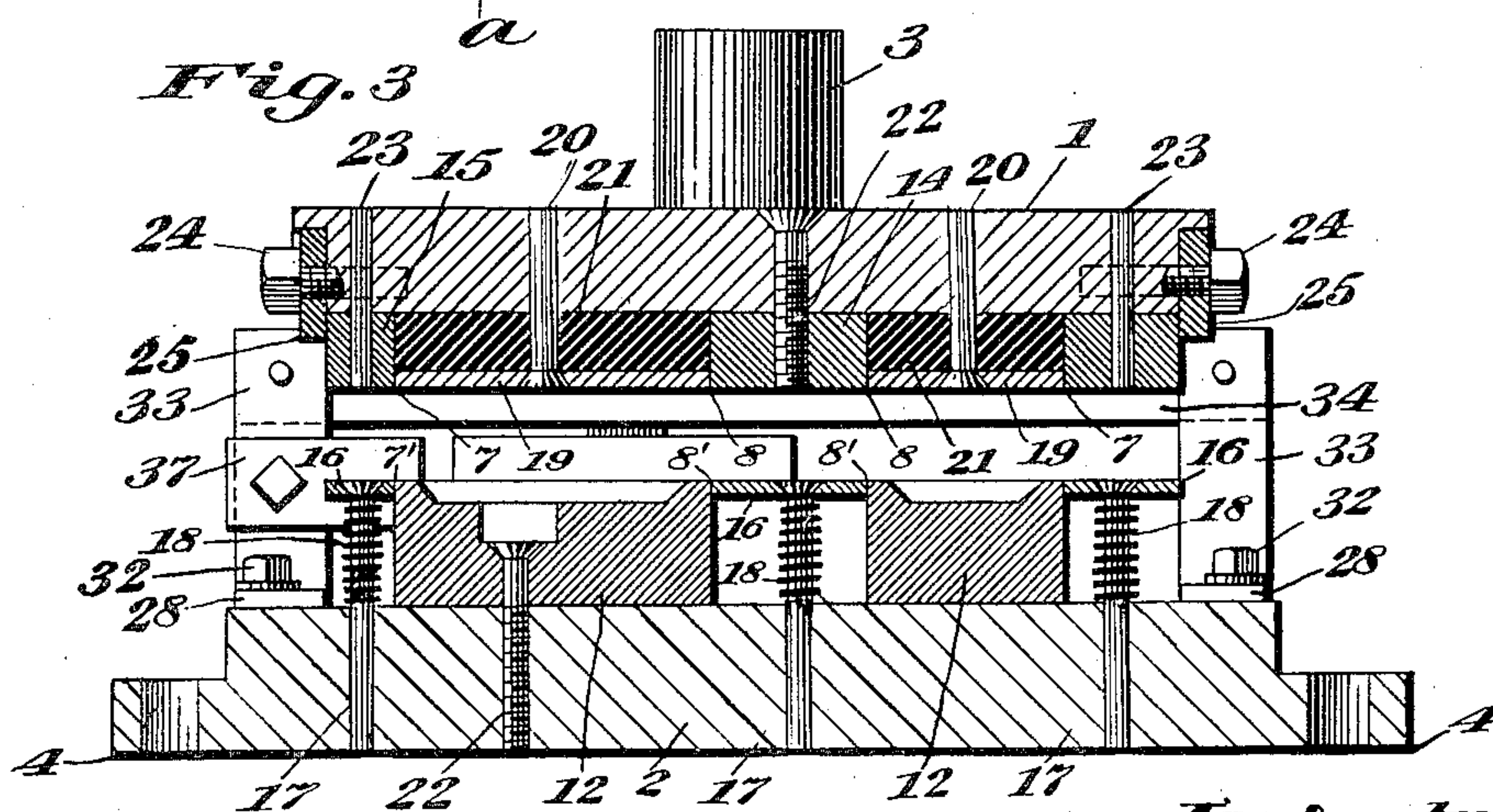
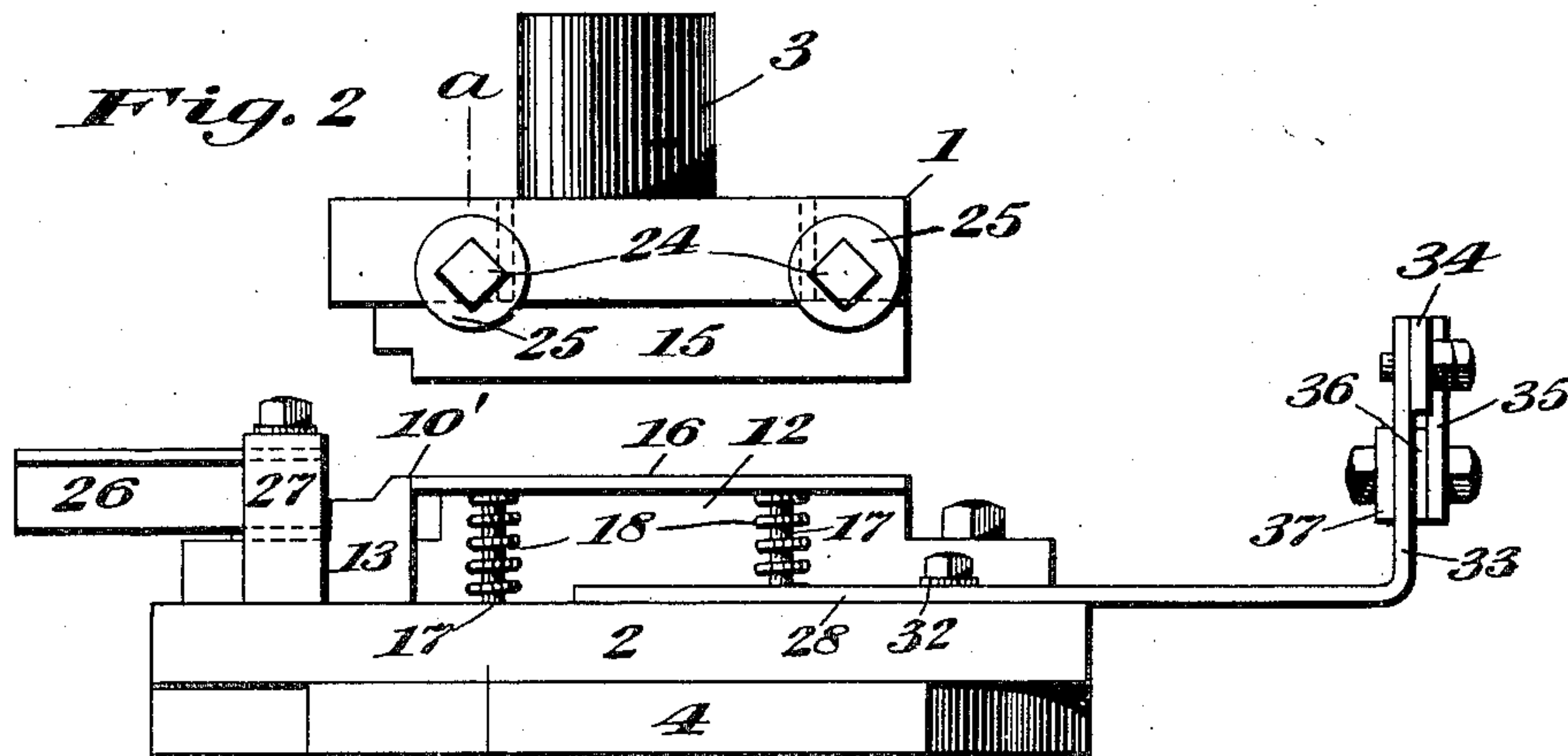
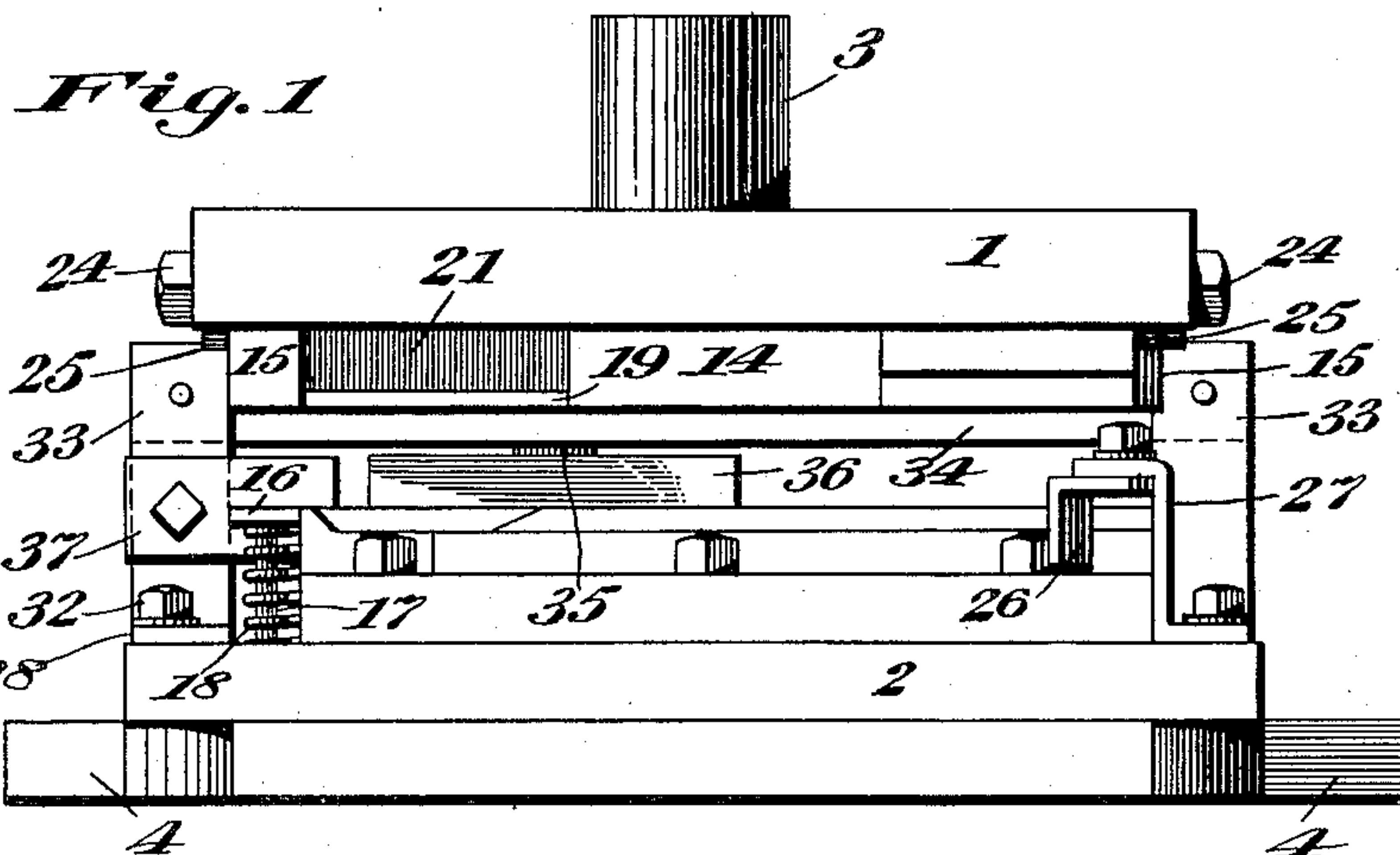


P. A. LORENZ.  
CUTTING DIE.

APPLICATION FILED JUNE 30, 1903.

3 SHEETS—SHEET 1.



Witnesses  
*J. B. Chaplin*  
*J. B. Chamberlain*

By

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No. 828,225.

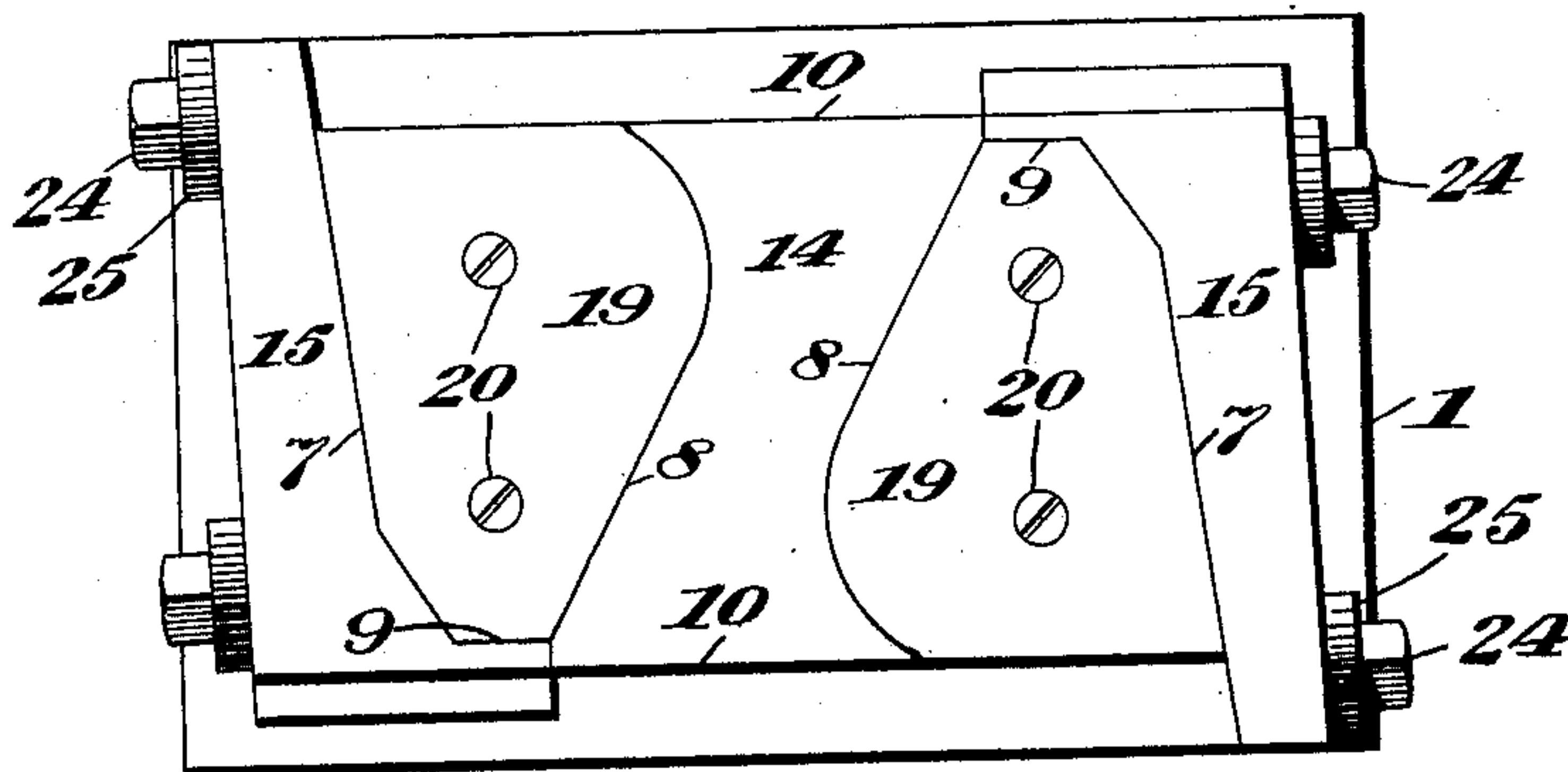
PATENTED AUG. 7, 1906.

P. A. LORENZ.  
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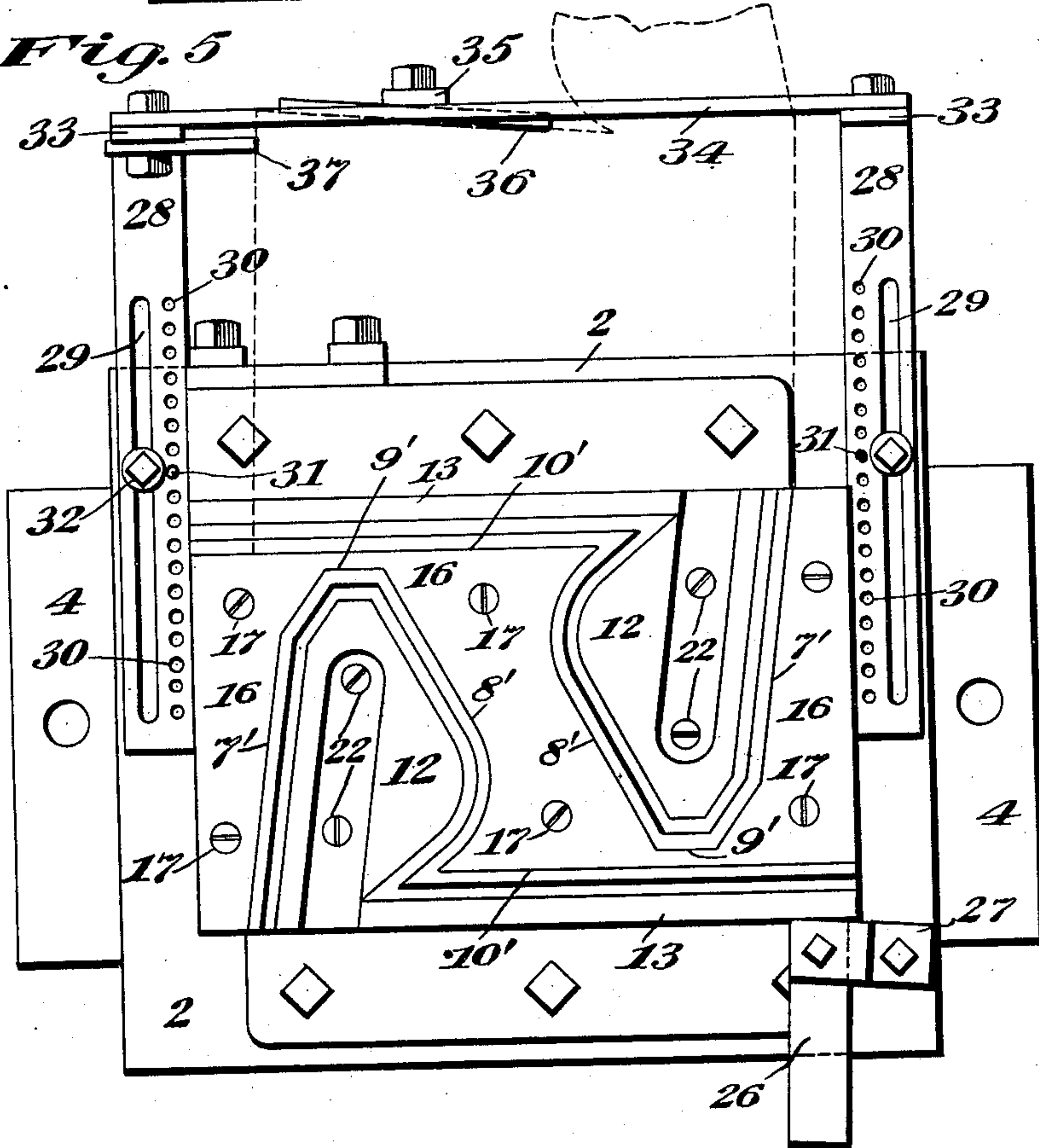
APPLICATION FILED JUNE 30, 1903.

3 SHEETS—SHEET 2.

*Fig. 4*



*Fig. 5*



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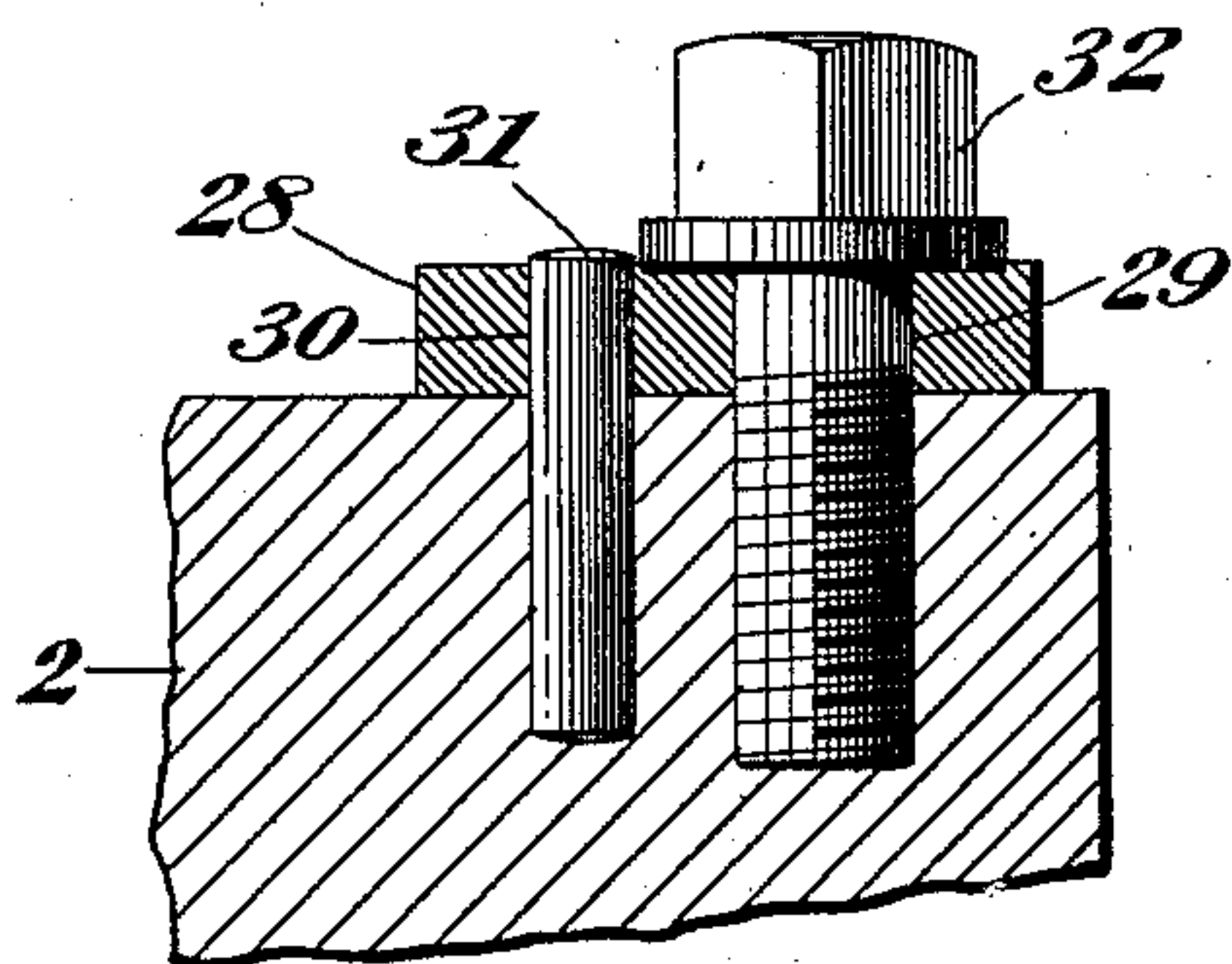
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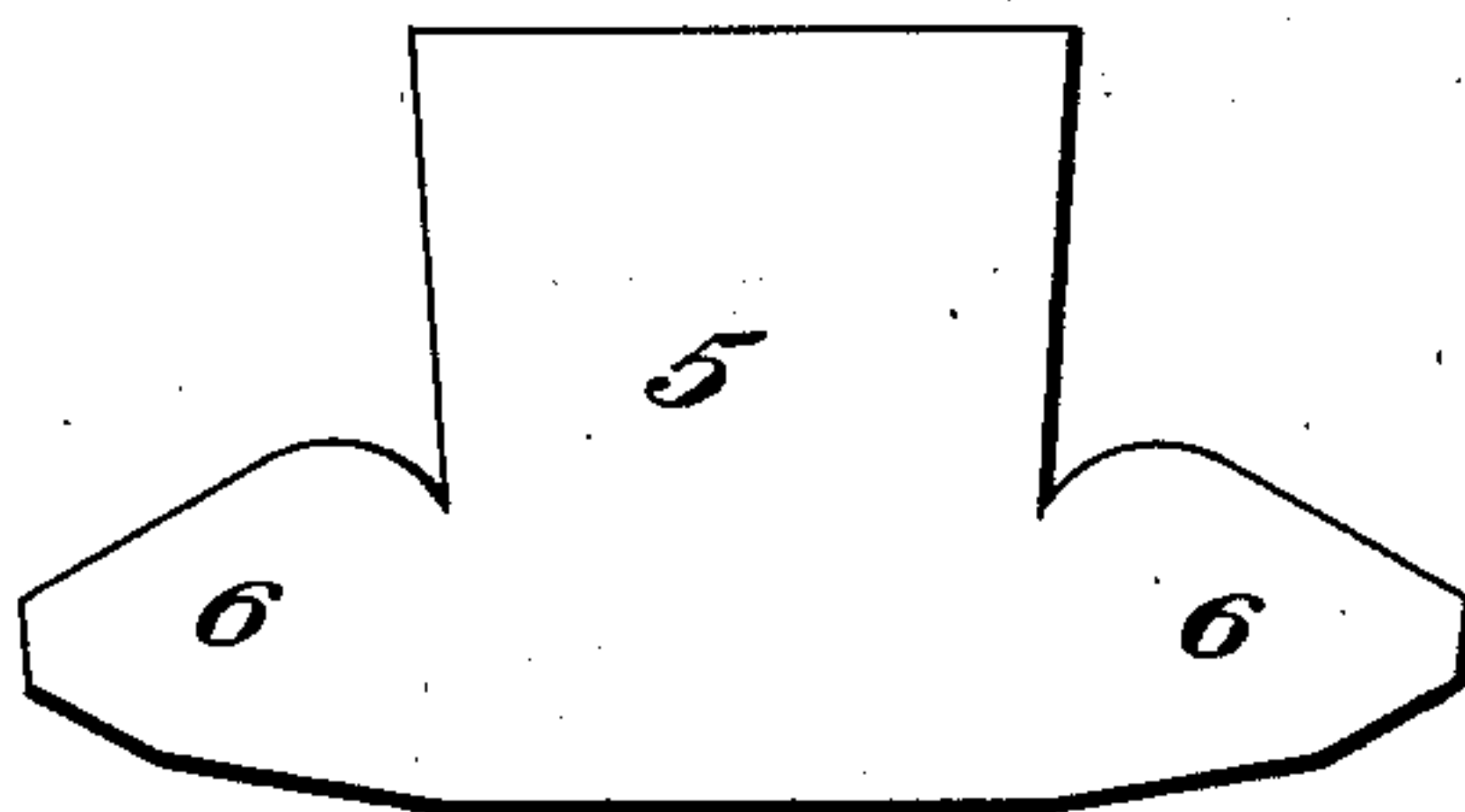
APPLICATION FILED JUNE 30, 1903.

3 SHEETS—SHEET 3.

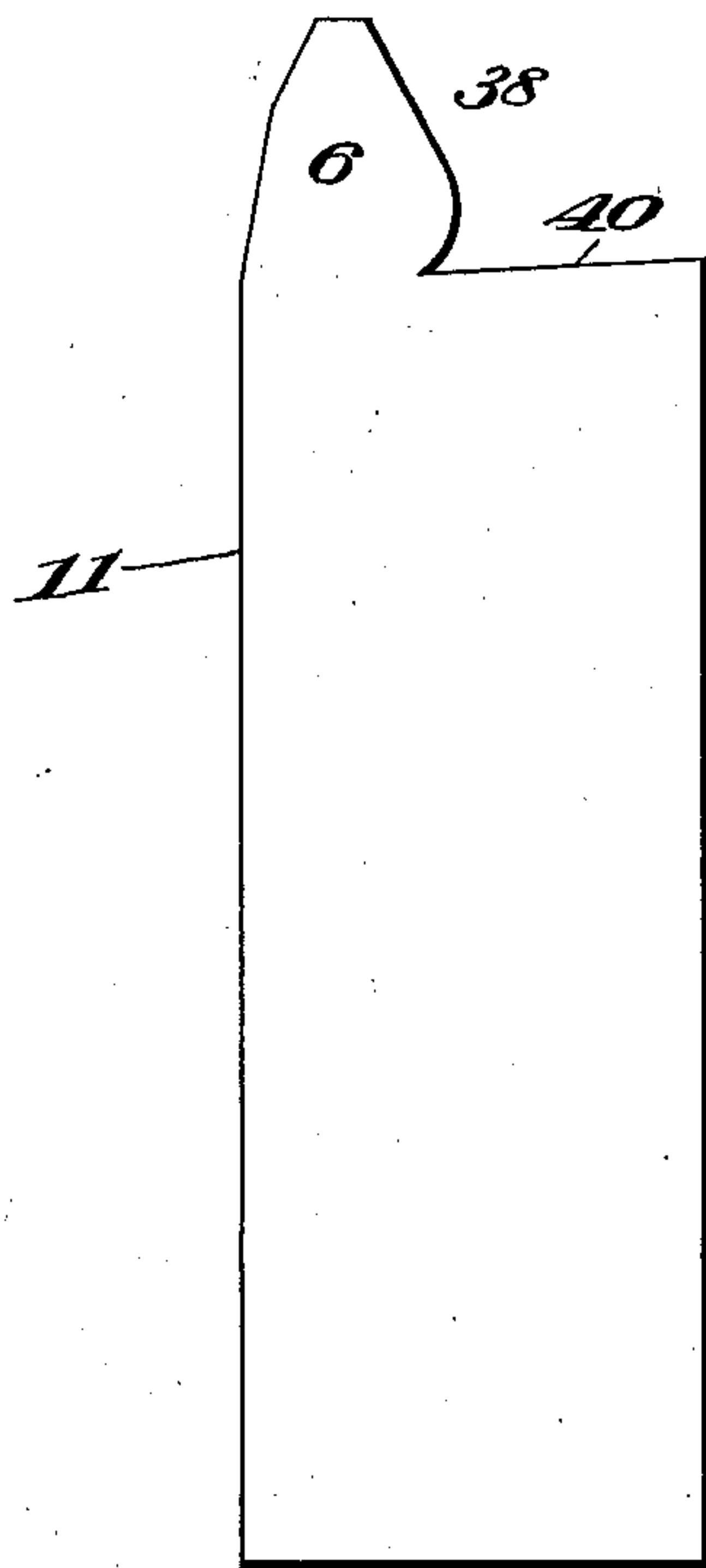
*Fig. 6*



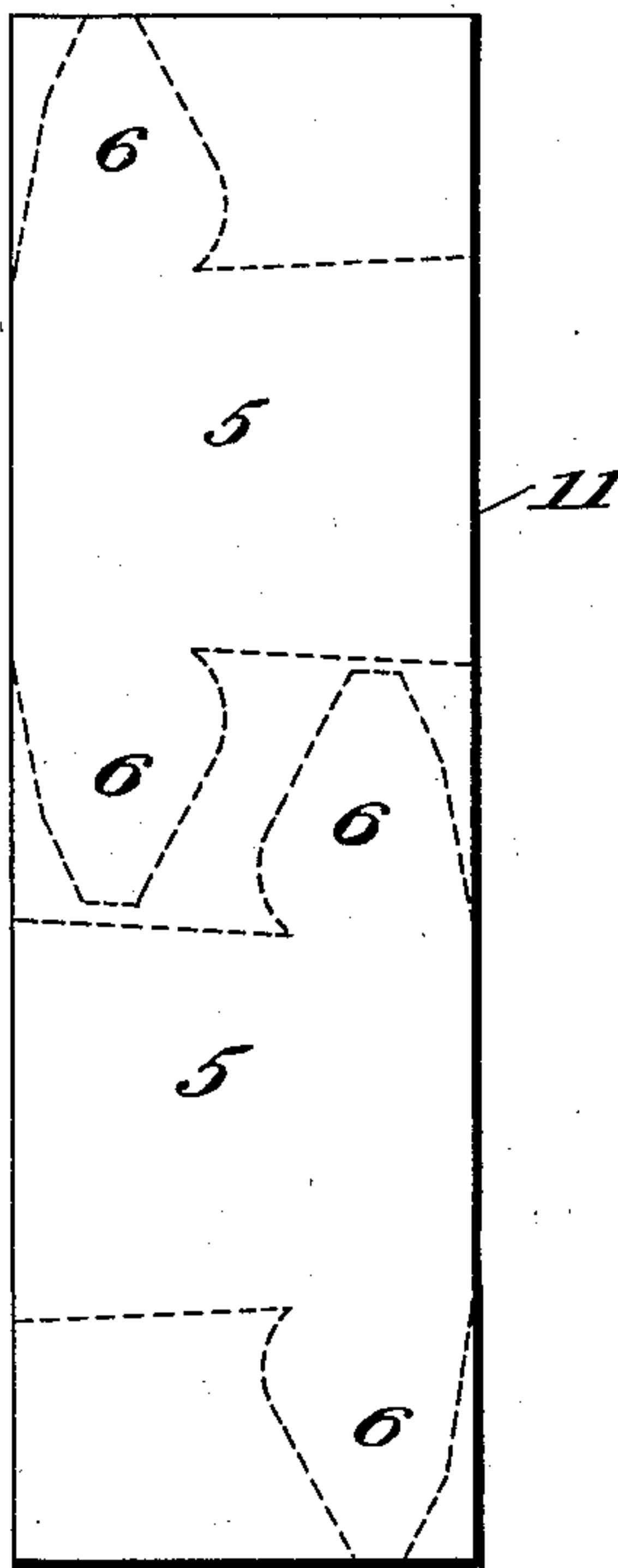
*Fig. 7*



*Fig. 8*



*Fig. 9*



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# UNITED STATES PATENT OFFICE.

PETER A. LORENZ, OF CHICAGO, ILLINOIS.

## CUTTING-DIE.

No. 828,225.

Specification of Letters Patent.

Patented Aug. 7, 1906.

Application filed June 30, 1903. Serial No. 163,696.

*To all whom it may concern:*

Be it known that I, PETER A. LORENZ, a citizen of the United States of America, and a resident of the city of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Cutting-Dies, of which the following is a specification.

This invention relates to certain improvements in dies, such as are employed for cutting out blanks from sheet or plate metal; and the object of the invention is to provide devices of this general character of a simple and inexpensive nature and of a compact, strong, and durable construction which shall be capable of certain adjustment whereby a single set of dies may be employed for cutting out blanks of varying lengths.

The invention consists of a pair or set of dies or similar devices, each having two series of operative parts alined in the direction of feed of material passed between the dies and adapted to conform to opposite portions of an article to be produced, the parts of one series being arranged with relation to those of the other series in an order reverse to that in which the respective produced portions stand in the produced article or blank, and the general disposition of the cutting edges is such that those portions of the two series which substantially face inwardly toward each other cut those portions of the blank which face outwardly from each other.

The invention also consists in an arrangement of adjustable guiding means combined with the improved dies in such a way as to gage the dies for operation at different points in the length of a metal sheet or strip from which blanks are to be cut, so as to adapt a single set or pair of dies for cutting blanks of varying lengths.

The invention also contemplates certain novel features of the construction, combination, and arrangement of the several parts of the improved dies, whereby certain important advantages are attained and the devices are made simpler, cheaper, and otherwise better adapted and more convenient for use, all as will be hereinafter fully set forth.

In the accompanying drawings, which serve to illustrate my invention, Figure 1 is a front elevation showing a pair of dies embodying my improvements, and Fig. 2 is a side elevation of the same. Fig. 3 is a sectional view taken vertically through the two dies in the plane indicated by the line *a a* in

Fig. 2. Fig. 4 is an under side view of the upper die, and Fig. 5 is a plan view of the lower die. Fig. 6 is an enlarged fragmentary detail view showing in section the devices for holding the guiding means in adjusted position. Fig. 7 is a view showing one of the blanks cut by means of the improved dies, and Fig. 8 is a view showing an end portion of a metal strip when the first or initial cut of the dies has been effected thereon for finishing one end portion of a blank. Fig. 9 is a view showing one of the strips or pieces of metal from which blanks are to be cut by means of the improved dies, the manner in which the blanks are to be cut from the strip being indicated in dotted lines.

As shown in the views, 1 is the upper and 2 the lower die, the upper die having a stem 3, by means of which it may be connected with a plunger, (not shown,) and the lower die having lateral portions 4 4, by means of which it may be bolted or otherwise secured to a suitable bed above which the upper die is adapted to reciprocate in a vertical direction.

The upper die 1 is provided with a die-surface extended beneath it and provided with two series of operative parts formed with cutting edges, each of the series conforming to an end portion of one of the blanks to be cut. The lower die 2 is also formed with an upper die-surface reciprocal with the surface of the upper die and also having two series of operative parts formed with cutting edges conforming each to an end portion of one of the blanks to be cut by means of the dies. Each die also has its two series of cutting edges alined in the direction or path in which material is to be fed through between the dies, one series of cutting edges being in front of the other series in each die.

As herein shown, the improved dies are adapted for use in cutting out, from sheet or plate metal, blanks for forming up elevator-buckets, the conformation of the finished blanks being illustrated in Fig. 7 of the drawings. As shown in said figure, the blank is of symmetrical form and comprises a body portion 5 of general rectangular form and from which the body portion of the elevator-bucket is to be produced and similar end portions or wings 6 6, located opposite each other at each side of the body portion 5 and adapted to form the ends of the elevator-bucket when finished. The upper die 1 carries two series of continuous cutting edges. Each series



comprises the edges 7, 8, and 9, corresponding to the external outline of one of the wings 6 of the blank, and the edge 10, corresponding to one side of the body portion 5 of the blank.

5 In like manner and conforming thereto the lower die 2 carries two series of continuous cutting edges. Each series comprises the edges 7', 8', and 9', corresponding to the internal outline of one of the wings 6 of the blank, and the edge 10', corresponding to one side of the body portion of the blank, as hereinafter more fully explained. In cutting

10 blanks of this nature it is customary to employ elongated strips or pieces of sheet metal, as indicated at 11 in Figs. 8 and 9, the strips or pieces 11 having a width equal to the width of the body portion 5 of the finished blanks, which latter are successively cut from the strips. In Fig. 9 I have illustrated in

20 dotted lines the manner in which the piece or strip 11 is cut or divided by the dies to produce a plurality of blanks. As indicated by these dotted lines, an end portion 6 of one blank overlaps the adjacent end portion 6 of another blank, the alternate blanks being arranged with their end portions or wings 6 6 at opposite sides of the strip 11 to permit this overlapping arrangement. To permit of cutting the blanks in this manner from the strips

25 or pieces 11 of sheet metal, the reciprocal series of cutters on each of the dies 1 and 2 are also arranged to overlap one another, and the cutters of one series are in an order exactly opposite or reverse to the cutters of the other series, as clearly shown in Figs. 4 and 5. This arrangement of the cutters is such that the straight cutters 10 10 are extended parallel with each other along the front and rear sides of the upper die, while the other cutters 7, 8, and 9 of the two series stand between these

40 two straight cutters 10 10, the cutters 7, 8, and 9 of one series being at the left-hand ends, while those of the other series are at the right-hand ends, of the dies, and the same relative arrangement exists in the several series of cutters which are carried by the lower dies.

The die-surface of the lower die 2 comprises parts 12 12, extended above the body of the die and conforming to the end portions or wings 6 6 of the blanks, and parts 13 13, extended laterally from said parts 12 and conforming to the end edges of the body portion 5 of the blanks, the cutters 7', 8', and 9' being formed around the edges of the parts 12 and the cutters 10' being formed upon the straight edges of the parts 13.

The die-surface of the upper die 1 comprises a central part 14, adapted for engagement between the parts 12 of the lower die-surface and parts 15 15, located at opposite sides of said upper die and adapted to engage beyond the opposite sides of the respective parts 12 12 of the lower die-surface. The opposite edges of the central part 14 form the

65 cutters 8 8 for forming the end portions or

wings of the blanks, and the parts 15 15 have on their inner edges the cutters 7 and 9 for forming said end portions of the blanks, while the cutters 10 10 are formed partly on parts 15 and partly on parts 14.

The spaces upon the lower die 2 and the intervening parts 12 and 13 thereof are adapted to be closed and covered over by a stripper-plate 16 of suitable contour, which plate 16 is arranged for sliding movement toward the body portion of the die 2, being guided on headed pins or screws 17 17 and backed by springs 18, coiled on said pins or screws and serving to hold the plate 16 normally pressed up from the die-body and flush with the die-surface formed of the parts 12 and 13.

When in the operation of the devices the upper die approaches the lower die, it will be evident that the pressure of the said upper die will come to bear upon the stripper-plate while the sheet metal is being cut, so as to force said plate 16 toward the body of the lower die against the tension of the springs 18. After the pressure of the upper die is relaxed the springs 18 will serve to uplift the stripper-plate 16 and free the die-surfaces of the lower die from the cut metal. The stripper-plate 16 may, if desired, be formed in sections instead of integrally, as herein shown.

The recesses in the upper die intervening the parts 14 and 15 and corresponding with the parts 12 and 13 of the lower die are filled or closed by metal plates or strippers 19 19, held on headed pins or screws 20 and backed by an elastic means, herein shown as formed of cushions 21 of india-rubber, which are to be compressed on contact of plates 19 with the sheet metal resting on the die-surface of the lower die 2 in the operation of the devices in such a way as to permit the sheet metal to be properly cut. When the die 1 is again uplifted, the elastic backing of plates 19 serves to press said plates down flush with the parts 14 and 15 of the upper die, so as to clear the die-surface thereof from the cut metal.

The parts of the die-surfaces for the dies 1 and 2 may be held to the bodies of the dies by any convenient means, such as the screws 22, as shown in Fig. 3, while the outer parts 15 15 of the die-surface for the upper die have dowel-pins 23 extended up into the die-body. The pressures upon the opposite sides of the central part 14 of the upper die-surface are equalized, so that liability of breakage of this part and its connections is avoided; but the strains upon the outer parts 15 15 are exerted outwardly and tend to break these parts or to loosen their connections with the die-body. To prevent damage incident to such outward strains, I provide on the ends of the die-body screws 24 24, on which are held collars 25, taking against the outer surfaces of the parts 15 15 at opposite ends thereof.

For guiding the insertion of the metal strip or piece 11 between the dies I provide



at one side of the forward part of the lower die a side guide 26, which may be formed of a piece of angle-iron held on a bracket 27 and upon one flange of which the edge of the piece or strip 11 is adapted to contact when properly inserted between the dies.

In connection with the improved dies constructed as above described I provide an adjustable gage or guiding means for gaging the longitudinal movement of the metal piece or strip 11 after each succeeding cutting operation. This gaging or guiding means comprises slide bars or arms 28, extended over and adjustable upon the side portions of the lower die 2 in the direction of their length and of the length of the piece or strip 11 when inserted between the dies. For the adjustable connection of the bars or arms 28 with the die 2 each bar or arm has a longitudinal slot 29 and also a series of perforations 30 parallel with and at one side of said slot, and the die 2 has pins 31, adapted to engage in perforations 30, and set-screws 32, passed through the slots 29 and adapted to be screwed down to hold the pins 31 engaged in the perforations. When the screws 32 are loosened, the bars or arms may be raised to disengage the pins 31 from perforations 30, after which the bars or arms may be adjusted lengthwise to any desired position and may be again held in such adjusted position by tightening the screws 32. The length of the bars or arms 28 is such that the ends thereof extend beyond the lower die 2, and said extended ends are upturned, as shown at 33, a tie-bar or cross-piece 34 being extended between the upper extremities of said upturned end portions 33, the cross-piece being at such an elevation above the upper face of the die 2 that the end of a strip or piece of metal rested on said die will pass underneath the cross-piece. Upon the cross-piece is secured a downwardly-directed bar or arm 35, upon the lower end of which is secured a gage-block 36 in line with the die-surface of die 2 and which may have an inclined face, as shown in Fig. 5, adapted to be engaged by the straight but inclined end edge of the strip of metal being operated upon. 37 indicates another gage held on one of the upturned parts 33 and adapted to be engaged by the lateral edge of the metal strip or piece being operated upon. The gage 37 and block 36 are in the same plane, and the block 36 has one end closely adjacent to said gage 37; but the opposite end of the block 36 is separated from the upturned part 33 of the arm 28 at the opposite side of the device by an interval or space adapted for the free passage of one of the wings or end portions 6 of the blanks. The arrangement of the cutters on the dies is such that one series of cutters is nearer to the forward or feeding side of the dies and is in advance of the other series which is arranged nearer to the rear side of the dies, and

it will be evident that the order in which these series of cutters stand relative to each other is exactly the reverse of the order in which the ends or wings produced by them stand in the finished blank, for the cutters 7, 8, and 9 corresponding with the wings 6 of the blanks project inwardly in the space between the two parallel straight cutters 10 10, which cut the straight end edges of the blank and are reversely and oppositely arranged to the wings 6 6, which project outwardly beyond said end edges of the blank.

In the operation of the improved dies a strip or piece 11 of metal, as shown in Fig. 9, of a width equal to the width of the body portion 5 of the blanks to be cut and of any desired length, is applied between the dies at the front or feeding side of the same (shown at the left hand in Fig. 2) with one of its end portions between the reciprocal die-faces of the upper and lower dies, with one lateral edge contacting with the side guide 26 at the forward part of the lower die. The upper die 1 is then moved downward to cut the inserted end portion of the strip or piece 11, whereupon an end portion or wing 6 of one blank will be produced upon the extremity of the strip 11, as shown at 38 in Fig. 8, this end portion being formed by that series of cutters 7, 8, and 9 and 10 which is nearest to the forward or feeding side of the dies. When the upper die 1 has been lifted, the end of the strip 11 is removed from between the dies, and said strip is turned half-way around upon its longitudinal axis until what was before its upper surface shall have become lowermost, whereupon the cut end 38 of the strip or piece is again inserted between the dies, being rested flush on the die-surface of the lower die 2 with one lateral edge engaged by the side guide 26. When the strip or piece 11 is in this position, it is pushed rearward between the dies in a path or direction with which the respective series of cutters of each die are alined until the wing or projecting part 6 at the cut end 38 of the strip passes through the space or opening beneath cross-piece 34 and between the gage-block 36 and the upturned part of arm 28, whereupon the straight portion 40 of the cut end 38 of the strip 11 will be flush on the inclined face of gage-block 36 and the other lateral edge of the strip will be engaged on the end of gage 37 in the position indicated by the dotted lines in Fig. 5. When the strip or piece 11 has been set in this position, the upper die 1 is again allowed to descend and again cuts the strip or piece 11, cutting off from the end thereof by means of that series of cutters 7, 8, 9, and 10 nearest the rear side of the dies a finished blank and also producing at the same time and by means of the cutters 7, 8, 9, and 10 nearest the forward or feeding side of the dies the finished end portion of an-



other blank, which is left projecting at the cut end of the strip 11. The foregoing operations are then repeated until the entire piece or strip 11 has been cut into finished blanks, it being only necessary to turn the strip or piece 11 at each successive cutting operation to compensate for the opposite or reverse arrangement of the successive blanks. In this way it will be seen that each blank has its opposite end portions produced by successive cuts of the dies, and the gaging or guiding devices are adapted for operation in connection with the dies at each successive actuation thereof, so that the blanks are quickly and accurately cut without the exercise of any particular care or skill on the part of the attendant except such as is required for properly engaging the strip with the several guides or gages. The first cutting operation on each strip or piece 11 merely finishes one end of a blank, and each succeeding cutting operation finishes the other end of and severs a blank which was previously partly finished and at the same time finishes the adjacent end of the succeeding blank. The turning of the strip or piece 11 is desirable for purposes of economy, since the reverse or opposite arrangement of the series of cutting edges on the dies permits a very material saving owing to the lapping of the end portions or wings 6 of adjacent blanks over each other in the length of the strip or piece 11. When it is desired to cut from the metal strips 11 blanks of different body lengths by means of these same dies, it is only necessary to loosen the set-screws 32 and to adjust the bars or arms 28 so that the cross-piece 34 and guides 36 and 37 shall stand at a greater or less distance from the body portion of the lower die.

2. By such adjustment it will be evident that the distance between the two wings or end portions 6 6 of the blanks may be varied at will, so that adjustments affording a wide range of different sizes of blanks may be effected without alteration or substitution of the die-surfaces.

The arrangement of the improved dies with the respectively reciprocal stripper-plates arranged in the recesses of the die-surfaces also affords a very material advantage, since it insures the clearing of the dies from the cut material and at the same time avoids any weakening of the dies such as is produced when dies are cut away for the passage of the waste metal through them.

From the above description it will be seen that the improved dies constructed according to my invention are of an extremely simple, strong, and inexpensive nature and are especially well adapted for use both by reason of the ease with which they may be operated and the facility with which they may be adjusted for the production of different sizes of blanks, and it will also be obvious from the above description that the devices are capa-

ble of considerable modification without material departure from the principles and spirit of the invention, and for this reason I do not wish to be understood as limiting myself to the precise form and arrangement of the several parts of the device as herein set forth in carrying out my invention in practice.

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

1. In a device of the character described, the combination of dies having reciprocal die-surfaces adapted to cut the edge of the body of a blank and simultaneously cut a wing projecting from said edge, and at the next successive operation to similarly cut the other end of the blank, with means adapted to contact with the edge of the body of the blank at the second cutting operation to govern the length of the body of the blank.

2. In a device of the character described, the combination of dies having reciprocal die-surfaces adapted to cut the edge of the body of a blank, and simultaneously cut a wing extending from such edge, and at a successive operation to cut the other end of the blank in a similar manner, with an adjustable gage adapted to contact with the forward edge of the body of the blank to govern the length of the body of the blank.

3. In a device of the character described a pair of dies each die having two cutting-surfaces of the same form but inverted in position and each cutting-surface extending the full width of the dies, said cutting-surfaces being so disposed that they will form at one cut through a strip of material the ends of two blanks having each a straight edge and an extended wing and at the next succeeding cut, will form from the same sheet, when it is advanced and turned over, two other straight edges and two extended wings.

4. Dies having two cutting-surfaces on each die, one in advance of the other, each cutting-surface on each die being of the same configuration as the other cutting-surface of the same die from edge to edge of the die, each cutting-surface being inverted relatively to the other, and the dies being adapted to cut a straight edge and an extended wing, of the same configuration but inverted position, simultaneously on two blanks.

5. The combination of dies having reciprocal die-surfaces comprising straight cutters extended along their edge portions, an arm extended from one die and having adjustable connection therewith, and a gage inclined to the straight cutters of the dies and carried by said arm and adapted to be engaged by an edge portion of a piece of material inserted between the dies.

6. The combination of dies having reciprocal die-surfaces, an arm having a series of perforations, a pin on one of the dies for engagement in one or another of said perfora-



tions of the arm, a gage carried by the arm and adapted to be engaged by an edge portion of a piece of material inserted between the dies, and means for clamping the arm to the die when the pin is engaged in one of said series of perforations.

7. The combination of dies having reciprocal die-surfaces, arms extended from opposite sides of one die and having adjustable connection with the die, said arms having their extended portions parallel, a cross-piece connected to and extended between the extended ends of the arms and a gage carried on said cross-piece and adapted to be engaged by an edge portion of a piece of material inserted between the dies.

8. The combination of dies having reciprocal die-surfaces, arms extended from opposite sides of one die and having adjustable connection with the die, said arms having

their extended portions parallel, a cross-piece connected to said arms and a gage carried on said cross-piece and arranged at an angle thereto, and adapted to be engaged by an inclined edge of a piece of material inserted between the dies.

9. The combination with a pair of dies consisting each of two pairs of operative parts designed and adapted to cut at each successive stroke a section coinciding in form and inverted in position from the preceding section of adjustable means for guiding the material to be operated on to secure correct inverse position of the sheet.

In witness whereof I have hereunto set my hand this 20th day of June, A. D. 1903.

PETER A. LORENZ.

Witnesses:

C. K. CHAMBERLAIN,  
ANNIE S. PHILLIPS.