

(No Model.)

2 Sheets—Sheet 1.

L. H. STELLMANN.
PERFORATING MACHINE.

No. 436,810.

Patented Sept. 23, 1890.

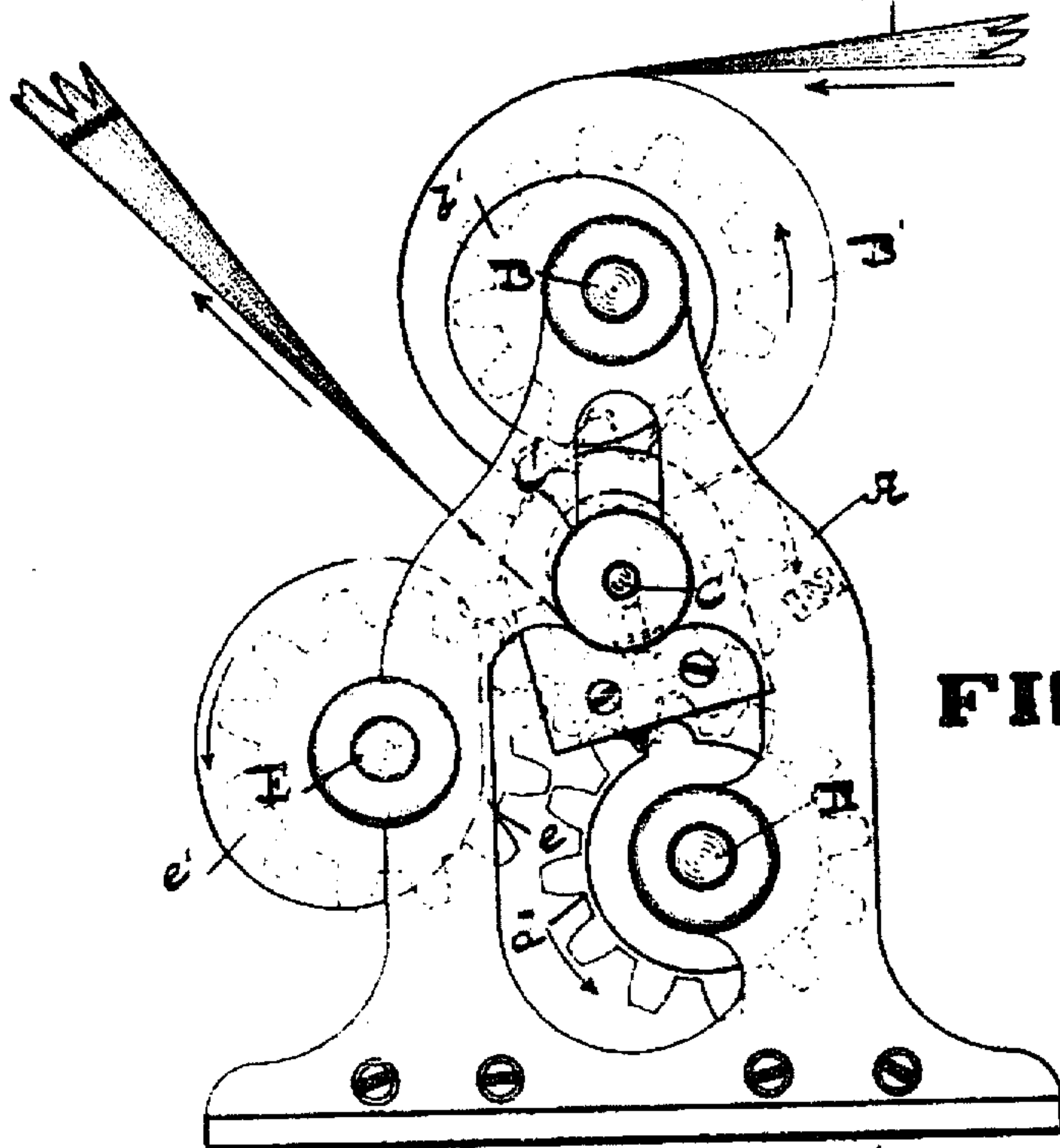


FIG. 1.

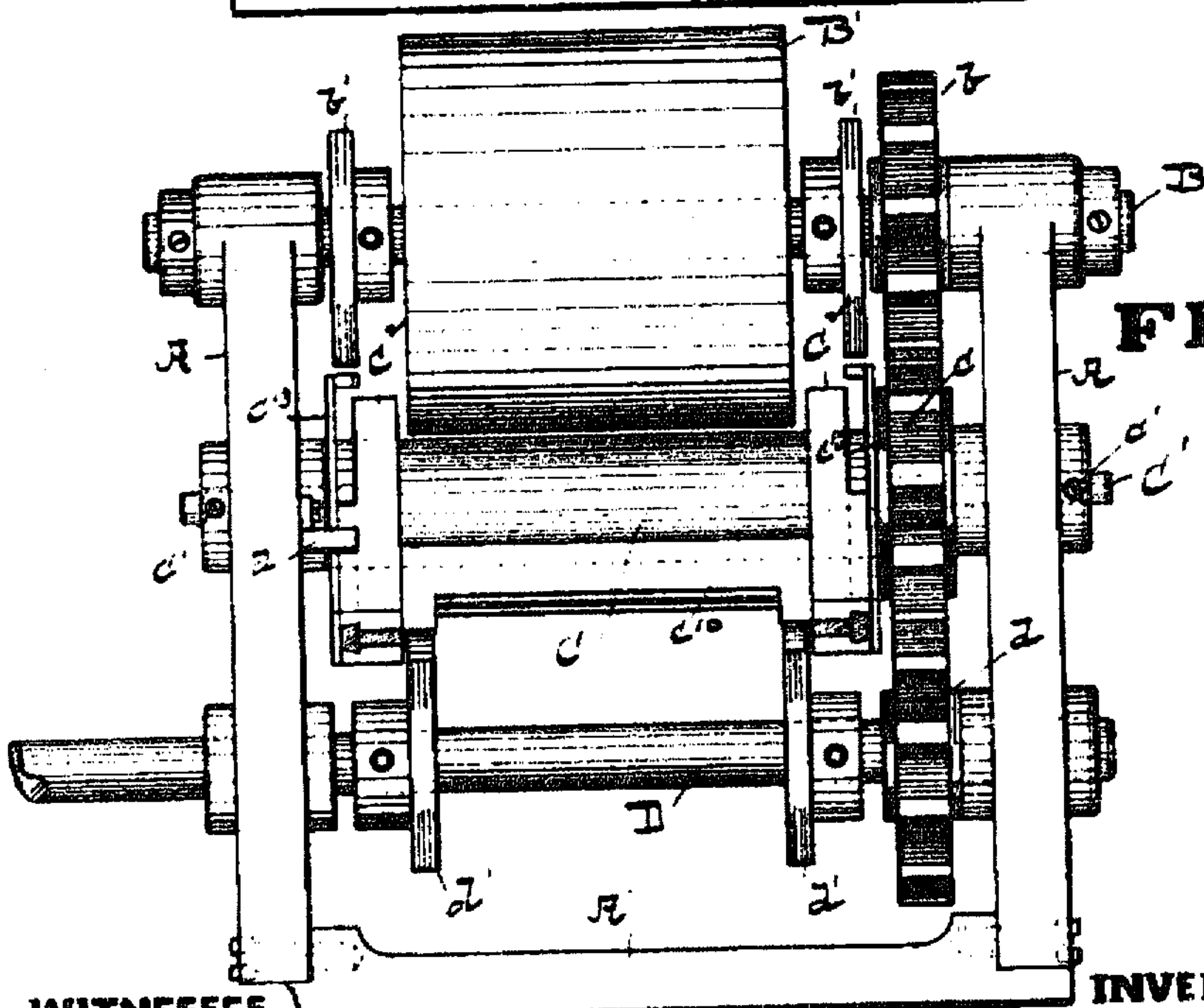


FIG. 2.

WITNESSES.

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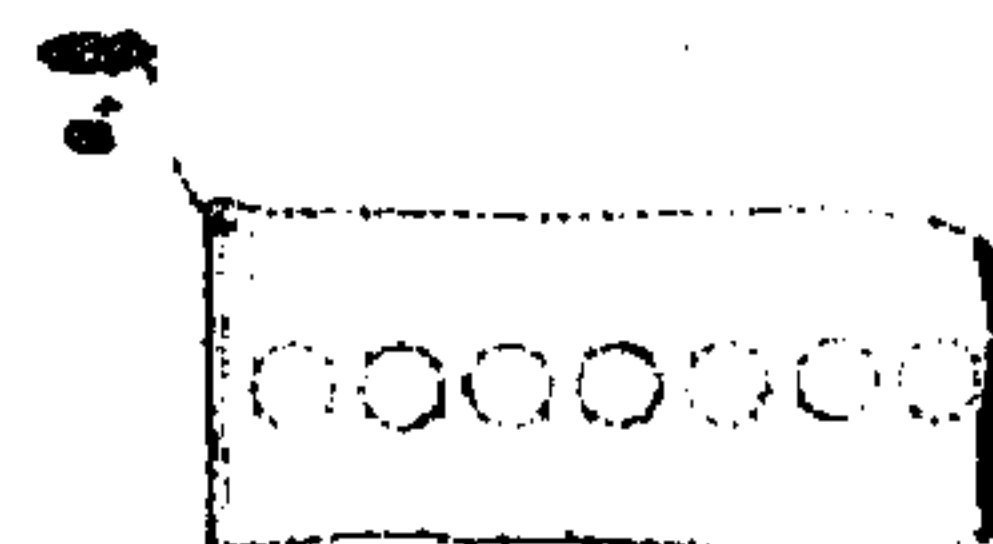
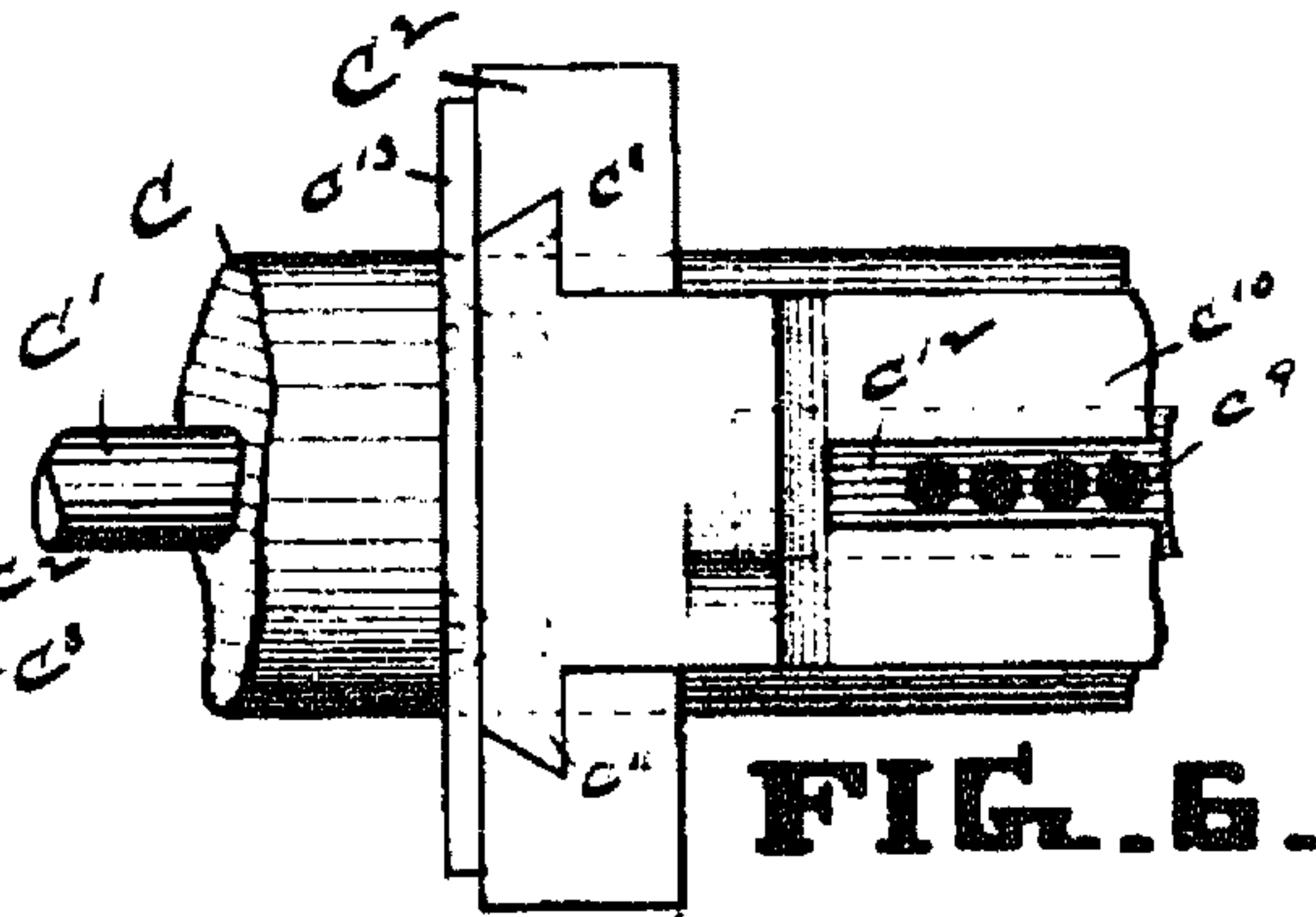
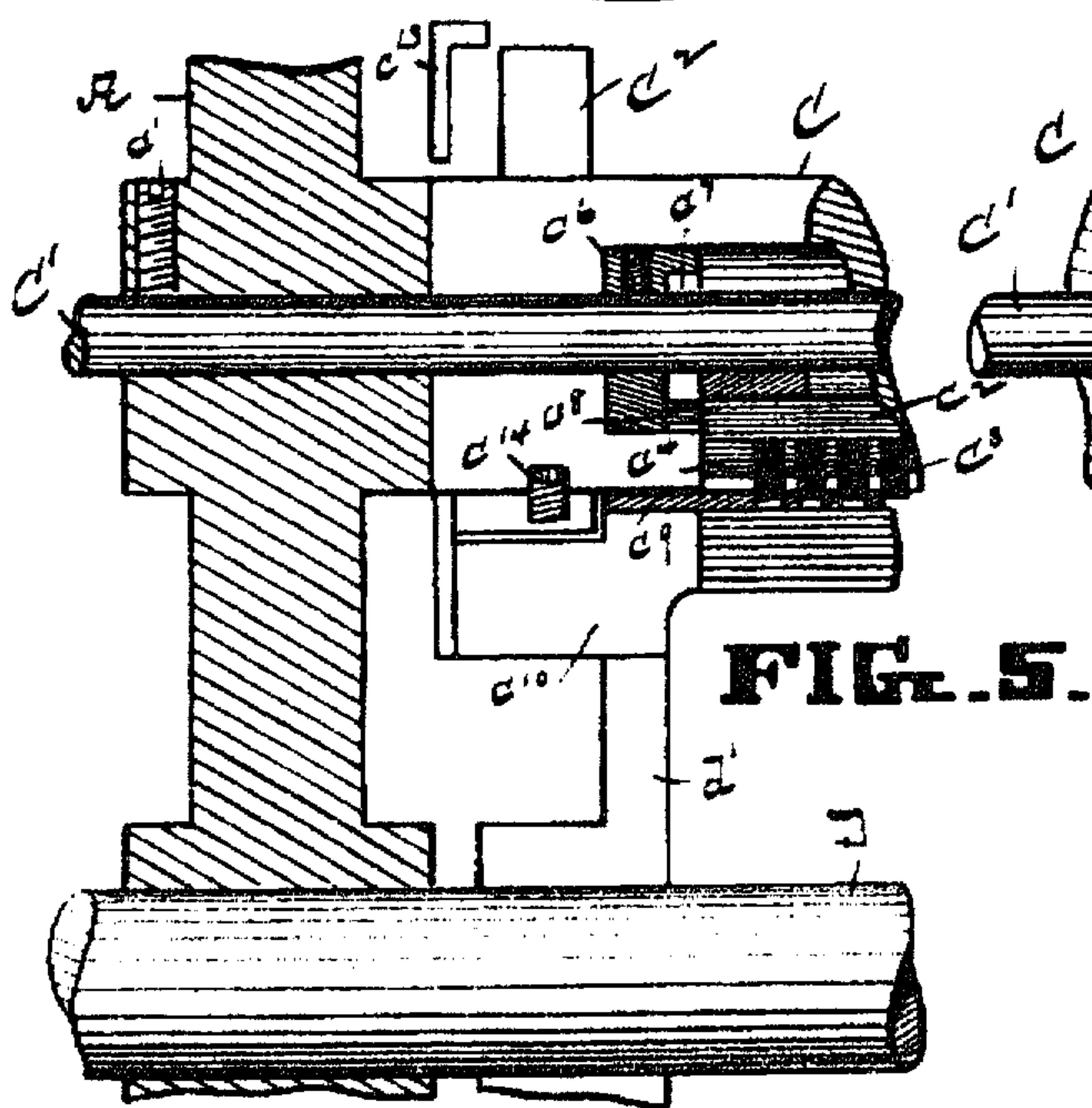
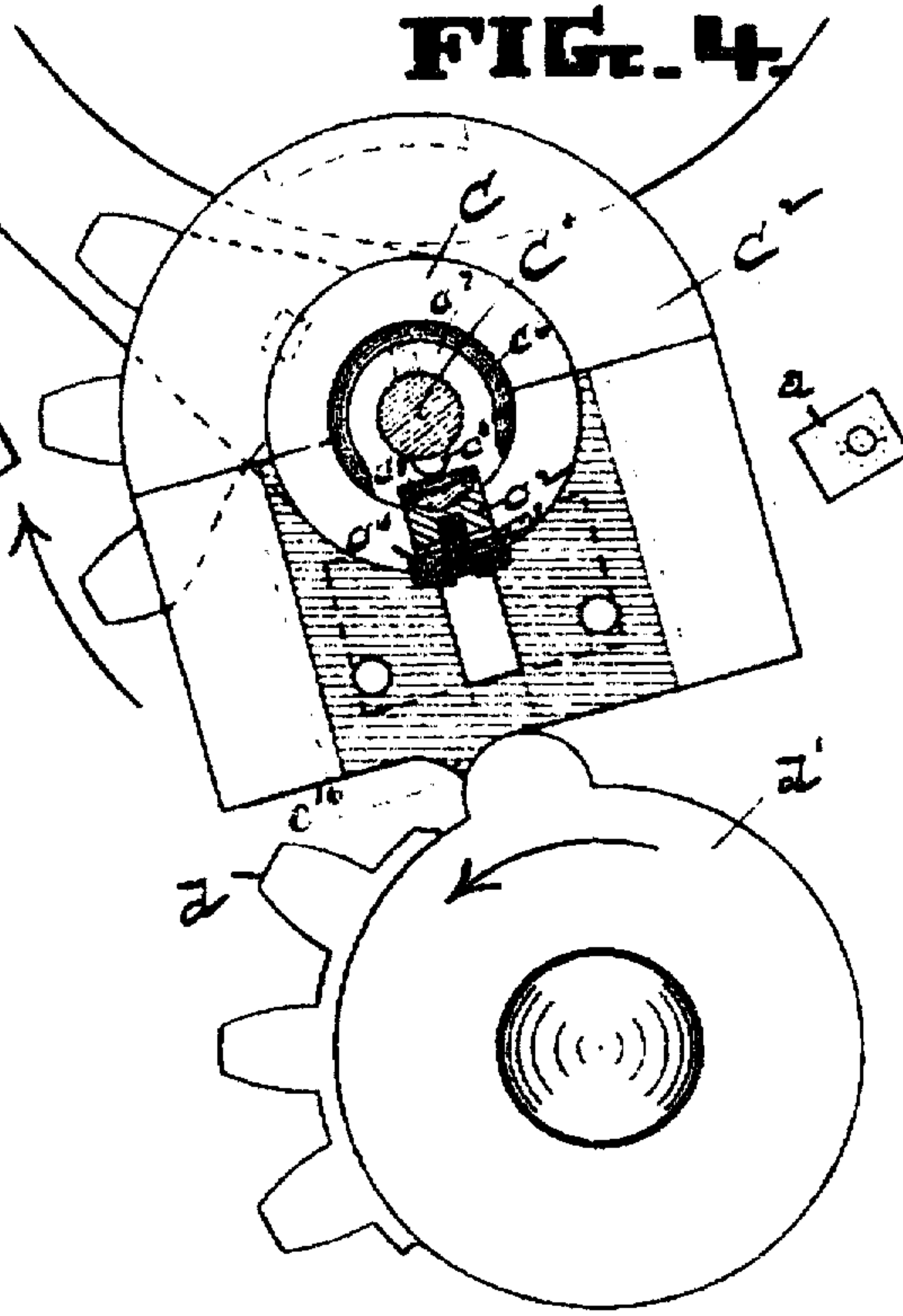
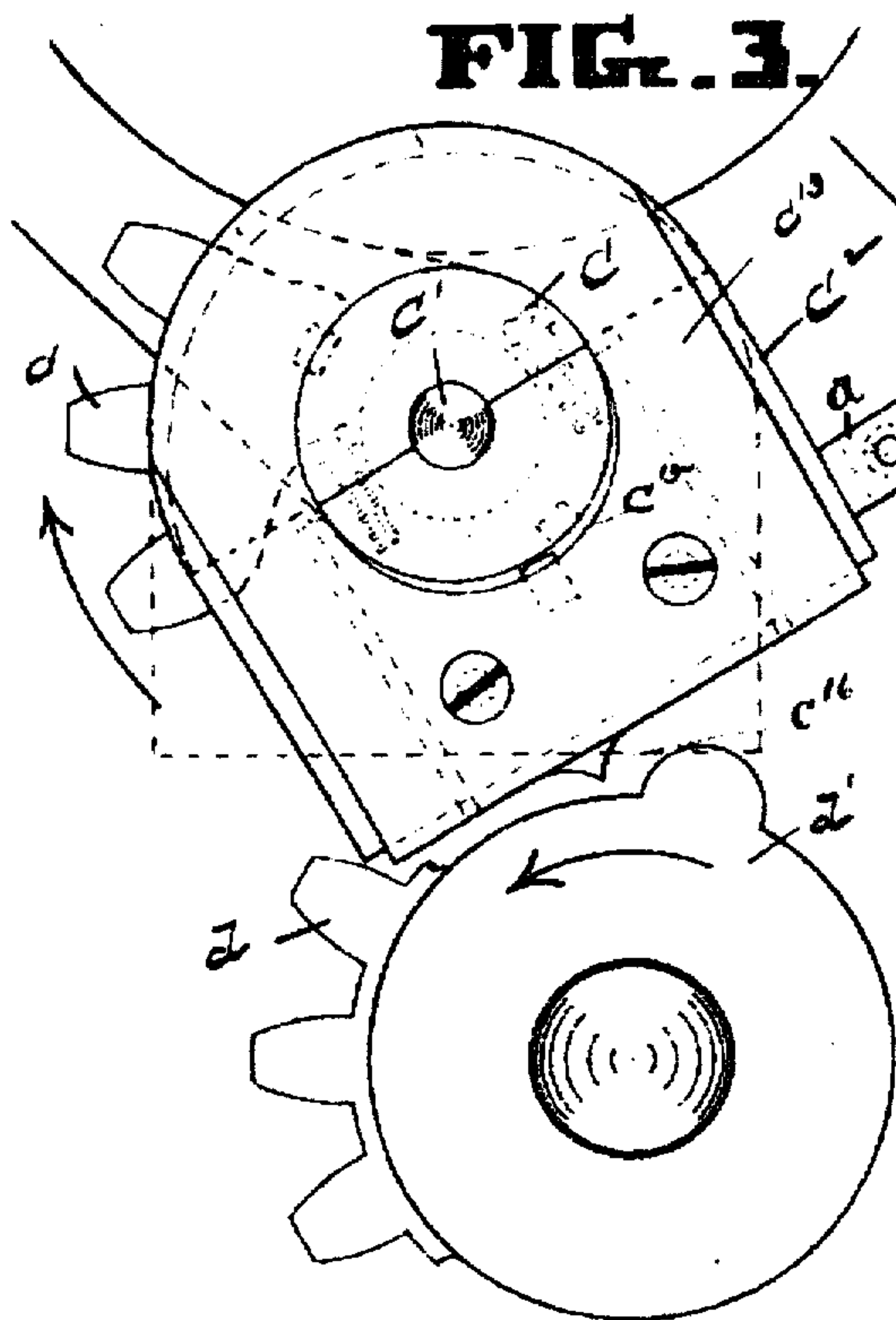
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-2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

LOUIS H. STELLMANN, OF BRATTLEBOROUGH, VERMONT, ASSIGNOR TO
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PERFORATING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 436,810, dated September 23, 1890.

Application filed November 12, 1889. Serial No. 330,032. (No model.)

To all whom it may concern:

Be it known that I, LOUIS H. STELLMANN, of Brattleborough, in the county of Windham and State of Vermont, have invented a new and useful Improvement in Perforating-Machines, of which the following is a specification, reference being had to the accompanying drawings, forming part thereof.

My invention relates to machines for perforating strips of paper or other material at intervals and in lines extending transversely across said strip, and has especial reference to machines for perforating thin tissue-paper for toilet use.

The object of my invention is to provide a machine for this purpose so constructed that the paper can be run therethrough in a continuous strip or web of any desired width and receive at intervals of any desired length a line of perforations extending across its entire width without interrupting the continuous movement of the paper and without danger of tearing or rupturing the paper.

A further object is to provide means in such a machine whereby the movements of the perforating-punches and their dies are positively produced, and thereby obviate the use of springs for such purpose.

A further object is to increase the speed at which the paper can be run through the machine.

To these ends my invention consists in a perforating-machine comprising a cylinder carrying a series of punches, a pivotally-mounted die-support, and a series of cams for positively actuating said punches and die in unison, as hereinafter fully described, and particularly pointed out in the claims.

Referring to the drawings, in which like parts are designated by like letters in the several figures, Figure 1 is an end elevation of the machine. Fig. 2 is a front elevation thereof, the shaft E and its cams being omitted to more clearly show the remaining parts of the machine. Fig. 3 is an enlarged end elevation of the punch-carrying cylinder, the die-support, and the cam for operating the latter in one direction, said cam being shown as about to engage said support. Fig. 4 is a similar view, partly in section, showing the cam in engagement with the die-support, and show-

ing the cams which actuate the punches. Fig. 5 is a partial longitudinal sectional view of the punch-carrying cylinder and the die-support. Fig. 6 is a partial inverted plan of the same parts. Fig. 7 represents a portion of the paper after being perforated.

The letters A A designate the two end pieces of the frame of the machine, which may be secured to a base A', as shown, or may be secured to the floor in the usual manner. At the top of said frame are suitable bearings in which is mounted a cam-shaft B, having the gear *b* secured thereon near one end thereof, and having the cams *b'* secured thereon near each end thereof. A large roll B', preferably made of wood, is loosely mounted on said shaft B for a purpose presently to be described. Beneath said shaft B and in the same vertical plane therewith is the tubular punch-carrying cylinder C, which is revolutely mounted upon a non-revoluble shaft C', held in fixed bearings in the two end pieces of the frame, set-screws *c'*, bearing at one end against said latter shaft, serving to prevent revolution thereof. Said cylinder C carries the gear *c*, which meshes with the gear *b*, and also serves as the support for yokes C², which carry the die-support, said yokes loosely encircling said cylinder in such manner as to have a free swinging movement thereon.

Near the bottom of the frame and slightly in front of the vertical plane of shaft B and cylinder C is mounted the main shaft D, which carries cams *d'* *d'* and gear *d*, which meshes with gear *c*, and which will be provided outside the frame with suitable band-pulleys by which motion can be transmitted thereto from any suitable source of power. Another cam-shaft E is mounted in bearings in the frame at the rear side of the latter and in a horizontal plane between that of cylinder C and shaft D, said shaft E carrying gear *e*, which meshes with gear *c* and cams *e'*.

The punch-carrying cylinder C is provided with a longitudinal slot or opening, in which is located the bar *c*², to which is secured the series of punches *c*³, said bar being free to move toward and away from the center of the cylinder. I also prefer to locate in said slot or opening in said cylinder and at the periphery thereof a fixed guide-bar *c*⁴, having a se-

ries of openings corresponding to the series of punches, and through which the latter project, which bar serves to steady the movement of the punches and protects them from being bent or broken from any cause.

Upon the fixed shaft C' is a rounded rib or projection c^5 , located on the lower side thereof, which may extend continuously along said shaft within the chambered portion of cylinder C, or may be composed of a series of projections located in the same plane, the office of which is to depress the bar c^2 and punches c^3 as said bar is carried past said projection by the revolution of cylinder C. Also secured to said cylinder C', at each end of the chambered portion of shaft C, are two collars c^6 , having formed within the inner sides thereof the cam-grooves c^7 , into which grooves project lips c^8 at the ends of bar c^2 . The grooves c^7 are broken away at a point opposite to the projection c^5 , as shown in Fig. 4, and are so shaped that as said lips c^8 enter said grooves, after the bar c^2 has passed the projection c^5 , the continued movement of cylinder C will cause said grooves to draw said bar toward the center of the cylinder and retract the ends of the punches within the circumferential plane of the cylinder. Means are thus provided for positively advancing the ends of the punches beyond the surface of cylinder C at one point in the revolution of said cylinder and for positively retracting said ends and retaining them within the surface of said cylinder throughout the remainder of its revolution.

The die-plate c^9 is secured within the upper surface of the die-support, which consists of a metallic block c^{10} , having at its ends vertical dovetail flanges c^{11} . The yokes C^2 , previously referred to, have at their lower ends an opening to receive the ends of said block c^{10} , and have within their outer surfaces an undercut groove to receive the flanges on the latter, whereby said block is adapted to have a limited movement within said yokes toward and away from the cylinder C, upon which the yokes are pivotally mounted, as before described. The die-plate and the upper surface of the block c^{10} are curved transversely to correspond with the curvature of the surface of cylinder C, whereby the paper is adapted to be tightly and evenly clamped between said block and die-plate and said cylinder, as hereinafter described.

The block c^{10} is provided with a slot c^{12} , located beneath the series of openings in the die-plate, to enable the small circular pieces of paper removed by the punches to escape to the floor, and thus prevent them from interfering with the operation of the punches. To the ends of the block c^{10} are secured, by means of screws or in any suitable manner, plates c^{13} , which plates embrace cylinder C in a manner similar to the yokes C^2 , the opening c^{15} in said plates, however, being slightly elongated vertically to permit the plates to rise and fall upon the shaft as well as to swing

thereon. At their upper end the plates c^{13} are provided with an inwardly-extending lip, as shown, which lips are in position to be engaged by the cams b' on shaft B when the plates are in their highest position and cause the plates to be moved by said cams from their highest to their lowest position.

Projecting from the lower surface of block c^{10} in the vertical plane of the cams d' on shaft D are two lips c^{16} , having two sides, which are inwardly curved, which lips are engaged by said cams d' , and the latter are thus caused to not only move said block and the plates c^{13} from their lowest to their highest position, but also to swing said block, said plates, and the yokes C^2 upon cylinder C as a center from their front to their rear position. The cams e' on shaft E act upon the rear side of yokes C^2 , and return the latter with block c^{10} and the plates c^{13} to their forward position, a stop a on one of the end pieces of the frame serving to limit such forward movement thereof.

The operation of the machine thus constructed is as follows: The web of paper F is led from the usual supply-roll (not shown) over roll B' and between said roll and cylinder C, thence partially around said cylinder C, and between it and the die plate and block c^{10} to the usual receiving-roll, (not shown,) as indicated by the arrows in Fig. 1. The receiving-roll will be positively driven to wind the web of paper thereon, and the supply-roll will have suitable friction devices to preserve the requisite amount of tension upon the paper; but as the use of such rolls is common in connection with perforating-machines, and as their construction and operation are the same when used in connection with my machine as heretofore I have deemed it to be unnecessary to show them in the drawings. Power being imparted to the main shaft D, the gears d , c , b , and e will transmit the motion of said shaft to cylinder C and shafts B and E, respectively, and the friction exerted upon the paper as it passes between roll B' and cylinder C imparts a continuous movement thereto through the machine. As the cylinder C is revolved, the ends of punches c^3 are retained within the surface thereof by the action of cam-grooves c^7 in collars c^6 upon lips c^8 of bar c^2 throughout the greater portion of the revolution of said cylinder C, or except when the punches are crossing the vertical line between the cylinder C and shaft D, at which point the cam projection on shaft C' forces the ends of the punches outwardly beyond the surface of the cylinder C. The cams b' , being eccentric to the shaft B throughout the greater portion of their circumference, retain the plates c^{13} , block c^{10} , and the die-plate in their lowest position, and the cams e' , being similarly shaped, retain said parts in their forward position except during the short interval when the cams d' are acting upon the block c^{10} , said cams d' being concentric with shaft D throughout the greater portion of

their circumference. The timing of the operations of said parts is such that the cams d' raise the block c^{10} and the die-plate to their highest position, wherein they clamp the paper tightly against cylinder C just previously to the outward movement of the punches by the cam c^5 , as just described, and then move said block and die-plate from their forward to their rearmost position as they are thus held against the cylinder C. The outward movement of the punches causes their ends to enter the openings in the die-plate, and the paper being tightly clamped between the cylinder and said die-plate the punches are caused to perforate the paper evenly and smoothly throughout its entire width, as indicated in Fig. 7. The swinging movement of the die-plate and its support being produced positively and synchronously with the movement of cylinder C, there is no drag upon the paper to impede its passage through the machine, and all danger of tearing or rupturing the paper from such cause is avoided. As soon as cams c^5 and d' have ceased their action upon the punches and die-plate, respectively, cams c^7 retract the punches, cams b' depress the die-plate and its support to their lowest position, and cams e' return said parts to their forward position again. The operation thus described is repeated with every revolution of cylinder C, and the distance between the rows of perforations in the paper will be governed by the diameter of said cylinder. Ordinarily the machine will be constructed to receive and perforate paper fifty or sixty inches in width, and the cylinder C will be of such diameter as to cause the distance between the rows of perforations to be six or seven inches; but these dimensions can be varied at will.

In order to insure the registering of the punches with the openings in the die-plate under all circumstances, I prefer to provide the block c^{10} with a pin c^{14} near each end, and to provide cylinder C with holes to receive said pins, as shown in Fig. 5.

It will be observed, as hereinbefore stated, that all the movements of the punches and die-plate are produced by positive mechanism, thereby obviating the use of springs with all their attending objections, and that, there being no drag exerted upon the paper during its passage through the machine, the machine can be run much more rapidly than has been possible heretofore. The punches, being withdrawn within the body of cylinder C except when they are operating upon the paper, are preserved from injury in such manner as to materially prolong their period of usefulness.

While I have herein shown but two cams d' on shaft D, it will be understood that in machines for perforating paper of extreme widths it will be desirable to locate a greater number of cams on said shaft, in order to insure an even movement to block c^{10} and the die-plate throughout the entire length of the latter. I do not wish to limit myself to the

exact details of construction herein shown and described, as it is obvious that modifications therein can be made without departing from the spirit of my invention.

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

1. The perforating-machine herein described, comprising, in combination, a revolving cylinder carrying a series of punches radially movable therein, a die-support adapted to have an arc movement about the axis of said cylinder as a center, a die-plate mounted in said support and movable therein toward and away from said punch-carrying cylinder, and means, such as the cam-shafts shown and described, for moving said punches toward and away from the center of the cylinder by which they are carried and for moving said die-plate both toward and away from said punch-carrying cylinder and in a plane parallel with the circumference of the latter, arranged and operating substantially as set forth.

2. In a perforating-machine, a revolving cylinder having a radial opening therein and extending longitudinally thereof, a series of punches located in said opening in said cylinder, means, substantially as described, for moving said punches toward and away from the center of said cylinder, whereby their ends can be caused to project beyond the surface of the cylinder, a die-support pivoted to move about said cylinder as a center, a die-plate mounted in said support in such manner as to have free movement therein toward and away from said cylinder, and means, substantially as described, for moving said die-plate in both directions, combined and operating substantially as and for the purpose described.

3. In a perforating-machine, a revolving cylinder having a central chamber and an opening leading from said chamber to the outer surface thereof, a bar carrying a series of punches located in said opening in said cylinder in such manner as to be capable of free movement toward and away from the center of the cylinder, a series of fixed cams located within the chambered portion of said cylinder for positively operating said bar in both directions, a die-support pivoted to swing about said cylinder as a center, a die-plate movably mounted in said support, and a series of cam-shafts carrying cams which engage said die-plate and its support in such manner as to positively move the former toward and away from the punch-carrying cylinder and the latter in opposite directions about its pivot, combined and operating substantially as and for the purpose set forth.

4. In a perforating-machine, the combination of the following instrumentalities, viz: a fixed shaft having a cam projecting from one side thereof and having near each end thereof a collar provided with a cam-groove within its inner face, a cylinder revolvably mounted upon said fixed shaft and having an

interior chamber inclosing said cams on the latter, said revolving cylinder also having a radial slot or opening leading from its interior chamber to the outer surface thereof, a bar carrying a series of punches located in the opening in said cylinder and having at its ends projecting lips adapted to enter the cam-grooves in the collars on said fixed shaft, two yokes embracing said punch-carrying cylinder and adapted to have a swinging movement thereon, a die-support mounted in ways in said yokes, whereby it is adapted to have free movement therein toward and away from the pivotal point of the yokes, a die-plate secured to said support, and a series of shafts carrying cams constructed to positively move said die-plate and its support in opposite directions within the yokes and to move said yokes in opposite directions about their pivot, arranged and operating substantially as set forth.

5. In a perforating-machine, the combination, with a revolving cylinder carrying a series of punches and means for causing said punches to intermittently project beyond the periphery of said cylinder, of a die-plate constructed to have a limited movement about the axis of said cylinder as a center, substantially as described, whereby perforations can be made in a web of paper passing around said cylinder without interrupting the movement of said web.

6. In a perforating-machine, frame A A, having journaled therein main shaft D, carrying gear *d* and cams *d'*, punch-carrying cylinder C, carrying gear *c*, and shaft B, carrying gear *b* and cams *b'*, and having fixed shaft C' secured thereto, said shaft being located centrally within the punch-carrying cylinder and carrying fixed cams for operating the punches, yokes C², having a swinging movement upon the cylinder C, die-plate *c*⁹, movably supported upon said yokes, and plates *c*¹³, projecting into the path of movement of cams *b'*, and being connected at their lower ends with said die-plate, combined and operating substantially as described.

7. In a perforating-machine, fixed shaft C', having projection *c*⁵ and having secured thereto the collars *c*⁶, having cam-grooves *c*⁷ therein, combined with chambered cylinder C, revolubly mounted upon said fixed shaft, and having bar *c*², carrying punches *c*³, movably mounted within a radial opening therein, said bar *c*² having the lips *c*⁸ at its ends, which are adapted to enter the grooves *c*⁷ in said collars,

whereby a positive movement will be imparted to said bar *c*² in both directions, substantially as set forth.

8. In a perforating-machine, fixed shaft C', carrying cams *c*⁵ *c*⁷, cylinder C, revolubly mounted on said fixed shaft and carrying the radially-movable punch-bar *c*², yokes C², loosely embracing the cylinder C, block *c*¹⁰, movably mounted at its ends in said yokes, die-plate *c*⁹, secured to said block, plates *c*¹³, secured to said block at the ends thereof, shaft B, carrying cams *b'*, shaft D, carrying cams *d'*, shaft E, carrying cams *e'*, and gears connecting said shaft D with cylinder C and shaft E and cylinder C with said shaft B, combined and operating substantially as and for the purpose described.

9. In a perforating-machine, the combination, with cylinder C, having the radially-movable punches *c*³ mounted therein, of yokes C², loosely mounted upon said cylinder, said yokes having a central opening at their lower ends and undercut grooves in their outer sides at each side of said openings, block *c*¹⁰, having its ends extending through the openings in said yokes and having flanges *c*¹¹ projecting within said undercut grooves, whereby said block is adapted to have free movement within said yokes, and die-plate *c*⁹, secured to said block at the upper side thereof, substantially as described.

10. In a perforating-machine, the combination, with frame A A, having shafts B D journaled therein, said shafts carrying gears *b* *d* and cams *b'* *d'*, of fixed shaft C', secured to said frame between said first-mentioned shafts and carrying cams *c*⁵ *c*⁷, cylinder C, mounted upon said shaft C' and carrying gear *c*, punch-carrying bar *c*², located within said cylinder C and receiving its movement from said cams *c*⁵ *c*⁷, substantially in the manner described, roll B', loosely mounted upon shaft B, yokes C², loosely mounted upon cylinder C, block *c*¹⁰, movably mounted in said yokes, plates *c*¹³, secured to said block at the ends thereof, and die-plate *c*⁹, secured to the upper side of said block, said block and die-plate having their upper surface curved transversely to conform substantially to the circumference of cylinder C, substantially as set forth.

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Witnesses:

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J. E. CHAPMAN.