES PATENT OFFICE.

LEON P. GARCIN, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR OF ONE-HALF TO JOHN LAFFERTY, OF SAME PLACE.

MACHINE FOR FORMING BULLETS.

SPECIFICATION forming part of Letters Patent No. 407,343, dated July 23, 1889.

Application filed February 5, 1889. Serial No. 298,754. (No model.)

To all whom it may concern:

Be it known that I, LEON PAUL GARCIN, a citizen of the United States, residing in the city and county of San Francisco, and State of California, have invented certain new and useful Improvements in Bullet-Machines, of which the following is a specification.

My invention relates to machines that turn out finished bullets from blanks or cylinders of metal in a cold state by means of pressure in a mold or hollow die; and my improvements in such machines consist in certain construction of three-part mold and operating mechanism, in blank-feeding devices, in plunger-operating mechanism, and, generally, in the production of a machine having several novel points and features over machines of the kind heretofore constructed, as hereinafter fully set forth.

I construct and apply my several improvements and produce a machine for turning out finished bullets from cold blanks by means of the mechanism illustrated in the accompanying drawings, that form part of this specification, the same being referred to from time to time in the description by figures and letters to render the explanation more clear.

Figure 1 represents a side elevation of my improved machine. Fig. 2 is a view of the machine, taken from the left-hand side of Fig. 1. Fig. 3 is a longitudinal section taken in a vertical plane through the center of the mold and the parts adjacent to it. Fig. 4 is a top view of the mold and the parts that operate to open and close it. Fig. 5 is a cross-section through the view Fig. 4 at the line *x x*, looking toward the end of the mold. Fig. 6 is a top view of the mold, showing it in position ready to receive a bullet-blank. These views are given on a scale of double that employed in the views Figs. 1 and 2. Fig. 7 is a vertical cross-section through the mold; and Figs. 8 and 9 are side view and front view, respectively, of the cup-shaped bottom part of the mold and the reciprocating bar that moves it. Figs. 10 and 11 show the plunger-operating mechanism in detail, and Figs. 12 and 13 are similar views of the mechanism for operating the wedges that hold the hinged sections of the mold together while the bullet is being pressed into shape. These views from Fig. 3 to Fig. 13, inclusive, are given on a larger scale.

The side frames 1 1 of the machine have boxes for the shafts 14 15 16, of which the first-mentioned one is the main or driving shaft, and is furnished with a fly-wheel and a pulley to take a belt from a power-shaft, and the second or highest shaft of the set operates the plunger that gives pressure to form the blank confined in the mold. These two shafts are connected by spur-gears 17 18. The third shaft 16 is driven from shaft 15 by a spur-gear 19, and by its rotation actuates two cams 37 38, the former working two vertically-moving wedge-blocks, by which the hinged sections of the mold are held together at suitable times, and the latter 38 operating a horizontally-acting slide-plate 33, Figs. 3 and 4, that raises the bottom section of the mold into place and draws it down again after the bullet is formed and is ready to be discharged from the mold. These three shafts give motion to all the moving parts, and the top one 15, in addition to its function as the motor of the plunger, operates upon the mold to move it back and forth intermittently upon the horizontal bed or way 5, Fig. 1, and under the blank-feeding apparatus and the plunger or presser B in successive order. By these movements the mold is thrown forward under the spout that carries down the blanks from a hopper above, and after receiving the blank it is drawn back under the pressing mechanism, where the blank is finally shaped. A cam of suitable shape fast on the shaft 15 moves the sliding mold through the medium of the slide 20, arm 21, rock-shaft 22, that is mounted in boxes on the outer ends of the brackets 2, and the arm 23 and connecting-rod 24, Fig. 1, this last-mentioned part being attached at 25, Figs. 1 and 4, to the mold by a hinge-joint.

The body of the mold A is made in two parts, separable on a center line, and hinged together at $d^{\times}$, Figs. 3 and 4, to swing open on this point for throwing out the finished bullet. The cavity *a*, Fig. 6, has the form of the body of the bullet at the upper part of the mold, but about midway in the depth thereof the cavity is enlarged to take in the removable bottom piece C, Fig. 3, in which a cup-shaped

cavity c^3 completes the mold when this part C is in place and shapes the conical point of the bullet. This bottom piece has vertical movement only; but the body of the mold has movement upon the bed horizontally in a longitudinal direction between the two points, where the blank is dropped into it and where the pressure is applied, and in consequence of these different movements it is necessary to draw down the bottom piece clear of the mold after the bullet is finished and before the mold begins to slide forward toward the feed-hopper. The part C is mounted on the end of an upright bar $C^\times$, Fig. 3, that works through an opening in a solid bed-block C^4, and in a slot extending longitudinally through this block at right angle to the upright bar is the slide 33. This part 33 is grooved inside and slotted along the top for the bar $C^\times$ to work in, the slot having suitable inclination to give the bar a length of movement that will bring the piece C down below the bottom of the mold. The front end of the slide is jointed to the upper end of a rocking arm 34 on the shaft 35, and the throw of this arm is given by the upright bar 36 and the cam 38 on shaft 16. The shape of this cam and the general connection of parts are shown in Fig. 1 of the drawings.

The mold A travels between the top plates or rails $a^\times$, Fig. 3, and the bed-plate 5, and its length of movement is from the center of the bed under the plunger to a point forward directly beneath the upright feed-tube 30, leading from the bottom of the hopper 31, Fig. 2. At this point the blanks, in the form of metal cylinders somewhat longer than the finished bullet and of smaller diameter also, are dropped into the mold one at a time as it is moved forward into place; but during this movement the mold is opened to eject the finished bullet, and then closed together before the blank is dropped into it.

An opening in the bed-plate under the mold allows the bullets to drop from the machine clear of the moving parts, and on either side of this opening there are grooves G G, Fig. 6, in the bed-plate, into which two studs a^2 a^2, Fig. 5, on the bottom of the mold-sections have a working fit and play as the mold travels forward and back. The grooves have straight and parallel portions that act to close the two sections together, and laterally-divergent portions that throw the sections of the mold apart, and then bring them together during the forward movement or in the travel from the center of the bed-plate forward to the blank-feeding mechanism. In the backward run of the mold, however, the blank is in place and the two sections are kept closed, or the blank would drop out of the cavity. This position of the two mold-sections is secured by loosely-pivoted switch-plates $g^\times$, Fig. 6, that form the inner sides of the divergent portions of the grooves G and divide them from the straight portions in such manner that in the forward run of the mold the studs a^2 pass on the outside of the switch-plates and follow in the diverging parts of the grooves, but in the backward movement to bring the mold under the plunger they are directed by the switch-plates along the straight portions of the grooves and hold the two parts of the mold together.

The switch-plates are held in position by spiral springs applied at the pivots g^2, which throw out the rear point of the plate across the straight portion of the groove, as shown in Figs. 4 and 6, to direct the stud on the mold-section into the diverging portion of the groove; but in the return movement the stud readily passes along inside the switch and depresses the point of this part. By means of this mechanism the two parts of the mold are opened in the run forward to discharge the finished bullet, and are closed again before the next blank is fed in, and are kept closed during the movement back to the plunger, by which pressure is applied upon the end of the blank.

The bullet-blanks are fed from the end of the tube 30 by two slide-gates 70 71, Fig. 3, in the box 26, the bottom one of which is kept closed by the pivoted finger 72 and the spring 73 inside the box, while the top one 71, working in the contrary direction, stands open when the bottom one 70 is shut, and is closed by the movement of this one 70 backward. The two slides are arranged in this manner to feed down one blank at a time and as often as the mold runs forward into position under the end of the feed-tube. In the forward run the bottom gate is thrown away from the end of the feed-aperture by the mold striking and pressing back the tappet 27, Fig. 3, that depends from the bottom of the gate 70, and by this movement the pivoted piece 72, connecting the two gates, operates to close the upper gate while the blank is being discharged from the feed-aperture into the mold.

The plunger-rod B gives pressure to condense and shape the blank in the mold; but instead of bearing directly upon the blank this part B acts upon the head of a pin or short plunger E, Fig. 3, that is aligned with the mold-cavity and the plunger-rod, and is arranged to fit into the top a of the cavity and receive the pressing force on its head when the mold is run back to the center of the machine. In charging the mold it becomes necessary to take this part E out of the way, and at such time when the mold is run forward under the feed-tube the part E is thrown to one side by the operation of the following mechanism: The pin E is furnished with a head of larger diameter than its body, to ride on a slotted plate F, Figs. 3, 4, 5, and 6, fixed in stationary position over the path of the mold, and having a slot f, Fig. 4, of equal length to the run of the mold. This slot has a vertically-inclined portion corresponding in height to the amount of vertical movement required to raise the end of the pin out of the mold-cavity, and also a lateral or angular di-

vergence in the horizontal direction, the extent of which is equal to the lateral movement of the pin to throw it from between the mold-cavity and the line of the feed-tube. The body of the pin E works at all times through this slotted plate F, and its end is set through and is carried by a swinging guide-plate D, Figs. 3 and 6, pivoted at $d^{\times}$ to the top of the mold and moving freely on this point as a center. This part D operates to bring the point of the pin E into accurate line with the mold-cavity and to secure a true vertical position of the pin under the plunger B.

Figs. 4 and 6 of the drawings illustrate the two positions of the pin and its guide-plate—first when the mold is under the plunger, and next when the mold is run forward under the feed-tube. In the first-mentioned position the blank receives pressure to compress the metal into the shape of the mold, and at this part of the operation the hinged sections of the mold are held firmly together by the laterally-movable blocks K and the locking-wedges L, Fig. 4, that are set between the blocks and the sides of the frame. The wedges are secured to the ends of vertical rods 50, and are operated by the mechanism illustrated in Figs. 12 and 13, where the cam 37, fast on shaft 16, moves the rod 54, which is connected by the link 53 to the toggle-levers 51 52. This construction is the same for both sides, and the two wedges are operated simultaneously to move the blocks K up against the mold and hold them firmly while the bullet is being pressed.

The plunger B is operated from the shaft 15 by means of a knuckle-joint or an arrangement of segment-cams. The mechanism illustrated in Figs. 10 and 11 of the drawings is employed by me for this purpose, and is recommended as giving the required pressure with small amount of friction. In this construction the face-cam 64, carried by the shaft 15, bears on the face of the segment-cam 60, and the two are geared together during working contact by a spur-gear fast on the shaft at one side of the cam 60 and a segment-gear 63 upon the segment-cam, the teeth of these two parts having suitable amount of projection beyond the working-faces of the cams to mesh together, and thus insure positive movement of the cam 60 during working contact with the other part that gives pressure. By this means the rod B is moved vertically downward against the head of the pin E. At the end of this movement, however, the segment 60 is thrown beyond the cam on the shaft, and is then brought to the front again, or on the opposite side of the center, to meet the cam 64, and come again into gear by the operation of a cam 66 and the link 61, pivoted at 62 to the back of the segment. The position of this point of attachment 62 on the back of the segment is beyond the center of oscillation that is situated at *b*, in consequence of which the cam 66, turning with the shaft, draws upward on the link 61 and throws the segment 60 over the center again beneath the cam 64 and into position to engage this cam and its spur-gear portion as they come around into place. The small cam 67 on the other side acts to raise the plunger after the downward stroke, and at the proper time in its revolution it does this by acting on the link 68, that is attached to the plunger-rod at *b*, where the segment 60 is connected to the rod B. By this construction I obtain a smooth rolling contact without slip, and thereby avoid excessive friction between the cams.

To relieve the plunger-rod and mechanism from undue strain—such, for instance, as might arise from the accidental introduction of any substance under the plunger or an excess of material in the mold—I mount the shaft 15 in yielding boxes 4 4, Fig. 2, and connect the boxes by long rods 8 8, Fig. 1, with the plates 9 9 beneath the side frames of the machine, between which and the plates 9 are inserted fulcrum-blocks 10, having ribs or projections 12 and 13 at the ends, those 12 at the top and front end and the others 13 at the opposite and bottom end, and both set in grooves provided for them in the parts against which they bear. The two blocks 10 are fixed on the outer ends of a cross-bar extending under the bottom of the frame, from the middle of which bar is carried a lever 11 to take on its outer end beyond the frames a weight, as shown in Fig. 1. By changing the size of this weight or its position on the lever it will be seen that the shaft-boxes are held down with corresponding force, that must be overcome by a greater upward thrust of the shaft 15 before the boxes will yield; but when this pressure received by the shaft is at any time in excess of the given weight at the end of the lever the boxes will yield and relieve the mechanism.

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

1. In a machine for pressing bullets from blanks, the combination of the following parts or elements: a hinged mold having horizontal reciprocating movement between a vertically-acting presser-rod and blank-feeding devices, means by which said mold in its forward run or toward the blank-feeding device is opened to discharge the finished bullet, and then closed to receive a blank at the end of such run, and is held closed on the return to place beneath the presser-rod during the pressing operation, a vertically-acting presser-pin placed for operation beneath the presser-rod and mounted in a swinging centering-plate having lateral movement to set the pin in line and to throw it clear of the mold-aperture while the blank is being fed, and a vertically-acting presser-rod adapted to apply pressure upon the head of the pin, constructed for operation as set forth.

2. In a machine for pressing bullets from blanks, the combination, with the horizontally-reciprocating mold divided longitudi-

nally and opening laterally to discharge the finished bullet, of the laterally-sliding blocks K K, the vertically-movable wedges L L, and mechanism whereby said wedges are operated, as described, to lock the blocks and hold the mold-sections together on the downward movement of the presser-rod while the blank is being pressed, substantially as set forth.

3. In combination with the horizontally-reciprocating mold and vertically-acting presser-rod, the presser-pin adapted to enter the mold-aperture upon the blank held therein, the pivoted plate carrying the end of said pin, and the slotted incline upon which the head of the pin is arranged to travel, as a means of moving said swinging plate laterally to carry the pin into and out of line with the mold-aperture and of moving it also in a vertical direction, substantially as set forth.

4. In combination with the horizontally-reciprocating mold-sections A A, separable on a longitudinal line for lateral movement, the stationary bed-plate having grooves G G, with parallel and divergent portions, and the switch-tongues $g^{\times}$ and studs a^2 on the mold-sections, substantially as set forth.

5. In a machine for pressing bullets from blanks, the combination of the divided mold-sections A, movable laterally to open and discharge the finished bullet, and the vertically-movable bottom section C, suitably shaped to form the end of the bullet and adapted to close the bottom of the mold-cavity during the operation of the presser, but to withdraw and clear the mold before the sections open, substantially as set forth.

6. In combination with the horizontally-reciprocating mold-sections A A, separable laterally, as described, the vertically-movable bottom piece C, mounted on the upright bar $C^{\times}$, and the horizontally-sliding plate 33, having the inclined slot C^2, in which the end of the bar 33 is fitted, substantially as described, for operation as set forth.

7. In a machine for pressing bullets from blanks, the combination, with a sliding mold having movement between a blank-feeding device and a pressing mechanism, of the blank-feeding tube, sliding gates adapted to operate alternately, the pivoted tongue or finger, and the lug on the lower slide-gate, projecting in the path of the mold in position to be struck and moved by it at the end of the travel, substantially as described.

8. In a machine for pressing bullets from blanks, the combination, with the rod by which pressure is applied to the confined blank, of the rotating shaft 15, cams 60 64, segment-gears 63, link 61, and cam 66, applied for operation as set forth.

9. In a machine for pressing bullets from blanks, the combination, with the rod by which pressure is applied to the confined blank, of the rotating shaft 15, cams 60 64 66, segment-gears 63, and links 61 68, applied for operation as set forth.

10. In combination with the divided mold consisting of the laterally-opening sections A A and the removable bottom section C, from which the sections A A are separated during their reciprocating movement, as described, the stop-pins a^4 a^4, applied for operation as set forth, to support the blank in the mold.

In testimony that I claim the foregoing I have hereunto set my hand and seal.

LEON P. GARCIN. [L. S.]

Witnesses:

C. W. M. SMITH,

CHAS. E. KELLY.