

(No Model.)

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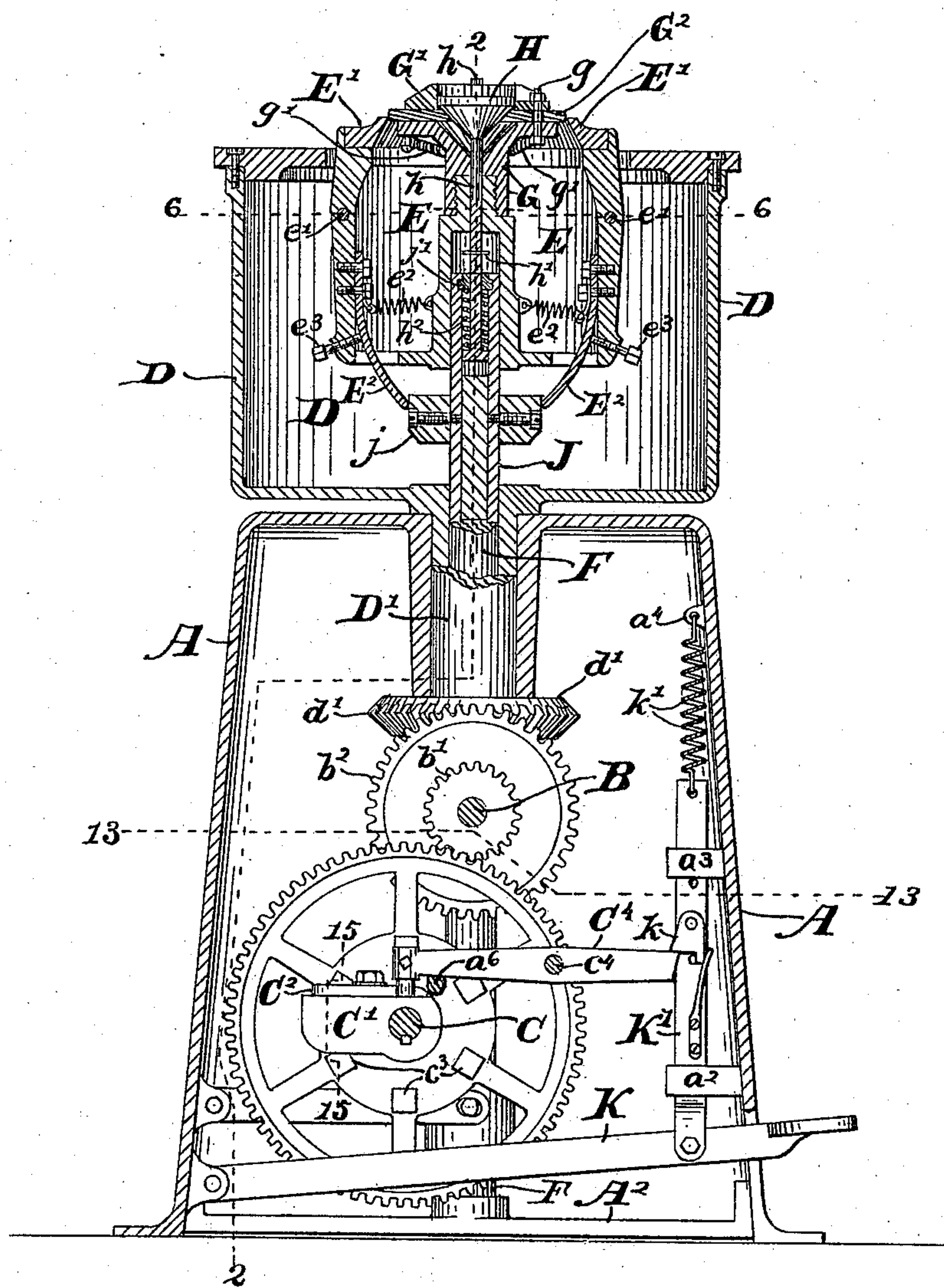
W. THOM.

LOCK SEAM ELBOW MACHINE.

No. 365,652.

Patented June 28, 1887.

*Fig. 1.*



WITNESSES.

Chas. Leonard.  
Chas. L. Thuer-

INVENTOR.

William Thom,

PER

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ATTORNEY.

(No Model.)

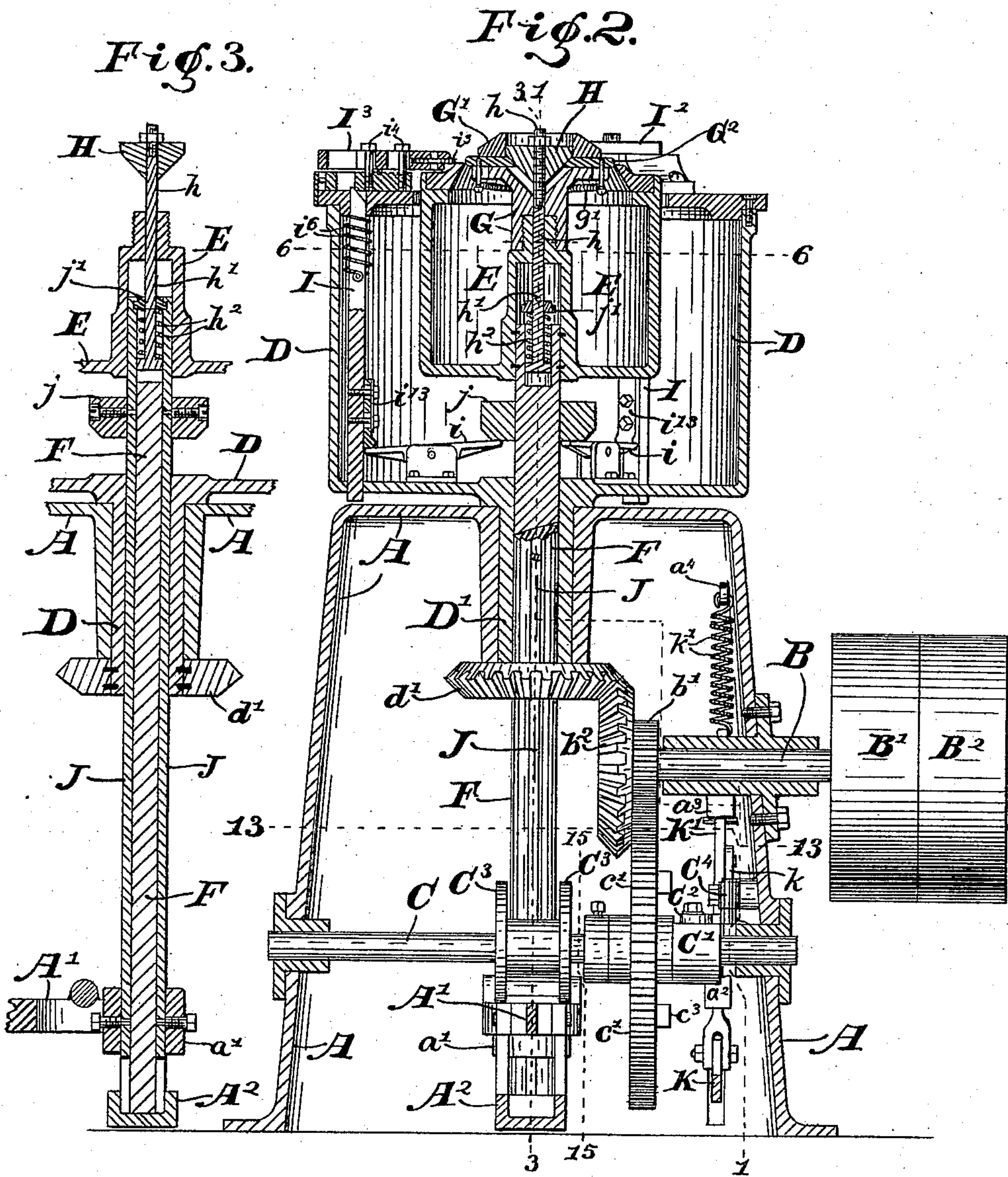
6 Sheets—Sheet 2.

W. THOM.

LOCK SEAM ELBOW MACHINE.

No. 365,652.

Patented June 28, 1887.



WITNESSES.

Chas. Leonard.  
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(No Model.)

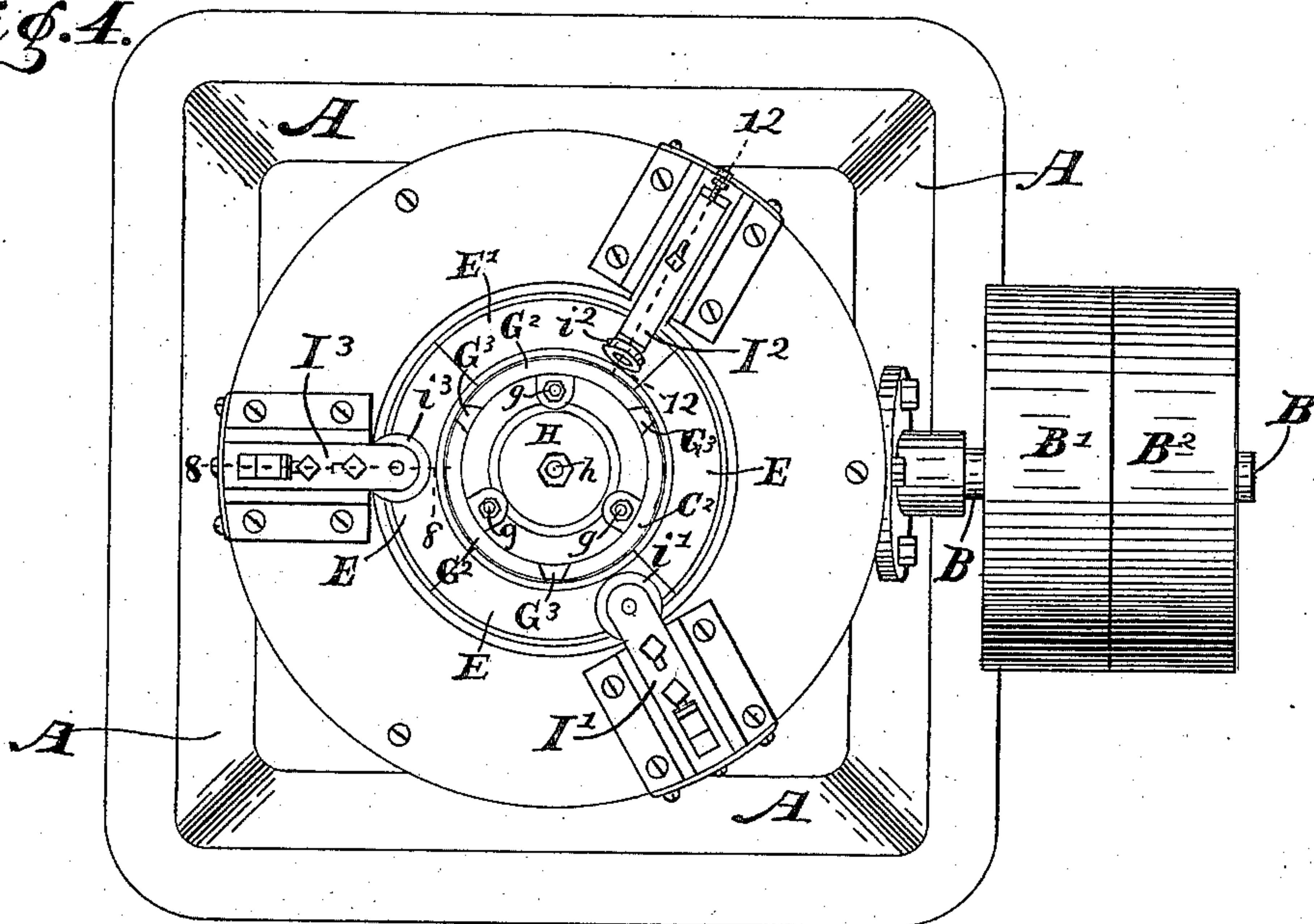
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W. THOM.  
LOCK SEAM ELBOW MACHINE.

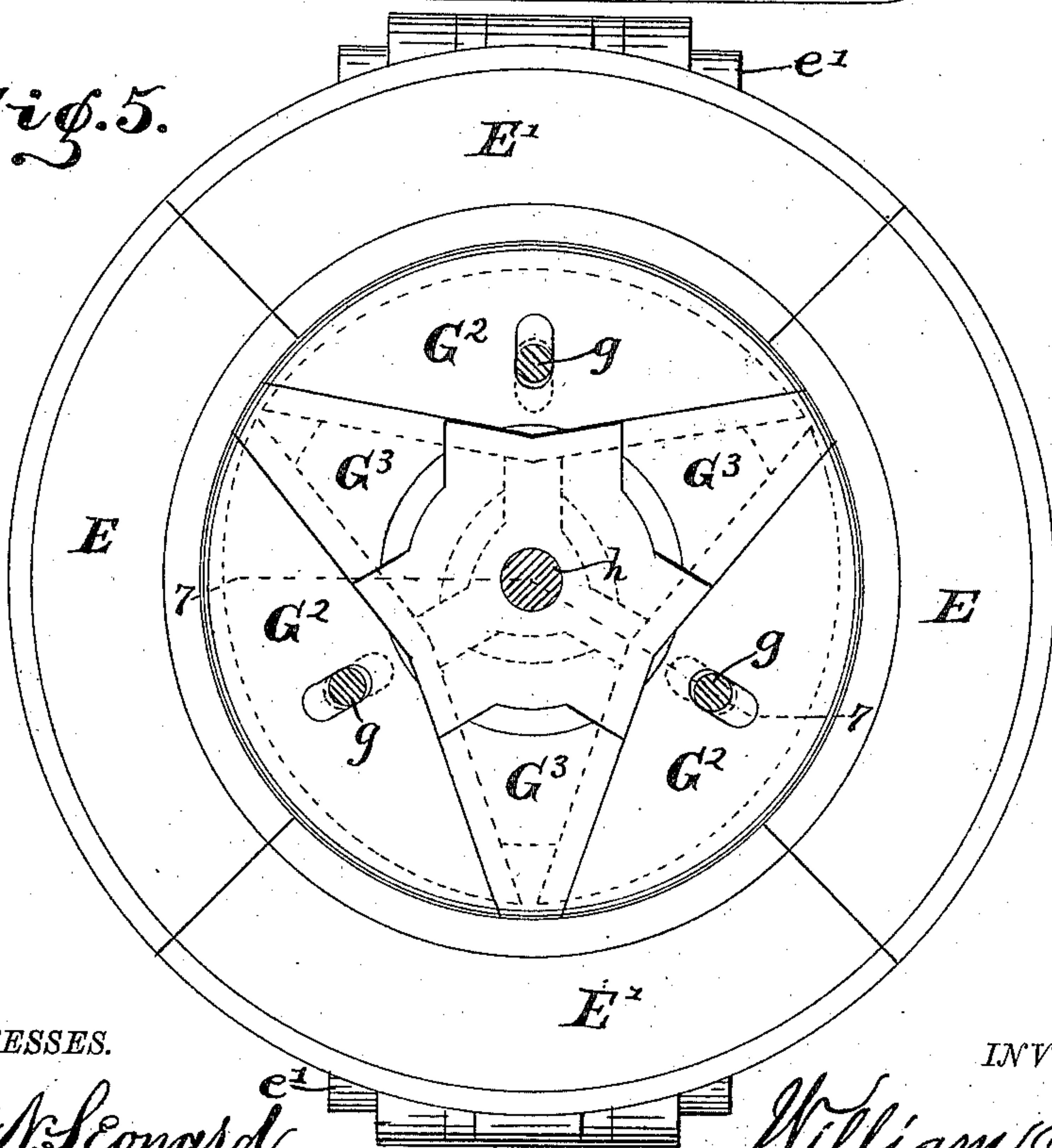
No. 365,652.

Patented June 28, 1887.

*Fig. 4.*



*Fig. 5.*



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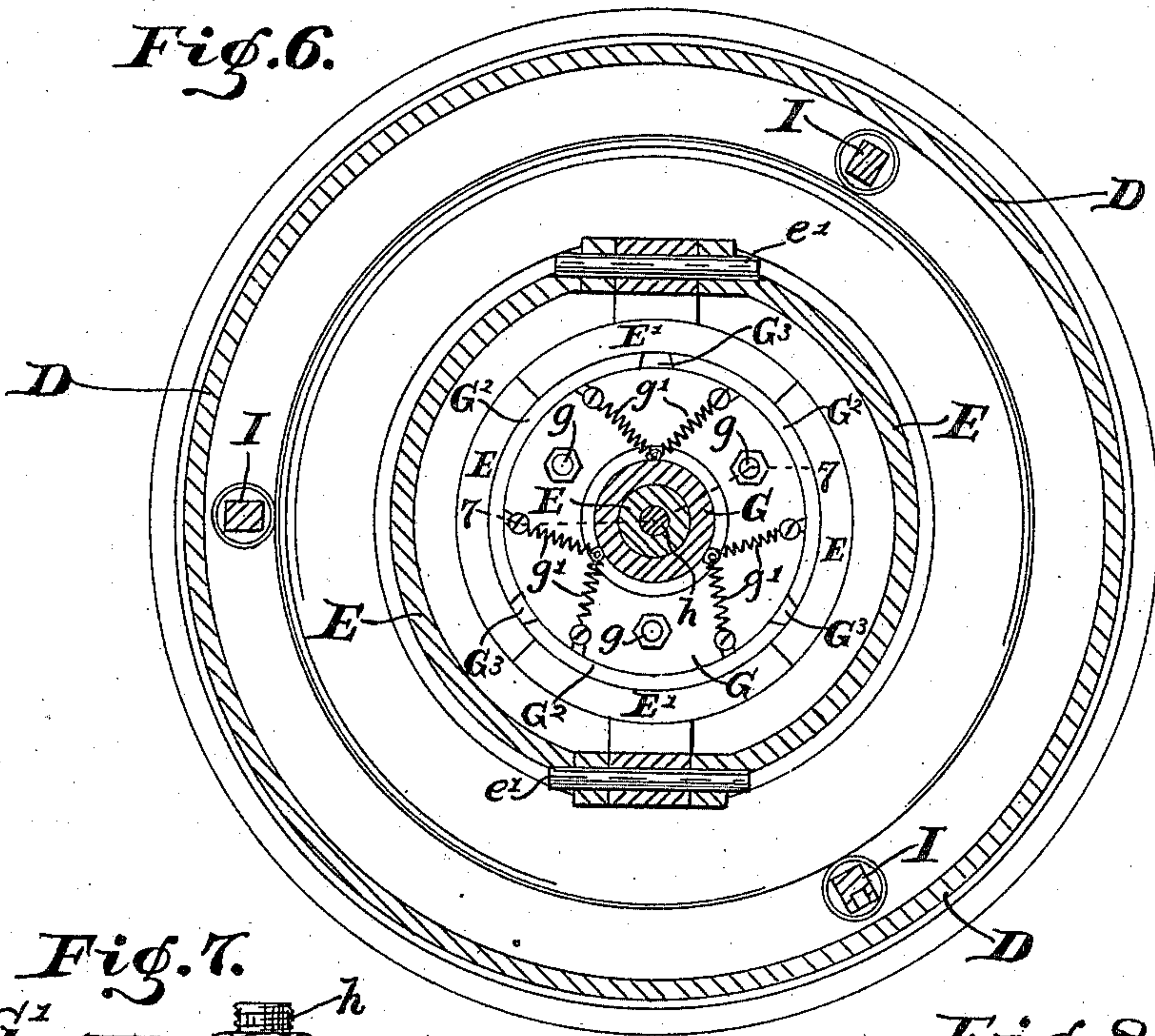
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LOCK SEAM ELBOW MACHINE.

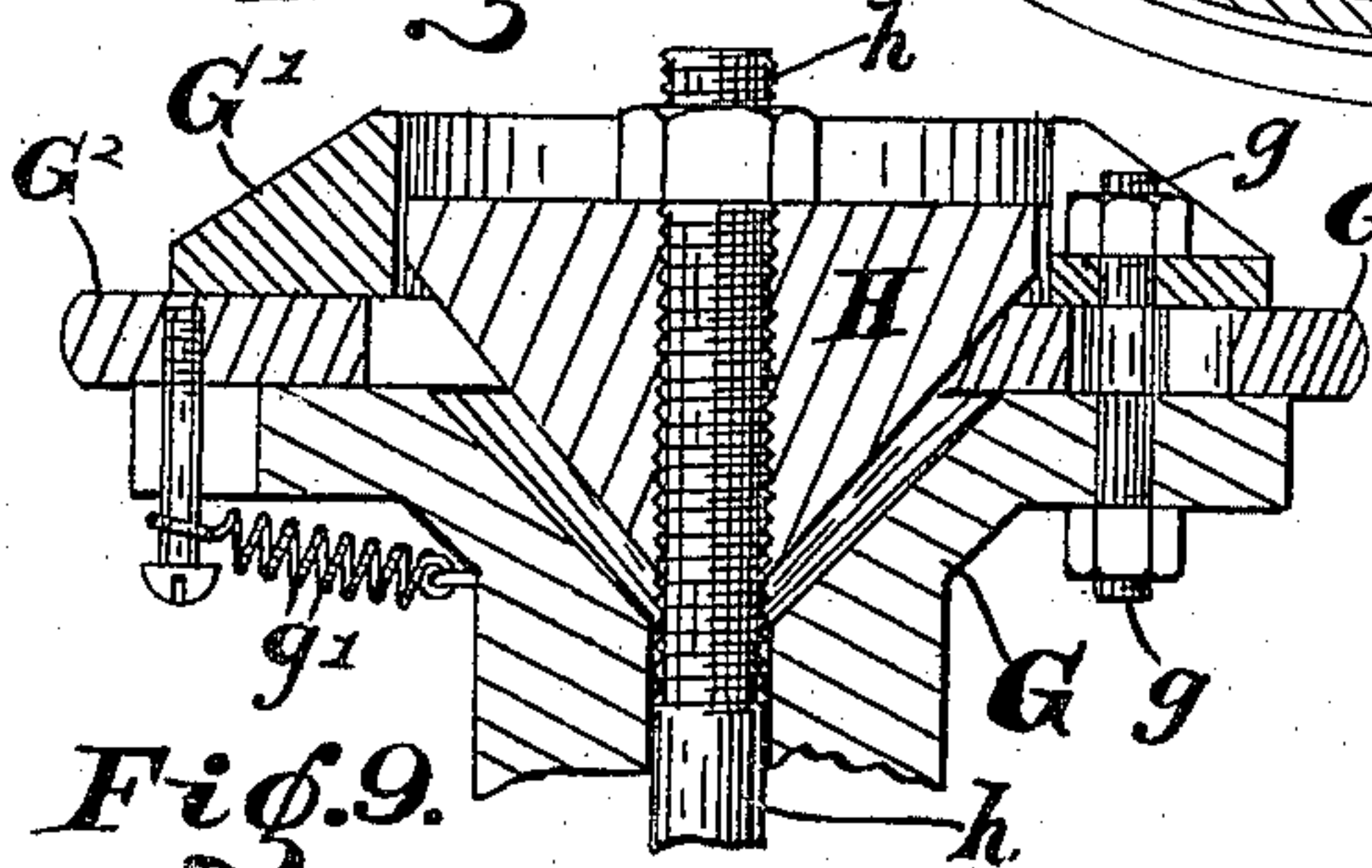
No. 365,652.

Patented June 28, 1887.

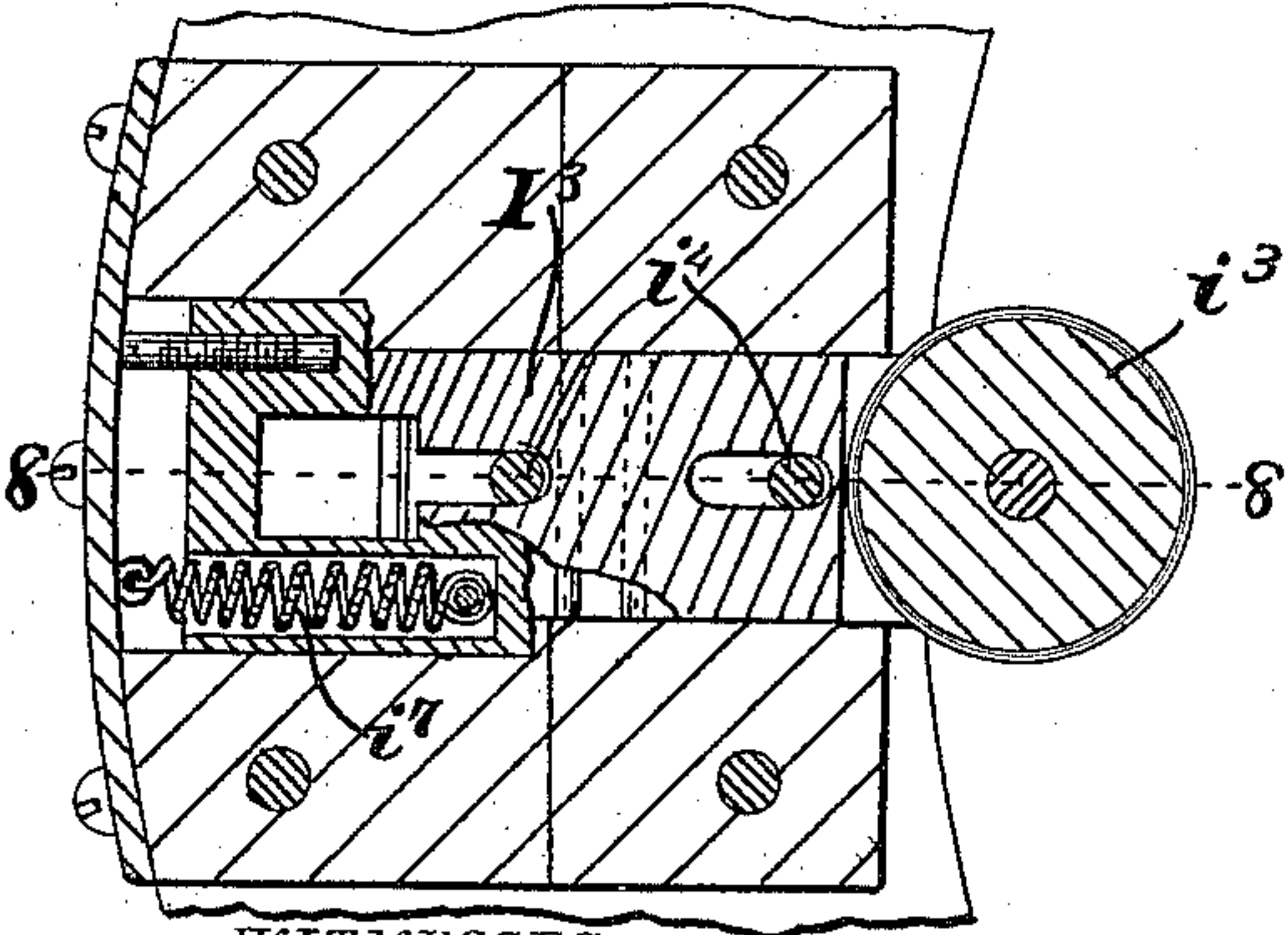
*Fig. 6.*



*Fig. 7.*



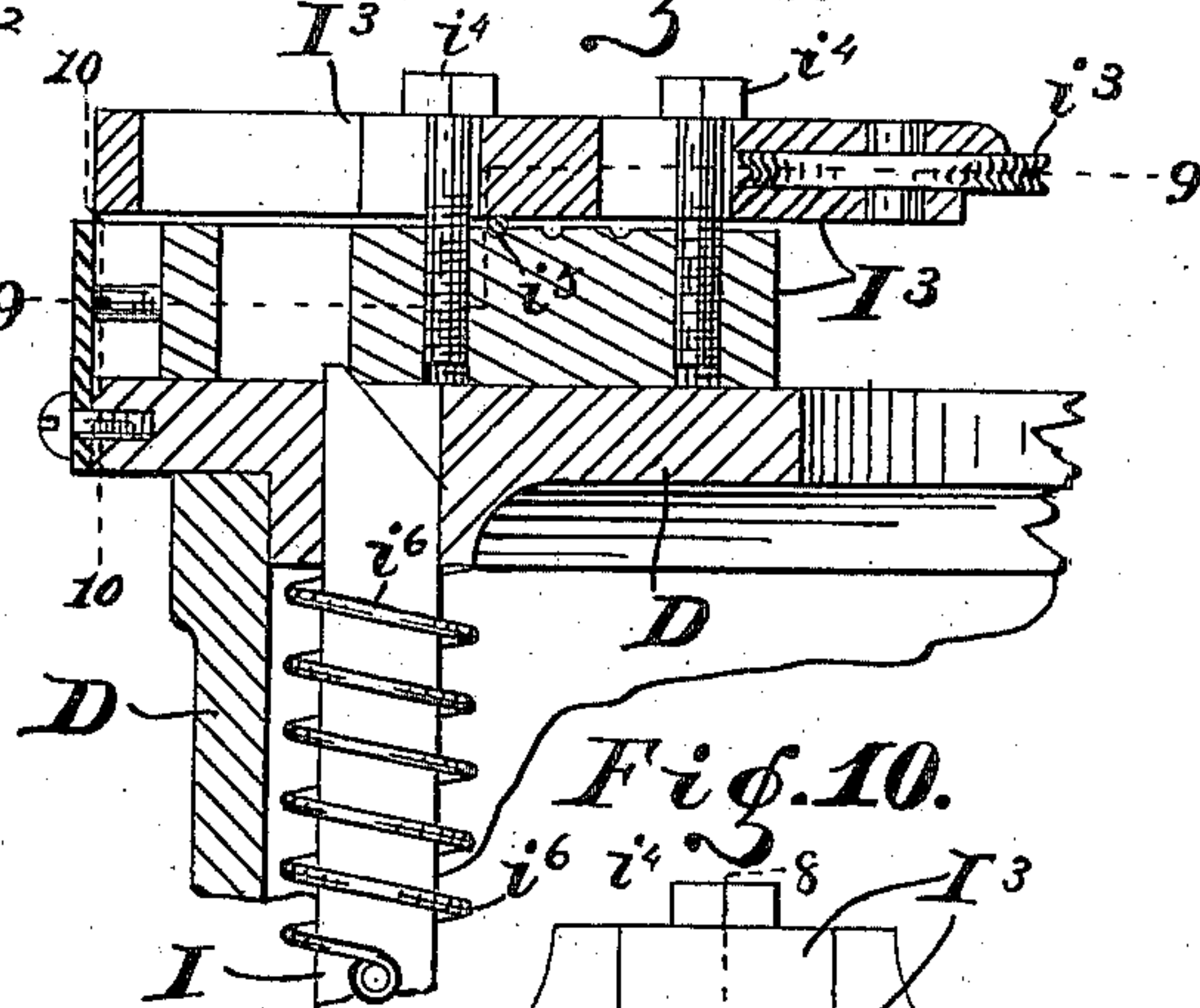
*Fig. 9.*



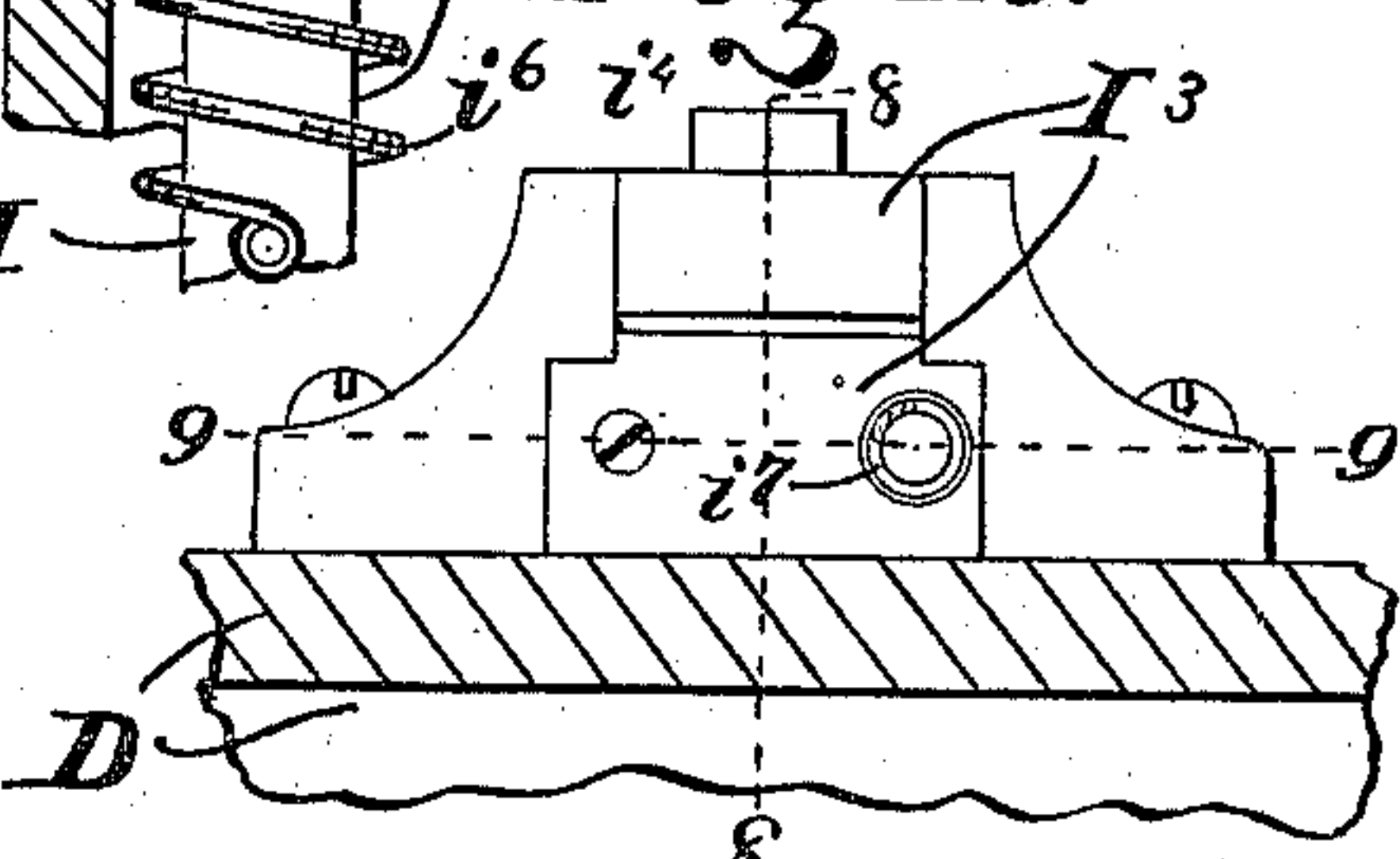
WITNESSES.

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*Fig. 8.*



*Fig. 10.*



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LOCK SEAM ELBOW MACHINE.

No. 365,652.

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Fig. 11.

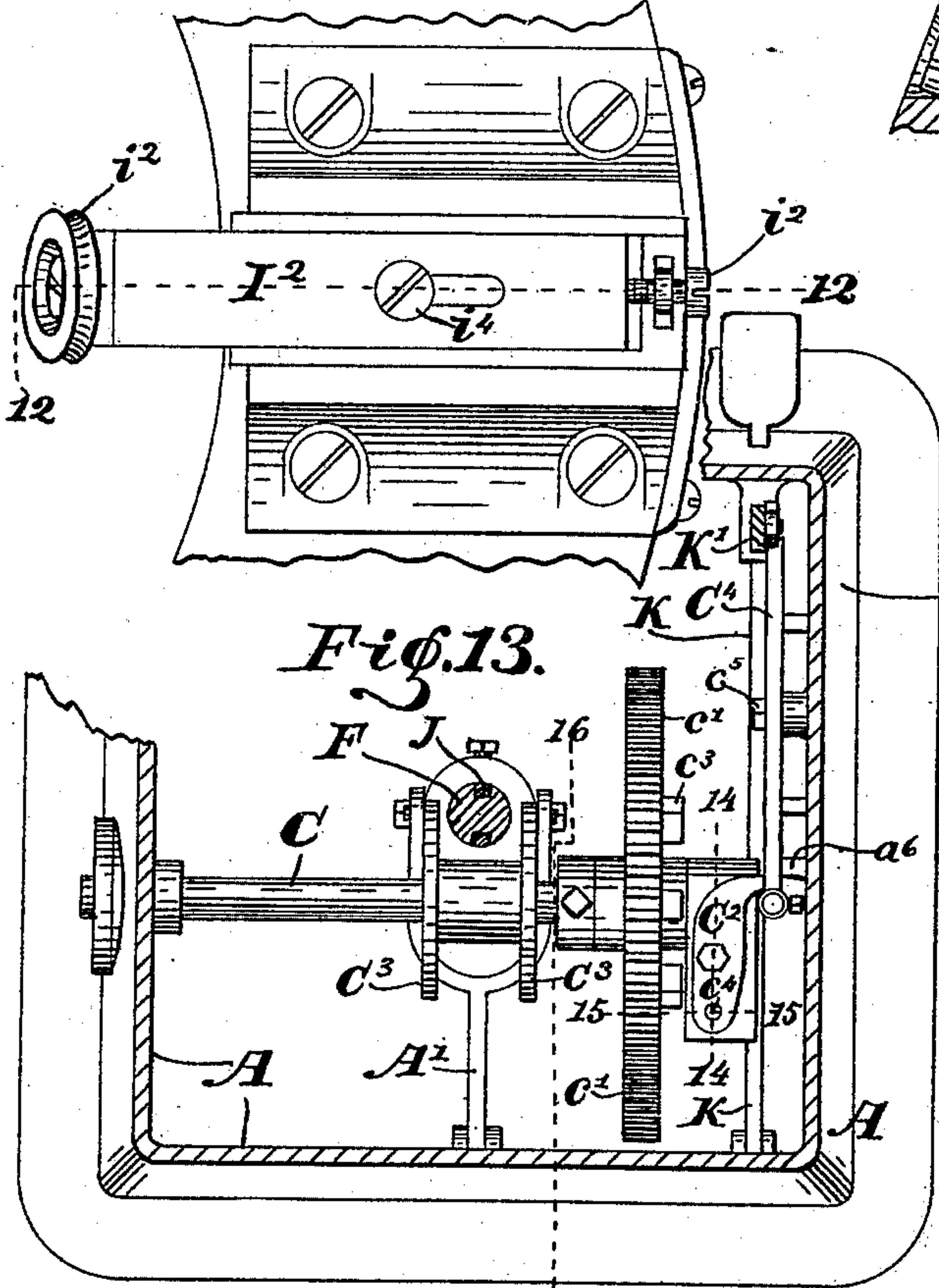


Fig. 13.

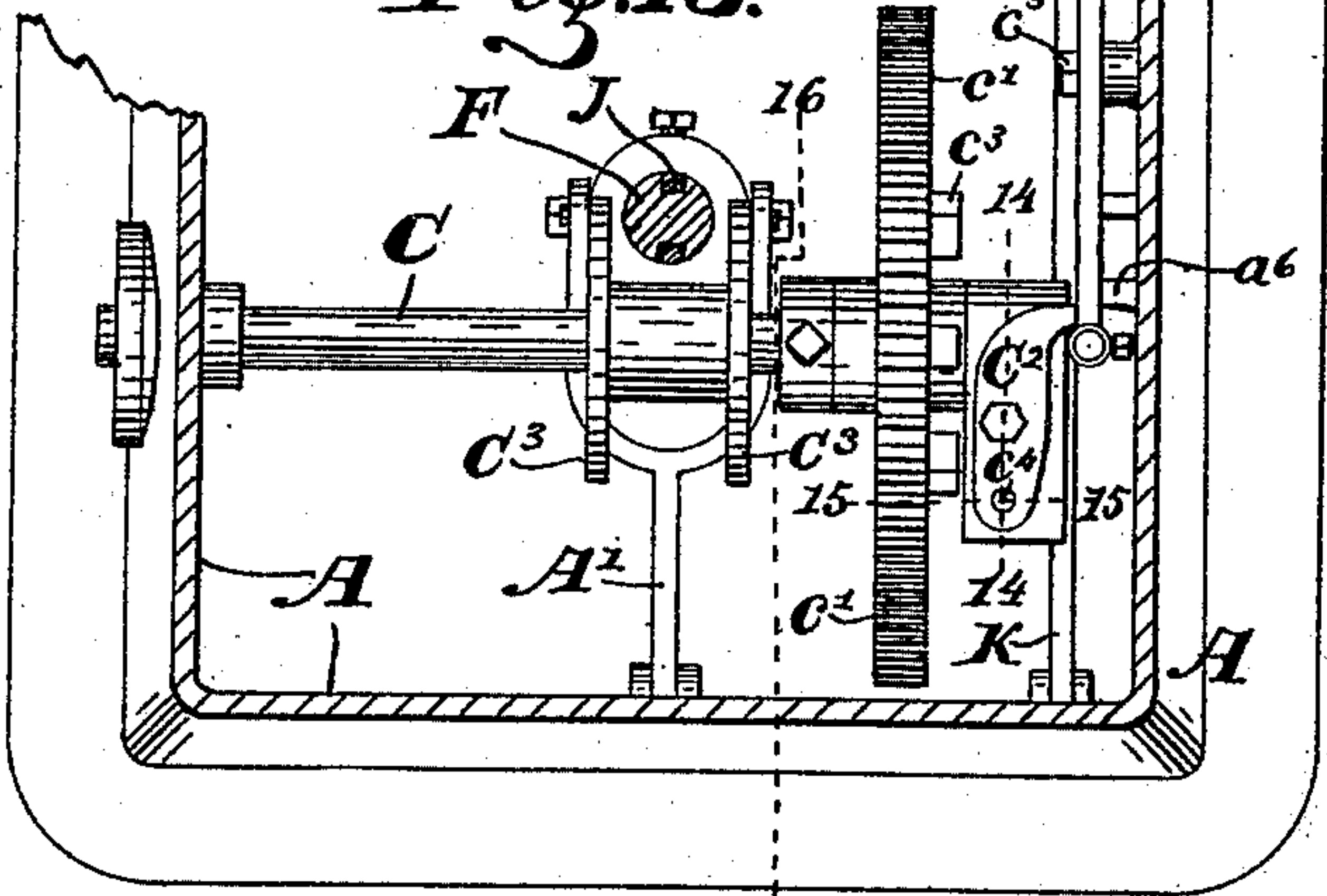
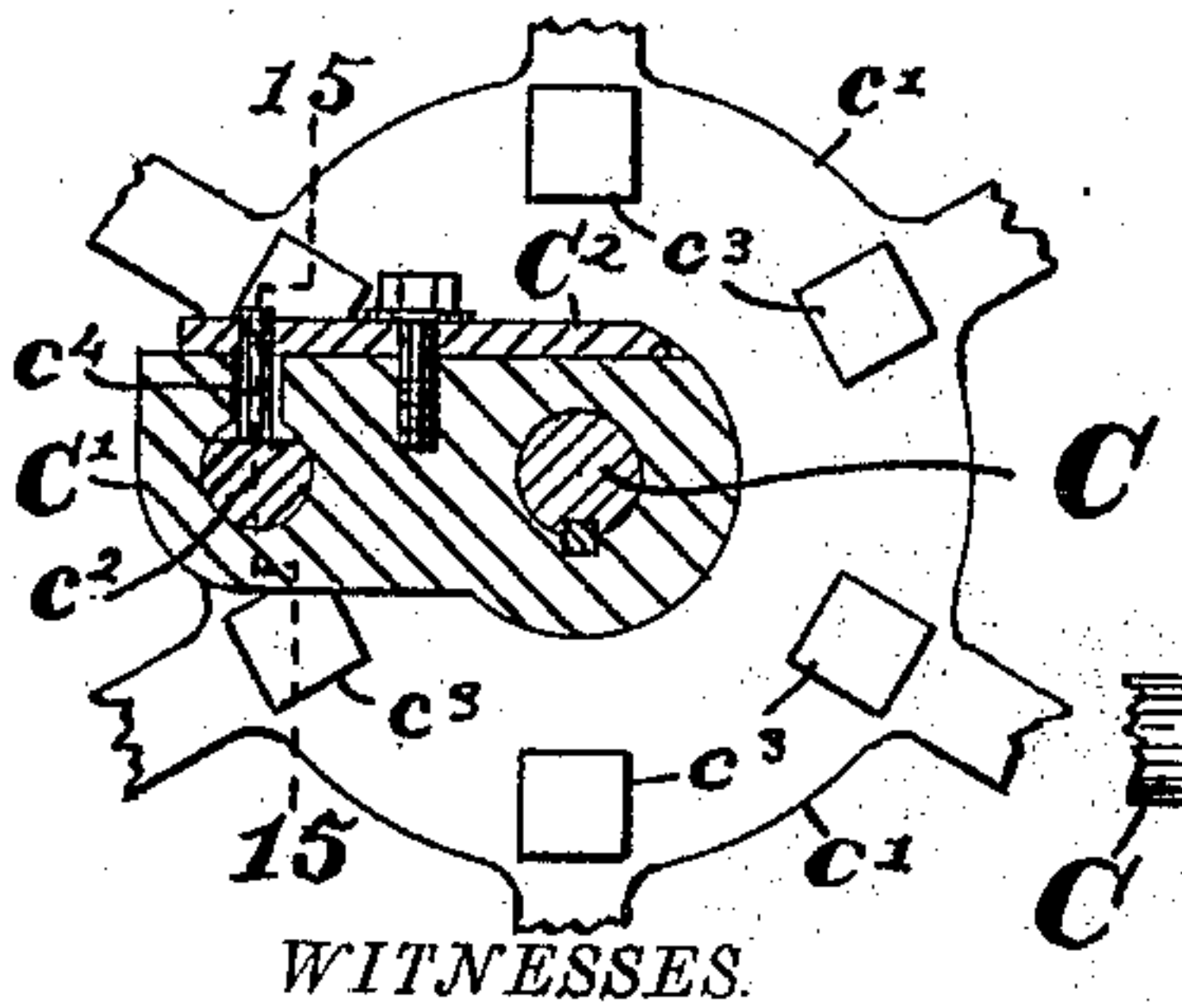


Fig. 14.



WITNESSES.

Chas. D. Leonard.  
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Fig. 15.

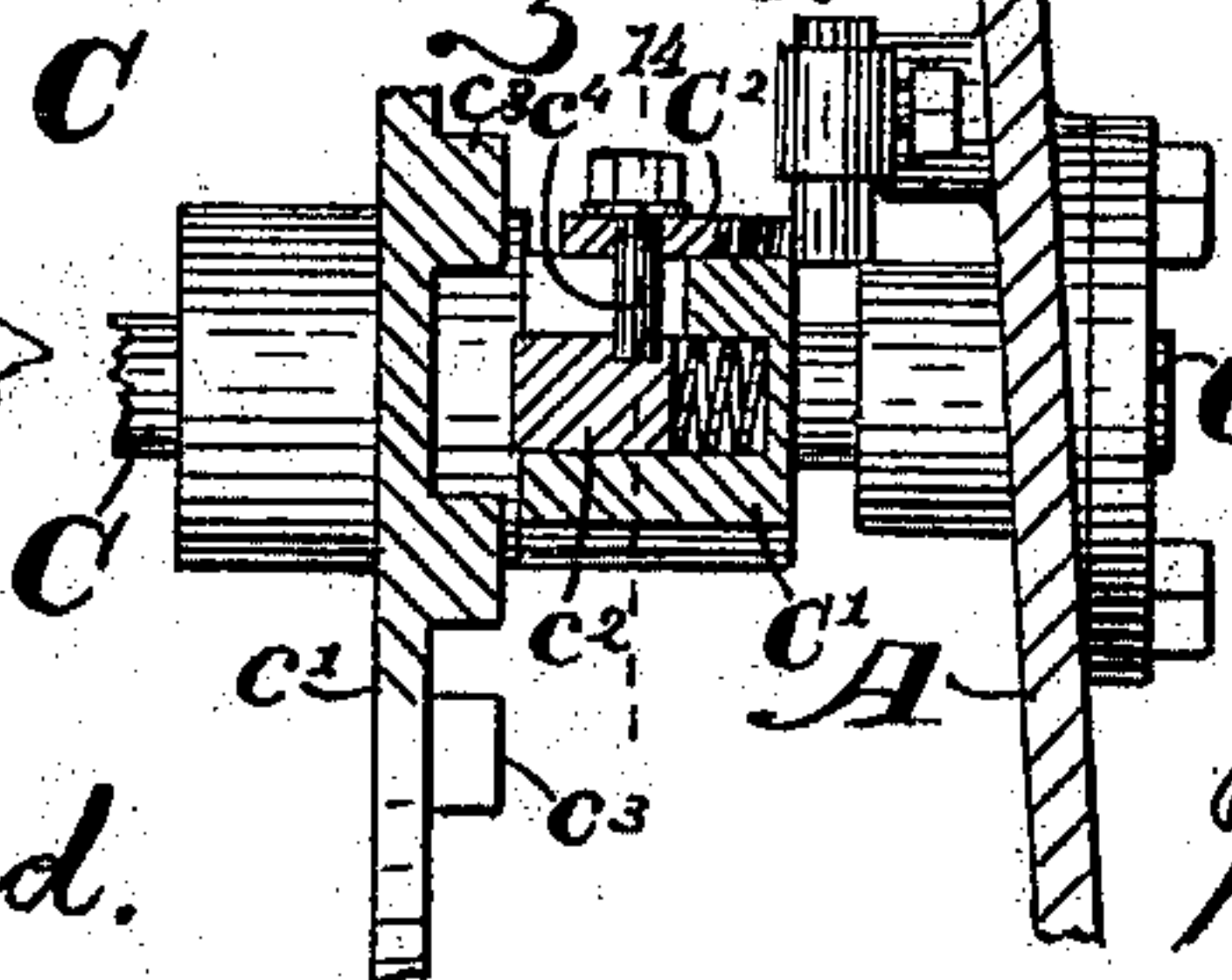


Fig. 12.

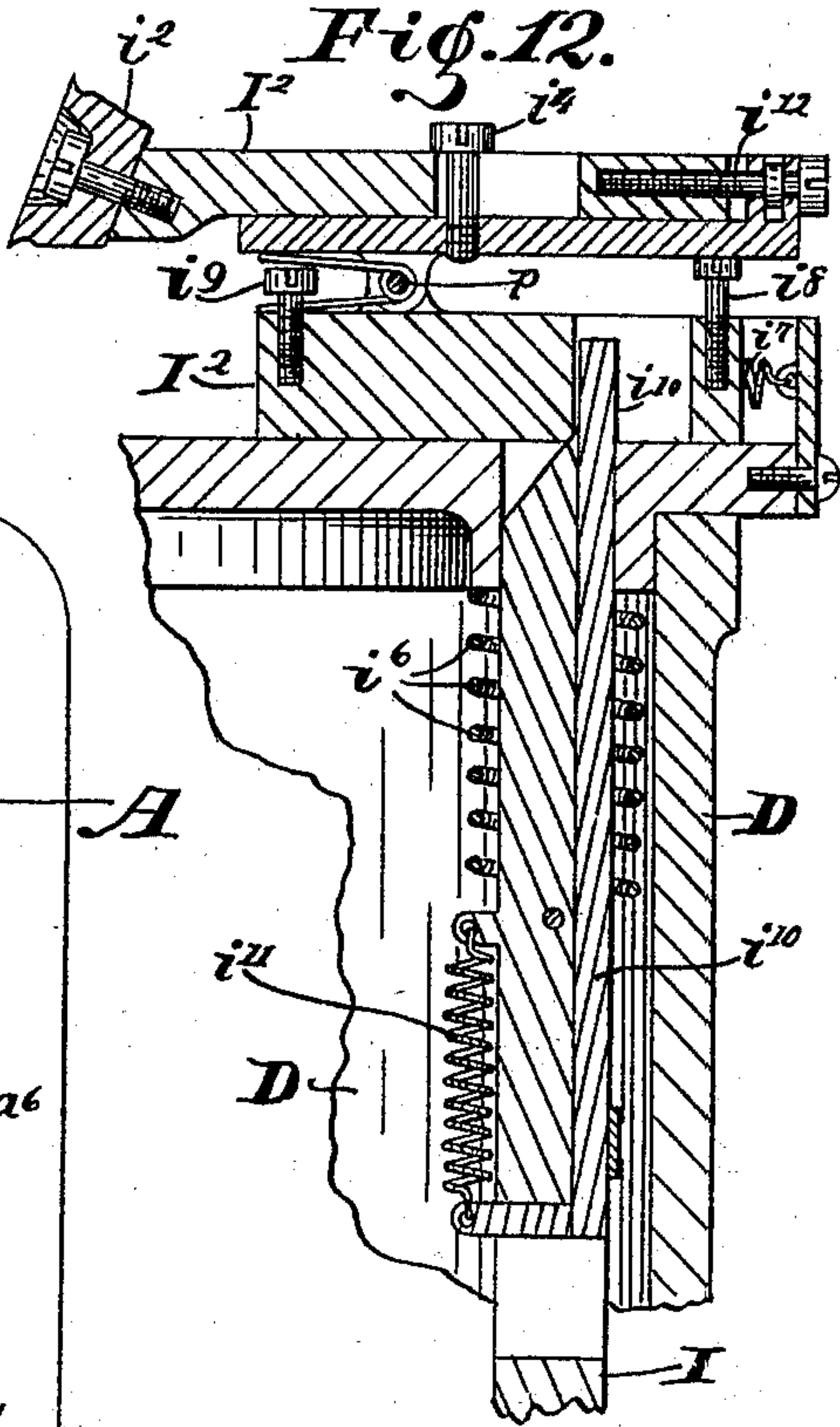


Fig. 16.

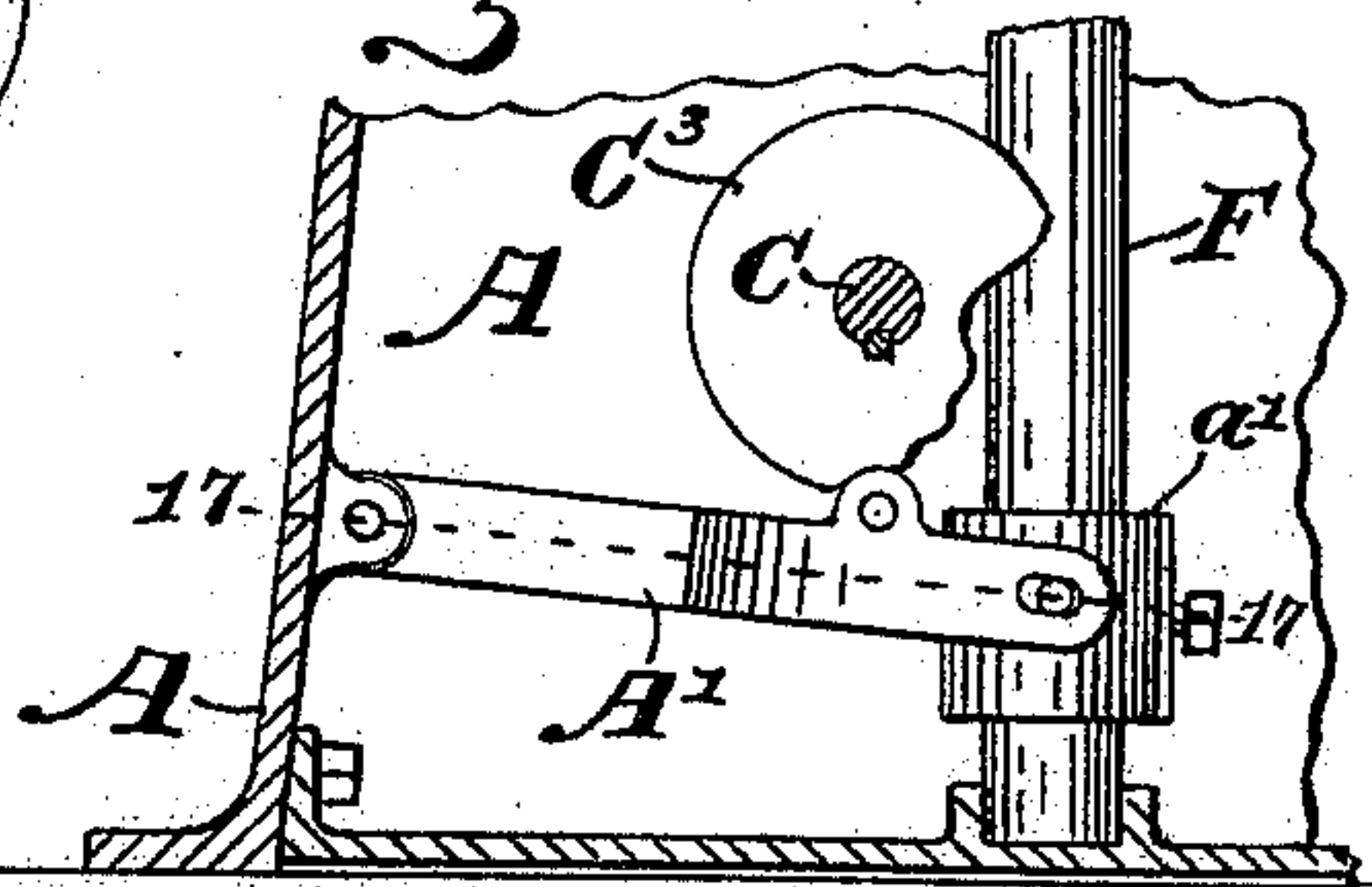
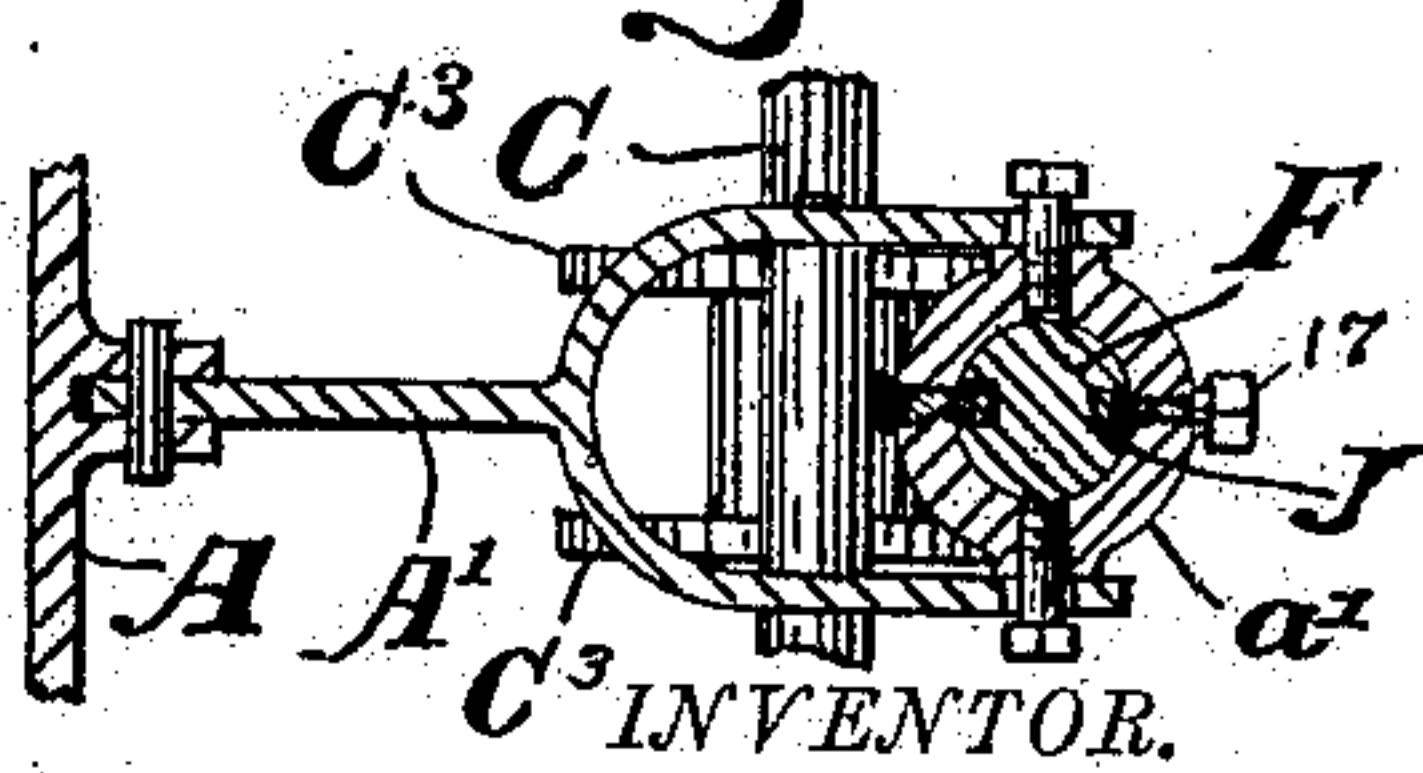


Fig. 17.



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(No Model.)

W. THOM.

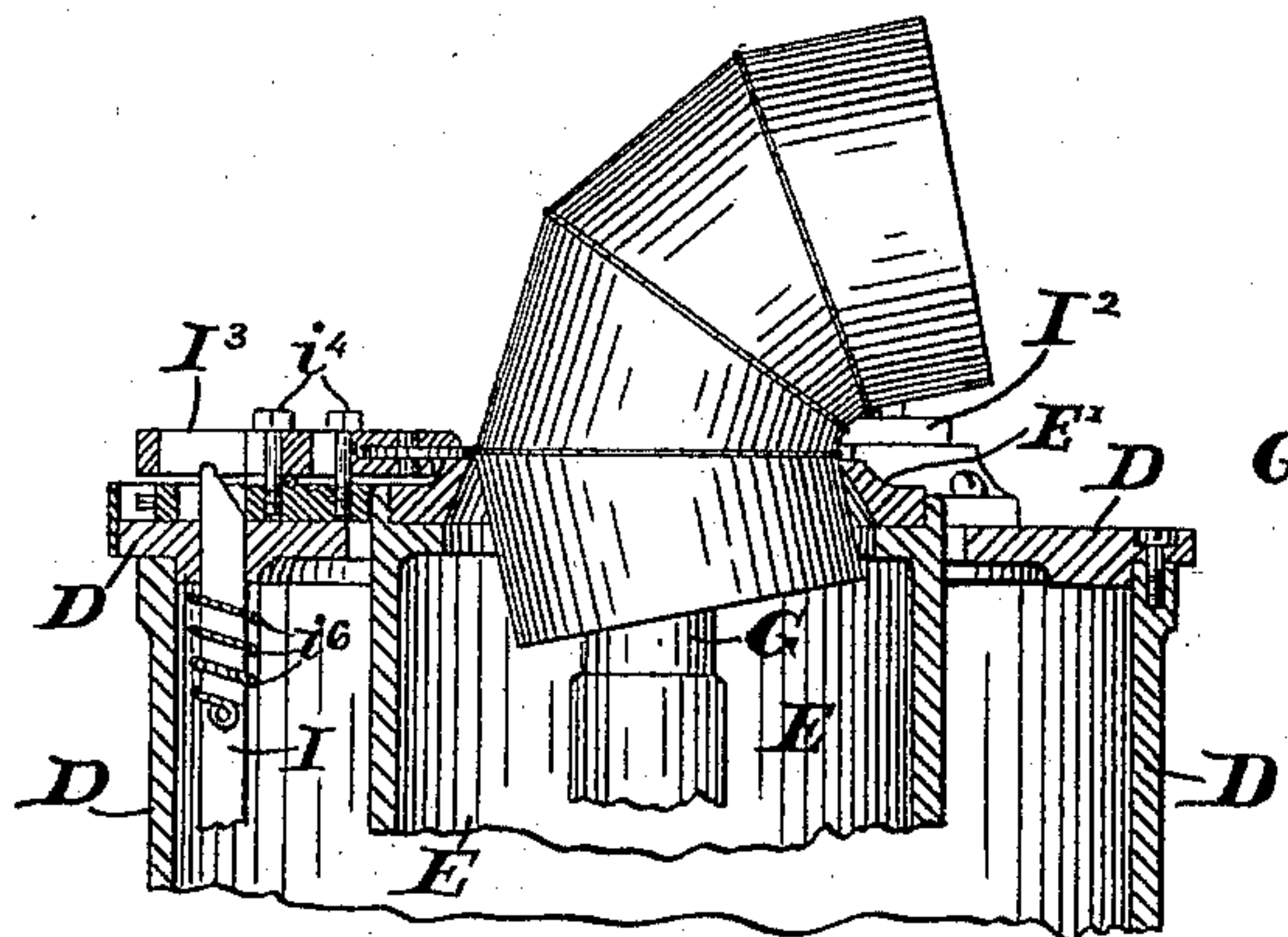
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LOCK SEAM ELBOW MACHINE.

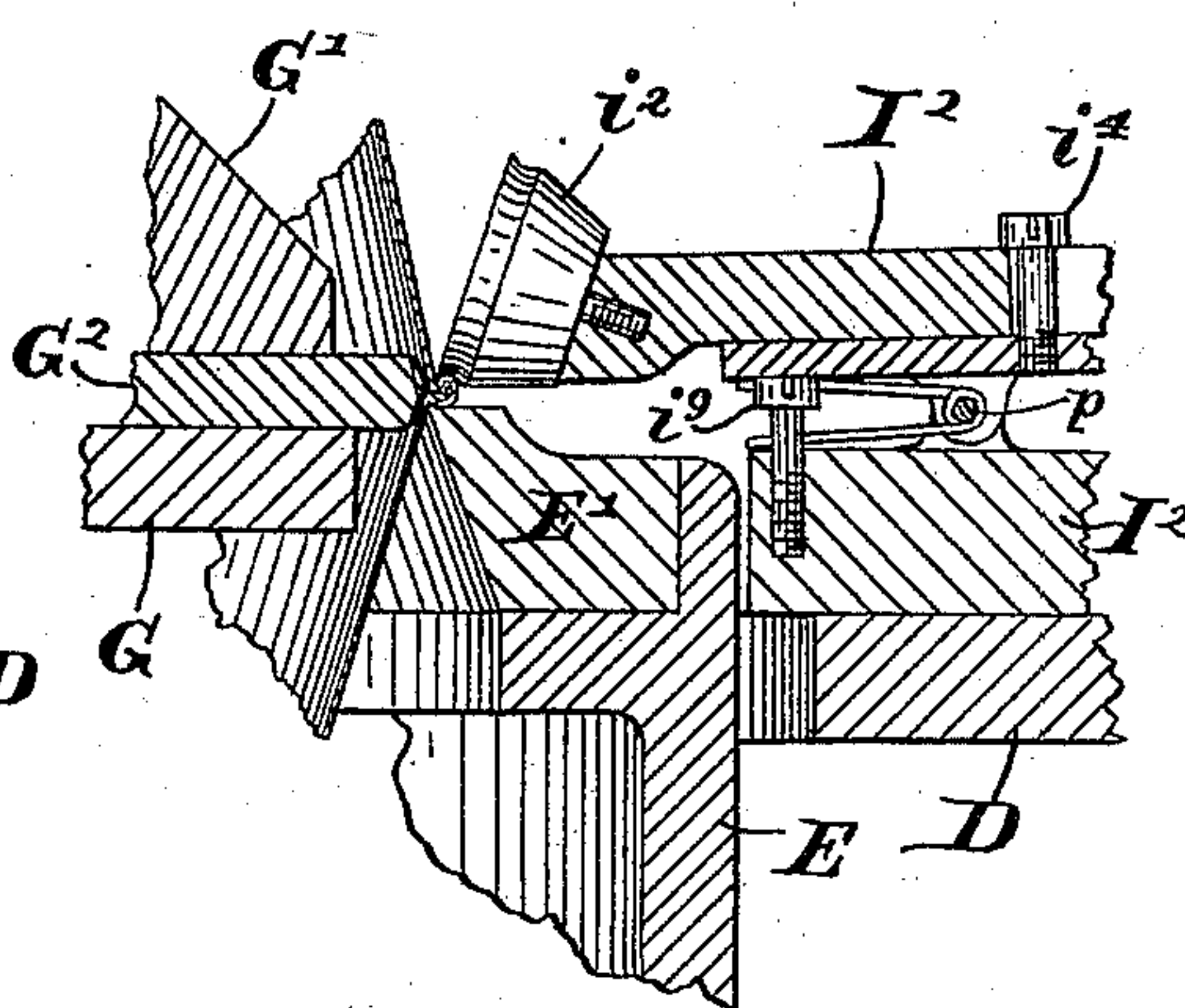
No. 365,652.

Patented June 28, 1887.

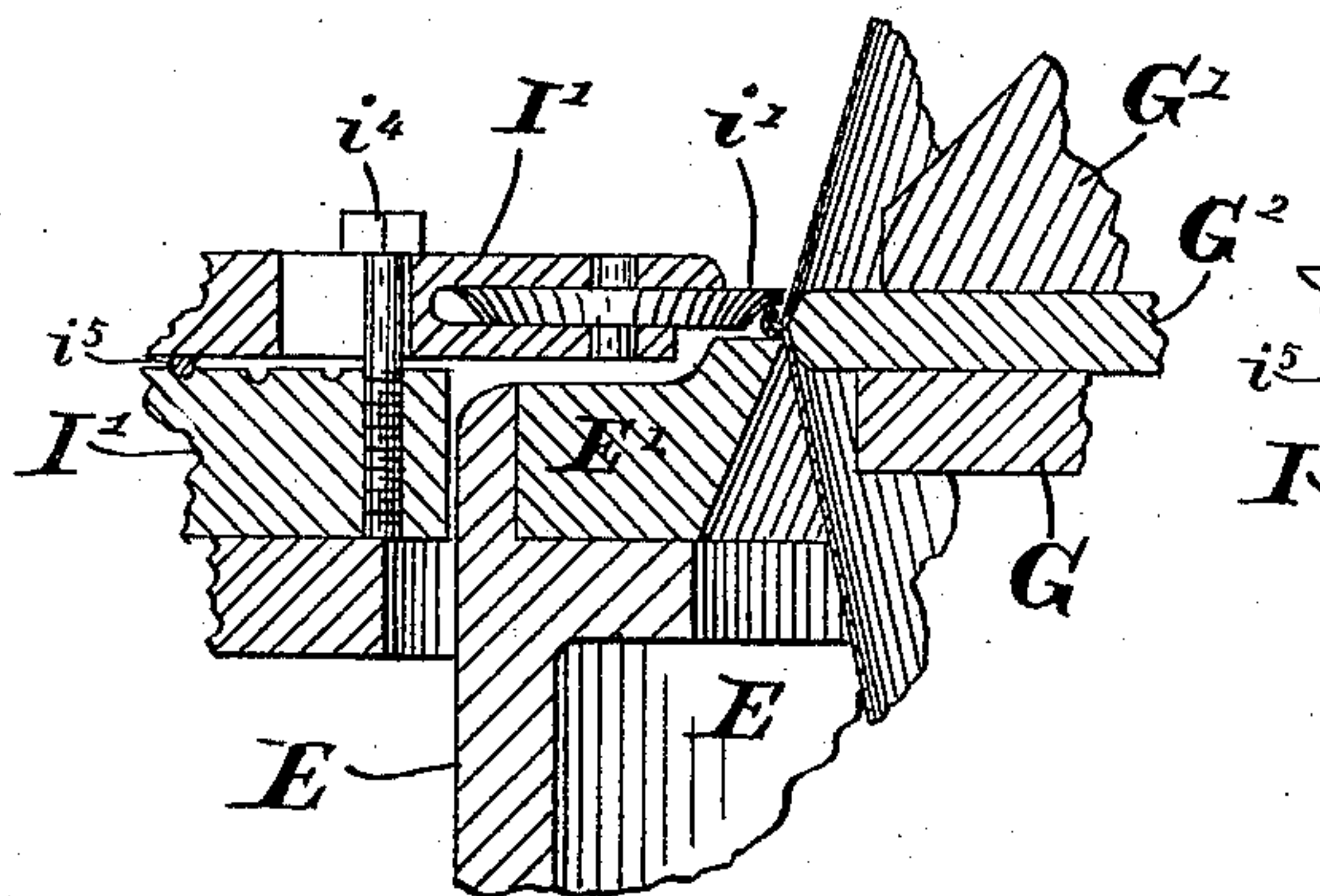
*Fig. 18.*



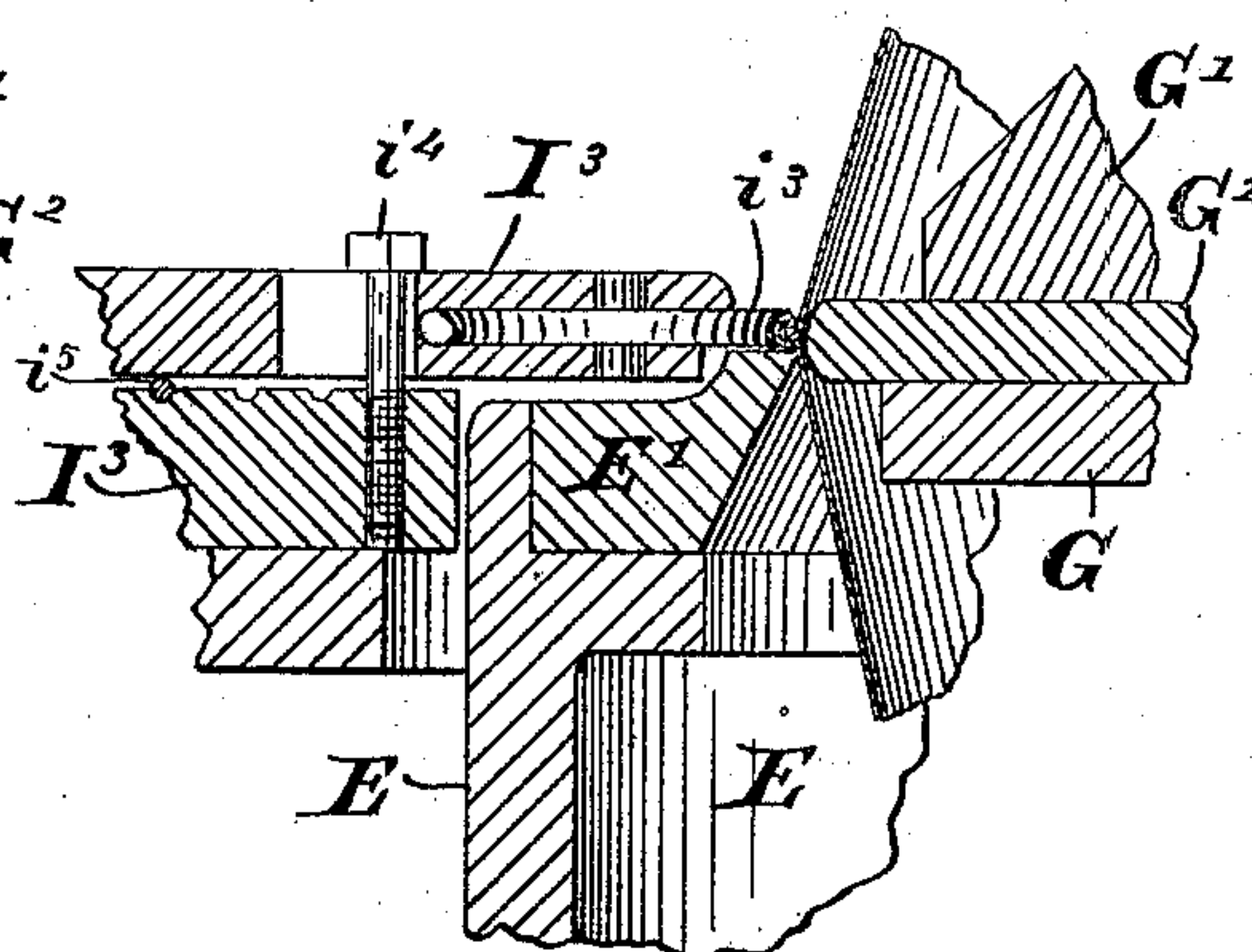
*Fig. 20.*



*Fig. 19.*



*Fig. 21.*



WITNESSES.

Chas. Leonard,  
Chas. R. Thuber.

INVENTOR.

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# UNITED STATES PATENT OFFICE.

WILLIAM THOM, OF INDIANAPOLIS, INDIANA.

## LOCK-SEAM-ELBOW MACHINE.

SPECIFICATION forming part of Letters Patent No. 365,652, dated June 28, 1887.

Application filed February 1, 1886. Serial No. 190,423. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM THOM, of the city of Indianapolis, county of Marion, and State of Indiana, have invented certain new and useful Improvements in Lock-Seam-Elbow Machines, of which the following is a specification.

My said invention relates to that class of machinery by which the seams uniting the several sections of stove-pipe elbows are finished or closed down and the elbow thus completed.

It consists in an improved machine for the purpose, whereby the joints of "lock-seam elbows" are so closed down or completed.

Referring to the accompanying drawings, which are made a part hereof, and on which similar letters of reference indicate similar parts, Figure 1 is a vertical sectional view through a machine embodying my invention on the dotted line 1 1 in Fig. 2, the forming-wheels, their carriers, and the operating mechanism therefor being omitted; Fig. 2, a similar view on the dotted line 2 2 in Fig. 1; Fig. 3, a detail central section through the central shaft or standard and adjacent or connected parts on the dotted line 3 3 in Fig. 2, being similar in part to Fig. 1; Fig. 4, a top or plan view of the complete machine; Fig. 5, a top or plan view of the expansion-head and clamping-jaws, the cone and cap portion being removed; Fig. 6, a horizontal sectional view looking upwardly from the dotted line 6 6 in Figs. 1 and 2; Fig. 7, a detail central sectional view of the cone and inside head or clamp on the dotted line 7 7 in Figs. 5 and 6; Fig. 8, a detail vertical section on the dotted line 8 8 in Figs. 4 and 9; Fig. 9, a horizontal sectional view on the dotted line 9 9 in Figs. 8 and 10; Fig. 10, a detail vertical sectional view looking toward the right from the dotted line 10 10 in Fig. 8; Fig. 11, a top or plan view of one of the forming-wheels and its carrier, similar to a portion of Fig. 4; Fig. 12, a longitudinal vertical section of the same on the dotted line 12 12 in Figs. 4 and 11; Fig. 13, a horizontal sectional view through the lower part of the machine, looking downwardly from the dotted line 13 13 in Figs. 1 and 2; Fig. 14, a detail sectional view looking toward the left from the dotted line 14 14 in Fig. 13; Fig. 15, a horizontal sectional view looking upwardly from the dotted line 15 15 in Fig. 13; Fig. 16,

a vertical sectional view looking to the left from the dotted line 16 16 in Fig. 13; Fig. 17, a horizontal sectional view looking downwardly from the dotted line 17 17 in Fig. 16; Fig. 18, a view indicating the position of the pipe-elbow in the machine while being operated upon, and Figs. 19, 20, and 21 detail views illustrating the operation of the several forming-wheels on said seam.

In said drawings, the portions marked A represent the frame-work of the machine; B, the main or driving shaft; C, a counter-shaft; D, the upper revolving casing or frame-work; E, the upper inner cylinder-head or frame-work; F, a central stationary rod or shaft mounted in the lower portion of the main frame-work A, and extending up and supporting the casing E; G, a central expansion-head or clamp carried by the frame E; H, a cone for operating the movable sections of said head or clamp; I<sup>1</sup> I<sup>2</sup> I<sup>3</sup>, three forming-wheel carriers, upon which the forming-wheels, which operate upon the elbow-seams, are mounted; J, rods by which, through various connections, these carriers and the cone are operated; and K, a treadle for tripping the lever, which holds the mechanism which operates the jaws, expansion-head, clamps, and forming-wheels out of operation until the proper time for them to operate has arrived.

The frame A is a hollow casting of the general form, exteriorly, of a frustum of a pyramid, and contains bearings for the shafts B and C, the extended hollow hub D', or shaft of the upper frame-work, D, and generally serves to support the mechanism of the machine. The shaft B rests in its bearing, carried by the frame A, and has a pulley or pulleys, B' B<sup>2</sup>, on its outer end, and a spur gear-wheel, b', and a miter gear-wheel, b<sup>2</sup>, on its inner end, through which it drives the other mechanism.

The shaft C is mounted in bearings, as shown, in the frame-work A, (see particularly Fig. 2,) and is driven by the spur gear-wheel b' on the shaft B and the spur gear-wheel c', (which is mounted and runs loosely on itself,) when brought into an engagement with an arm, C', by means of a clutch-pin, c<sup>2</sup>, therein, as will be hereinafter more fully described. When this shaft is caused to revolve, the cam-wheels C<sup>3</sup> thereon operate upon the lever A', which,



through the ring  $a'$ , operates to pull down upon the rods J and operate the expansion-head, clamps, jaws, and forming-wheels, as will be hereinafter more fully described.

5 The frame-work D is in effect, a hollow cylinder having an extended hollow hub,  $D'$ , which rests in a vertical bearing in the upper portion of the frame A and surrounds the rod or shaft F. To this extended hollow hub or  
10 shaft is secured the bevel gear-wheel  $d'$ , through which and through the similar gear-wheel,  $b^2$ , this upper frame-work or cylinder is driven from the shaft B, and is thus caused to revolve, while the inner mechanism, mounted on the  
15 upper end of the rod F, remains stationary.

The upper inner cylinder-head, E, is rigidly mounted on the upper end of the stationary rod or shaft F, and, like the upper frame-D, is substantially a hollow cylinder; but, unlike said frame D, it has two pivoted sides  
20 carrying jaws  $E'$ , (see particularly Figs. 1 and 5,) which can be spread out somewhat, while the other two sides or jaws remain stationary. By this means the opening is made to accommodate the shape of the pipe while it is being  
25 introduced, which, because of the angular character of the pipe-sections, is somewhat oblong instead of perfectly round. These sides are hung upon pivots  $e'$ , and are operated by a partially cone-shaped block,  $j$ , secured to the rods  
30 J, as shown most plainly in Fig. 1, and by springs  $e^2$ , operating reversely to said cone-shaped block. The arms  $E^2$ , which are connected to said pivoted sides, and through which  
35 the block  $j$  operates thereon, are constructed to spring somewhat, and thus insure a close grip on the pipe while it is being operated upon. These spring-arms are also made adjustable by means of set-screws  $e^3$  passing through the  
40 lower ends of the pivoted sides and resting against them.

The rod or shaft F is rigidly secured at its lower end to the bridge-tree  $A^2$  and extends up through the hollow hub or shaft  $D'$  to near the  
45 upper end of the machine, where the cylinder-head E is secured thereto. Its sides are grooved throughout their whole length, to receive the rods J, by which the partially cone-shaped block  $j$  and the cone H are operated.

50 The head G is a solid casting mounted on the inner portion of the cylinder-head E, and carries three wide jaws,  $G^2$ , and three narrow jaws,  $G^3$ , which, together, when forced out into position, form a circle, and bear closely against  
55 the entire inner side of the pipe being operated upon. The position of these jaws when in operative position is shown most plainly by the full lines in Fig. 5, and their position when released and out of operation is shown by the dotted  
60 lines in the same figure. These jaws rest and slide upon the upper face of the casting G. The wide ones,  $G^2$ , are held in position by pins or bolts  $g$ , which pass up from said casting G through slots therein, and the narrow ones,  $G^3$ ,  
65 are confined between said wide ones and the conical head H. Resting on top of these slid-

ing jaws, or, rather, upon central collars or enlargements on the bolts,  $g$  (see Fig. 7,) is a cone-ring,  $G'$ , and the bolts  $g$ , which pass up through the slots in the jaws, also pass through and se-  
70 cure this cone-ring in position.

The cone-shaped head H is secured to a rod,  $h$ , which passes down through the casting G and the inner portion of the cylinder-head E into a longitudinal orifice in the upper end of  
75 the rod F, and has a head on its lower end, as shown in Figs. 1 and 2, and also a pin,  $h'$ , as also shown in said figures. A cap,  $j'$ , surrounds this rod  $h$ , and between this cap and the head of said rod is interposed a coiled  
80 spring,  $h^2$ . The rods J are secured to this cap  $j'$ , and operate to move it up and down, whereby through the cone H and connections the sliding jaws  $G^2$  and  $G^3$  are operated. Said  
85 sliding jaws, when released from the pressure of the cone, are drawn inwardly or retracted toward the center by springs  $g'$ , which are attached thereto, as shown most plainly in Figs. 6 and 7.

The three forming-wheel carriers  $I'$ ,  $I^2$ , and  
90  $I^3$  are mounted in ways or slides in or secured to the upper plate of the frame D, and carry the forming-wheels  $i'$ ,  $i^2$ , and  $i^3$ , which operate upon the seams which secure the pipe-sections together in the following manner: The carriers  
95  $I'$  and  $I^3$  are substantially alike, and are operated in the same manner, and the construction of these two carriers is best shown in Fig. 8. The form of the wheel  $i'$ , which is carried  
100 by the carrier  $I'$ , is somewhat different from that of the wheel  $i^3$ , carried by the carrier  $I^3$ , the former being beveled inwardly from the upper edge, as shown in Fig. 19, while the latter is grooved or hollowed out on the edge, as  
105 shown in Figs. 8 and 21. These carriers consist of two parts, the lower of which rests upon the plate forming the top of the upper frame or cylinder, D, and slides thereon, and the upper portion of which is secured to said  
110 lower portion by means of bolts or machine-screws  $i^4$ , which pass down through slots in said upper portions and screw into said lower portions. Small grooves are formed trans-  
115 versely in the upper surfaces of said lower portions, and in one of the grooves rests a small pin or roller,  $i^5$ , interposed between said two portions, and by means of this roller acting as a fulcrum or pivot-bearing the relative position of said upper portion carrying the  
120 wheel may be varied, and said upper portion may be adjusted longitudinally on said lower portion by means of the slots therein. There are several of the transverse grooves in the upper surface of said lower portion, in order  
125 that said pin or roller may be moved from one to the other as said upper portion is adjusted back and forth, and thus maintain its relative position to said upper portion. These carriers are operated in the following manner: The rods  
130  $I$ , having beveled upper ends, are mounted in bearings in the frame D, as shown, and the points of said beveled ends extend up into ori-



fices in the rear ends of the lower portions of said carriers. At or near the lower ends these rods I come into engagement with the pivoted levers *i*, which in turn extend across to and engage with the partially cone-shaped block *j*, attached to the rods J. As said rods J are pulled down, this block comes in contact with the inner ends of these levers, and through them operates to force said rods I upwardly, and the bevels on the upper ends of said rods operate upon and force said carriers inwardly, and the operating-wheels are thus brought into contact with the seam of the pipe sections it is intended to operate upon. When the pull on the rods J is released, the springs *i'*, surrounding the rods I, operate to force said rods I downwardly, thus releasing said carriers, and allowing them to slide back and carry the forming-wheels out of engagement, which they are caused to do by springs *i'*, (see Fig. 9,) provided for the purpose. The lower portion of the carrier *I*<sup>2</sup> is much like the lower portions of the carriers *I*<sup>1</sup> and *I*<sup>3</sup>, except that it is divided into two parts, the upper one of which is secured to the lower portion by a hinged joint, *p*, and is adapted to rock on said joint to such extent as is desirable, this being determined by the adjusting-screws *i*<sup>8</sup> *i*<sup>9</sup>. The upper portion proper of said carrier is secured to said upper part of the lower portion by a bolt or machine screw, *i*<sup>4</sup>, similar to the corresponding bolts or machine-screws of the other carriers. This carrier is also slid forward in the same manner as are the carriers *I*<sup>1</sup> and *I*<sup>3</sup>; but there is an additional movement given to the upper portion by means of the hinged or pivoted arrangement just described and a supplemental rod, *i*<sup>10</sup>, which is mounted in a groove and slot in the rod I, and is secured thereto by a spring, *i*<sup>11</sup>, as shown in Fig. 12.

The operation, so far as moving the whole structure of the carrier horizontally is concerned, is, as before stated, the same as in the other cases; but this sliding rod *i*<sup>10</sup>, as the rod is forced upwardly, comes in contact with the under side of the rear of the upper portion just as it reaches the proper point in its forward movement and tilts the inner end, carrying the forming-wheel *i*<sup>2</sup> down onto the seam being operated upon, and thus presses downwardly as well as inwardly at the same time on said seam. The spring *i*<sup>11</sup>, when the limit of this movement is reached, gives way and obviates any danger of breakage, notwithstanding the continued upward movement of the rod I. The upper portion of this carrier *I*<sup>2</sup> may be given a very exact position relatively to the lower portion by means of the adjusting-screw *i*<sup>12</sup>, which is provided with a collar and mounted between the parallel projections on the upper part of the lower portion, as will be plainly understood from an examination of Fig. 12.

On the rods I, near the lower ends, are secured adjustable bearing-plates *i*<sup>13</sup>, with which the pivoted levers *i* come in contact. The pur-

pose of these adjustable plates is to cause the forming-wheels to come in contact with the seam being operated upon in the desired succession, and therefore the bearing-plate on the rod which operates upon the arm *I*<sup>1</sup> is set lower than that upon the rod which operates the carrier *I*<sup>2</sup>, and the plate upon the rod which operates the carrier *I*<sup>3</sup> is higher than either of the others, so that, as in its downward movement the block *j* operates these levers *i*, the first rod to be operated will be that which operates the carrier *I*<sup>1</sup>, as the forming-wheel carried by said carrier is the one which should first operate in forming the seam, and so on in the succession indicated.

The rods J, as before stated, are located in grooves in the sides of the rod or shaft F, and extend from the upper portion of the machine down through said grooves to the lower portion, where they are connected to a collar or ring, *a'*, which surrounds said rod or shaft F, which collar or ring is connected by appropriate pins to the pivoted lever *A'*, which said lever carries the roller on which the cam-wheels *C*<sup>3</sup> operate. Said cam-wheels are mounted rigidly on the shaft C, which shaft also, as before stated, carries a loosely-running spur gear-wheel, *c'*, on the hub of which are several projections, *c*<sup>3</sup>. An arm, *C'*, is rigidly mounted on said shaft C alongside of the hub of said wheel *c'*, and carries (mounted in a suitable orifice therein) a clutch-pin, *c*<sup>2</sup>, seated upon a spiral spring, as shown in Fig. 15, and connected with a pivoted lever, *C*<sup>2</sup>, by means of a small pin, *c*<sup>4</sup>. This lever (see Fig. 13) extends back and curves around in contact with another lever, *C*<sup>4</sup>, which is pivoted to the frame-work A by a pivot, *c*<sup>5</sup>, and which when in engagement holds said lever *C*<sup>2</sup> in such position as to hold the clutch-pin out of engagement with the projections *c*<sup>3</sup> on the hub of the wheel *c'*.

The treadle K is pivoted to the frame A and extends out into a foot-piece upon the outside. A rod, *K'*, resting in bearings *a*<sup>2</sup> *a*<sup>3</sup> on the frame-work, is pivoted thereto and connected at its upper end to a spring, *k*, which is in turn secured to a lug, *a*<sup>4</sup>, near the upper portion of the frame A. Upon said rod *K'* is a pivoted catch, *k*, which engages with the outer end of the lever *C*<sup>4</sup>, and thus, when said rod is pulled down by the operation of said treadle, the inner end of said lever *C*<sup>4</sup> is raised up and released from engagement with the lever *C*<sup>2</sup>, and thus the clutch-pin *c*<sup>2</sup> is permitted to be operated, by the spring on which it is seated, to be forced into engagement with the projections *c*<sup>3</sup> on the hub of the wheel *c'*, and said wheel being in continual rotation will thus drive said shaft until said clutch-pin is withdrawn from such engagement, which is accomplished in the following manner: As the arm *C'* revolves with the shaft C the lever *C*<sup>2</sup> thereon will again come in contact with the projecting pin on the lever *C*<sup>4</sup> and be forced around on its pivot until the clutch-pin *c*<sup>2</sup> is



withdrawn from engagement, when of course the revolution of the shaft C will cease. The lever C<sup>4</sup> is pivoted to the side of the frame A by a pivot, c<sup>5</sup>, and its inner end is secured in proper position to come into engagement with the curved end of the lever C<sup>2</sup> when said lever C<sup>4</sup> is not pulled down by the operation of the treadle K and its attachments by a lug, a<sup>6</sup>, which extends out from the side of the frame to beneath the end of said lever C<sup>4</sup>.

The operation of my machine may be briefly recapitulated as follows: The main shaft being set in motion by the motor provided therefor, the upper cylindrical frame, D, and the wheel c' are revolved thereby. An elbow in the proper condition being then introduced into the machine, (see Fig. 18,) the operator steps on the foot-piece of the treadle K, which, as before described, releases the clutch mechanism and causes the counter shaft C to revolve. The cam-wheel C<sup>3</sup> on said shaft C then operates to pull down the rods J, and they, through the block j, operate through the arms E<sup>2</sup> to force in the pivoted sides of the cylinder-head E, through the pivoted levers i, to operate the rods I, and through them the several sliding carriers I' I<sup>2</sup> I<sup>3</sup>, carrying the forming-wheels, and through the rod h to pull down the vertically-moving cone-shaped head H and force out the several sliding jaws forming the inner clamp or expansion-head, thus completely clamping the pipe-section both inside and out and bringing the forming-wheels into contact with the seam, all at one operation.

As will be seen by an examination of the drawings, particularly Fig. 5, the edges of the several jaws of the inner clamp or expansion-head when forced out to their extreme position just form a perfect and complete circle, and thus bear equally at all points upon the inner surface of the section of pipe being operated upon, leaving no interstices or vacant spaces between them, which, as will be readily understood, is a considerable advantage, as all portions of the pipe are thus supported equally. When the cone H is raised, the springs g' (see particularly Fig. 6) retract these jaws into the position shown by the dotted lines in Fig. 5, thus leaving a sufficient space for the introduction of the pipe. The forming-wheels, by reason of the adjustment of the connections between the pivoted levers i and the rods I, come successively into contact with said seam, the wheel i' first, which rounds over the flange somewhat, the wheel i<sup>2</sup> second, which takes the seam where left by the forming-wheel i' and closes or curls it down and turns in the edge, and the wheel i<sup>3</sup> third, which comes up against the seam, which is now nearly finished, and closes the parts tightly together, thus making a perfect lock-seam.

Efforts have been made to form a lock-seam elbow, but with indifferent success. I have found by experiment that to make such a lock-seam joint a revolving carrier having a curved former mounted thereon so as to move

inward and downward, to curve and spin over the edge of the outward-hooked flange nested therein, as shown in Fig. 20, is an indispensable requisite, because of the angular or curved form of the pipe. A straight-moving tube will not form the joints around the throat of the elbow, and therefore the process is inseparable from the mechanism.

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

1. In an elbow-machine, the combination, with an expanding central clamp and an outside joint or seam-support, E', of a revolving wheel-carrier, I<sup>2</sup>, with mechanism for moving the same inwardly and downwardly for turning in and compressing down the edge seam, substantially as described.

2. In an elbow-machine, the combination of a central clamp, an outside seam-support, and the revolving carrier I<sup>2</sup>, mounted and connected by a hinge-joint with the lower portion of the carrier, so as to permit the roller or former to be moved inward and downward in the act of turning the edge of the seam, substantially as described.

3. In an elbow-machine, the combination, with a central clamping mechanism and an outer seam-support, of a traveling former constructed and operated to move upon the curved hook-flange of one section of the article to be seamed and force it over and down into the flange of the other section, substantially as described.

4. The combination, in a machine for closing down or finishing the seams which unite sections of sheet-metal pipe, of a lower stationary frame, an upper revolving frame or cylinder carrying the forming-wheels, a central stationary rod or shaft carrying the expansion clamping-head, and vertical sliding rods laid in grooves in said stationary rod or shaft, whereby the mechanism in said head and said revolving upper frame or cylinder may be operated from below.

5. The combination of the main shaft, a counter-shaft, a wheel loosely running on said counter-shaft and driven from said main shaft and having projections on its hub, an arm, C', rigidly secured to said counter-shaft, a spring-seated clutch-pin therein, a curved lever pivoted on said arm C', a lever pivoted to the frame-work and engaging with the curved end of said lever at one end and with mechanism for tilting or tripping it at the other, cam-wheels C<sup>3</sup>, mounted on said counter-shaft and engaging with mechanism connected to the sliding rods J, and said sliding rods, whereby as said clutch mechanism is operated said rods will be pulled down and thus operate the expansion-head and other mechanism, substantially as shown and specified.

6. The combination of the main shaft, a counter-shaft, a wheel loosely mounted on said counter-shaft and driven from said main shaft, a clutch mechanism whereby said shaft may



be upon occasion driven by said wheel, a cam-wheel mounted on said shaft, a stationary central rod or shaft having grooves in its sides, rods placed in said grooves and connected to a ring or collar at the lower end and to the operating mechanism at the upper end, a connection between said ring or collar and said cam-wheel, whereby when said shaft is revolved said rods may be caused to operate the mechanism connected thereto, substantially as set forth.

7. The combination of a lower stationary frame, a central stationary shaft therein, an upper revolving frame or cylinder having an extended hollow hub, gearing connected to and driving said frame through said hollow hub, forming-wheels and carriers therefor mounted upon the top of said revolving upper frame or cylinder, a central cylindrical head or clamp mounted on the upper end of said central stationary shaft, an inner expanding-head or clamp secured to the inner portion of said cylindrical head, rods extending down alongside said central stationary shaft, connections between said rods and said expanding-head or clamp and forming-wheel carriers, and mechanism for giving said rods a reciprocating movement.

8. The combination of reciprocating rods J, having a block, *j*, attached thereto, a central stationary shaft, F, a central cylinder, E, mounted thereon, a head, G, mounted on the inner portion of said cylinder E, sliding jaws thereon which form an inner clamp, and jaws on said cylinder E, which form an outer clamp, arms extending from said outer jaws and adapted to come in contact with the block *j*, and a cone, H, connected to said rods J and adapted to expand said inner jaws, substantially as set forth.

9. The combination, in an expansion-head, of a base, G, sliding jaws  $G^2$   $G^3$ , mounted on said base, a cone for expanding said sliding jaws, and springs *g'*, for retracting them, all substantially as shown and described.

10. A clamping-head consisting of a solid base, six sliding jaws mounted thereon, three of said jaws being wide and secured in position by bolts passing through slots therein, and three being narrow and filling the interstices between said wide jaws, the outer edges of said several jaws being formed so that when they are expanded they will together form a complete circle, substantially as shown and described.

11. An expansion or clamping head consisting of a base, sliding jaws mounted thereon, and an upper conical ring connected to said base by bolts passing through slots in said jaws, said ring being supported by collars or enlargements on said bolts, substantially as shown and described.

12. The combination, with a clamping-head consisting, essentially, of expanding jaws, of an inverted cone for expanding said jaws, a rod upon which said cone is mounted, a head

on said rod, a collar or ring surrounding said rod, a spring interposed between said head and said collar, whereby said operation is rendered elastic and yielding, and rods connected to said collar by which said rod and cone are operated, substantially as described.

13. The combination of a clamping head or cylinder, E, having pivoted sides carrying jaws  $E'$ , arms  $E^2$ , secured to said pivoted sides, reciprocally-moving rods J, and a vertical cone-shaped block, *j*, which comes in contact with and operates said arms and through them said pivoted jaws, substantially as set forth.

14. The combination of the head or cylinder E, the pivoted sides carrying clamping-jaws therein, the arms  $E^2$ , secured to said pivoted sides, constructed of spring metal, and adjusting-screws  $e^3$ , for adjusting said spring-arms, substantially as set forth.

15. The combination of the head or cylinder E, pivoted sides therein carrying clamping-jaws  $E'$ , arms on said pivoted sides, reciprocally-moving rods carrying a block, *j*, and springs  $e^2$ , operating reversely to the operation of said block on said arms, substantially as set forth.

16. The combination of the vertically-moving rods J, the inverted cone H, the rod *h* therefor, extending down between said rods J and having a head on its lower end, a ring or collar, *j'*, surrounding said rod *h* and connected to said rods J, a spring,  $h^2$ , interposed between the head on the rod *h* and said collar *j'*, and a pin, *h'*, passing through the rod *h*, substantially as set forth.

17. The combination of the vertically-moving rods J, the block *j* thereon, the pivoted levers *i*, mounted in bearings in the frame or cylinder D, vertically-moving rods I, having cam-shaped upper extremities, and forming-wheel carriers with which said upper ends engage, substantially as set forth.

18. The combination of the vertically-moving rods J, the block *j* thereon, the vertically-moving rods I, which operate the forming-wheel carriers, adjustable plates  $i^{13}$  on said rods I, and pivoted levers *i*, bearing at one end against said adjustable plates and at the other end against said block *j*, whereby said rods I are operated from said rods J, substantially as set forth.

19. The combination, with the forming-wheel carriers having openings therein, of vertically-moving rods I, having cam-shaped upper ends which enter said openings, whereby as said rods are forced upwardly said forming-wheel carriers will be forced inwardly, substantially as set forth.

20. The combination, with the forming-wheel carriers, of vertically-moving rods I, having cam-shaped upper ends for forcing them forward, and retracting-springs  $i^7$ , for drawing them backward when released from the operation of said vertically-moving rods I, substantially as set forth.

21. The combination of the forming-wheel



carriers, vertically-moving rods I, for operating the same, pivoted lever-connections, whereby they are operated to move upwardly by the rods J, and springs  $i^6$ , whereby they are re-  
 5 tracted when released from the operation of said rods J.

22. A forming-wheel carrier consisting of two portions secured together by machine-screws or bolts, one portion having transverse  
 10 grooves in its surface, and a pin or roller,  $i^5$ , adapted to rest in one of said grooves, whereby the relation of the upper to the lower portion may be adjusted, substantially as set forth.

23. The combination of a lower portion  
 15 mounted and adapted to slide in ways on the upper revolving frame or cylinder, an upper portion adjustably secured thereto, the two forming a forming-wheel carrier, and the forming-wheel mounted in the point of said  
 20 upper portion and operated thereby, substantially as shown and specified.

24. The combination of a series of forming-wheel carriers and forming-wheels mounted therein, two of which are moved inwardly on  
 25 a horizontal plane during the operation of the machine and the other of which is moved inwardly and also downwardly, thus operating to compress the seam being operated upon in both directions, substantially as set forth.

30 25. The combination of two portions hinged together by a hinge-pivot,  $p$ , and forming a forming-wheel carrier, a forming-wheel,  $i^2$ , mounted on the upper portion of said carrier, a vertically-moving rod, I, having a cam-shaped  
 35 upper end for moving said forming-wheel carrier inwardly, and a second rod,  $i^{10}$ , secured to

the first, adapted to come in contact with the under side of the upper portion of said forming-wheel carrier and force its inner end downwardly, substantially as described, and for the  
 40 purposes specified.

26. The combination of the forming-wheel carrier  $I^2$ , the lower portion of which is constructed of two parts and hinged together and the upper portion of which is longitudinally  
 45 adjustable thereon, the screws  $i^4$  and  $i^{12}$ , by which said adjustment is effected, the hinge  $p$ , by which the two parts of said lower portion are secured together, and the adjustable screws  
 50  $i^8$  and  $i^9$ , by which the movement of the upper part on said hinge is determined, substantially as set forth.

27. The combination of three forming-wheel carriers, each carrying a forming-wheel, and three vertically-moving rods, I, for operating  
 55 the same, each of which is provided with an adjustable plate,  $i^{13}$ , said plates being arranged in different positions, whereby all of said vertically-moving rods can be operated from the  
 60 same power or point and yet be operated successively, and the forming-wheel  $i^1$  be thus first brought into operation, the forming-wheel  $i^2$  second, and the forming-wheel  $i^3$  third, substantially as set forth.

In witness whereof I have hereunto set my  
 65 hand and seal, at Indianapolis, Indiana, this 28th day of January, A. D. 1886.

WM. THOM. [L. S.]

In presence of—

C. BRADFORD,  
 CHARLES L. THURBER.