

(No Model.)

4 Sheets—Sheet 1.

G. C. CONVERSE.
CIRCULAR KNITTING MACHINE.

No. 351,624.

Patented Oct. 26, 1886.

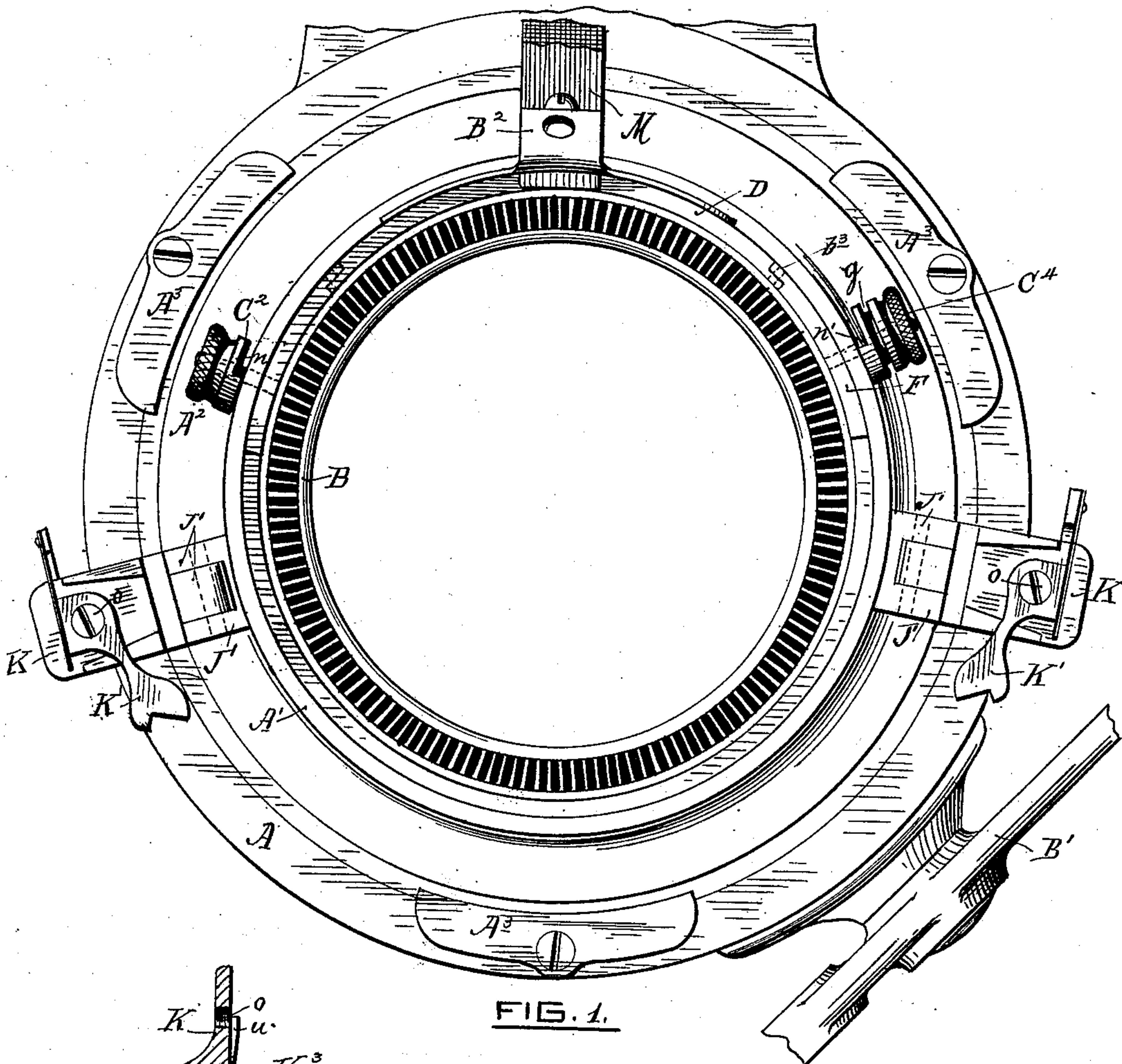


FIG. 1.

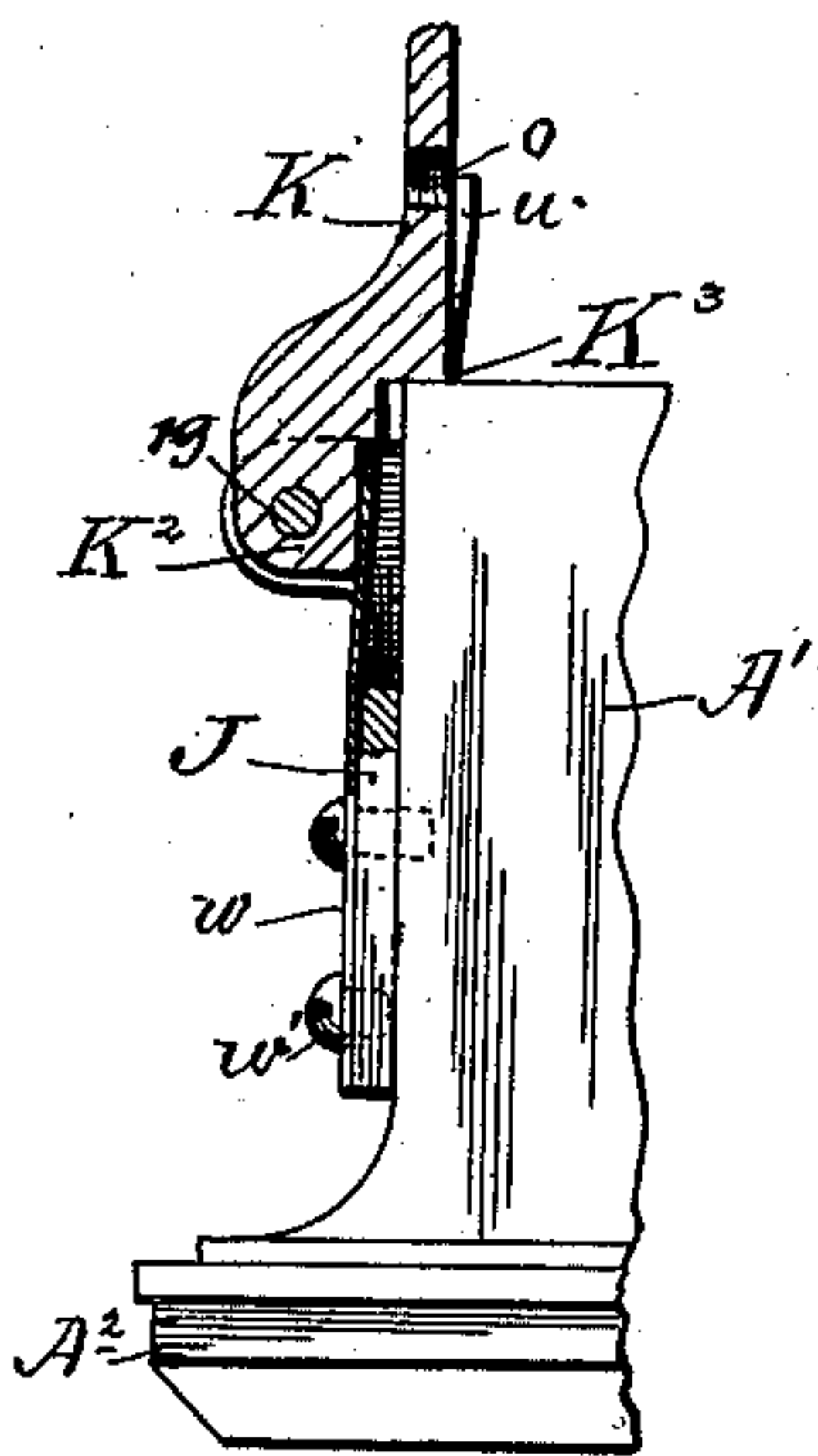


FIG. 2.

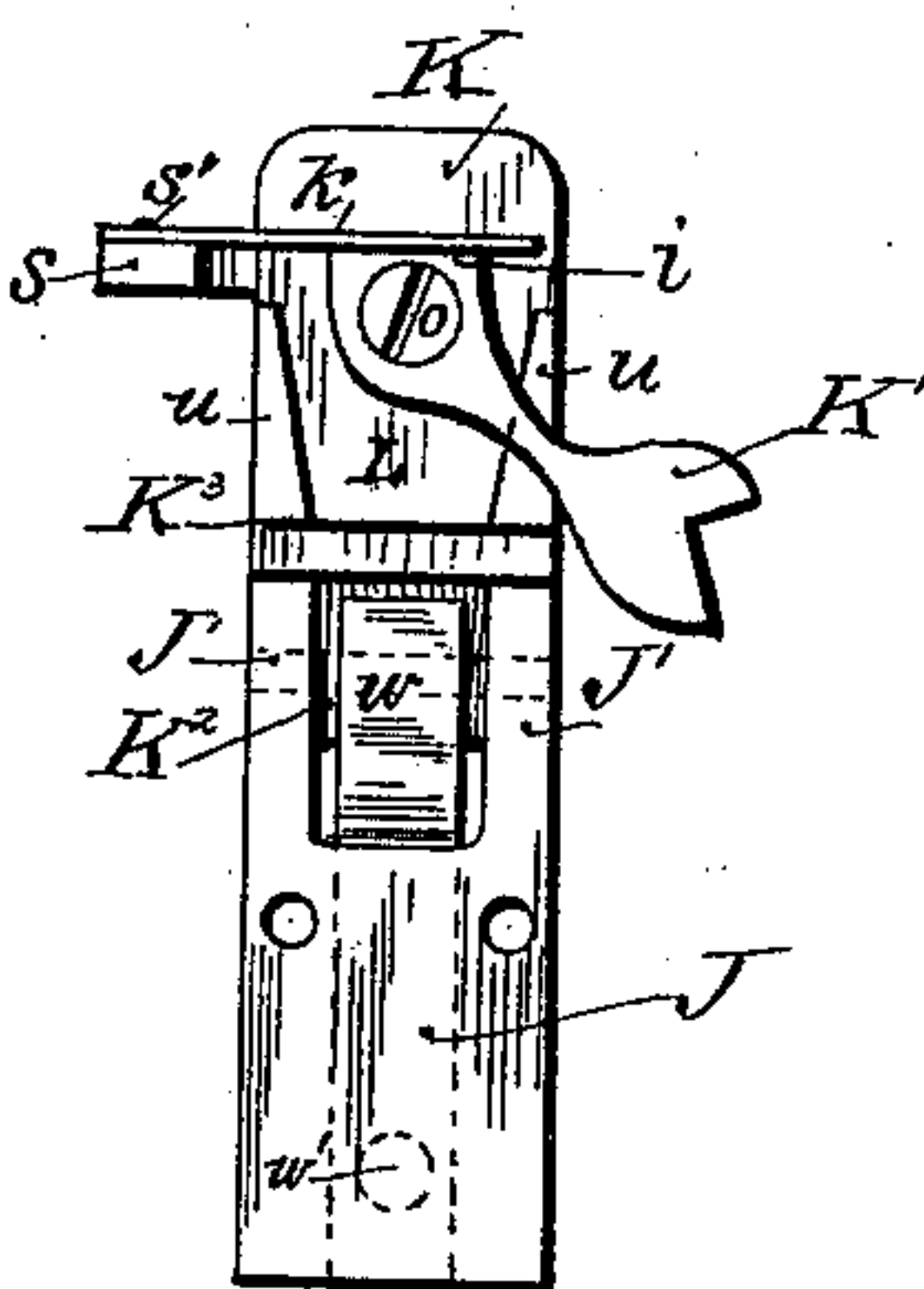


FIG. 3.



FIG. 4.

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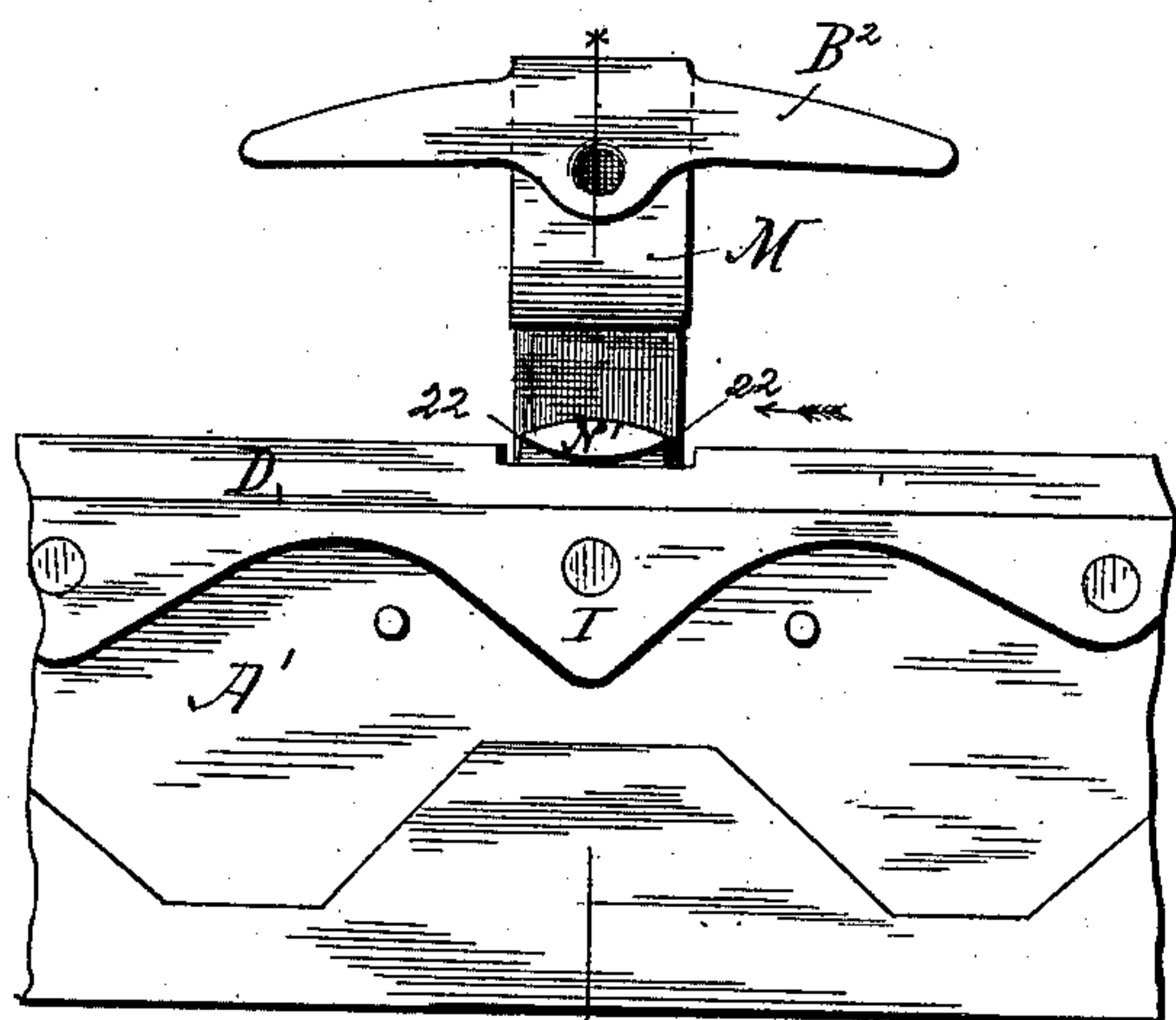


FIG. 5.

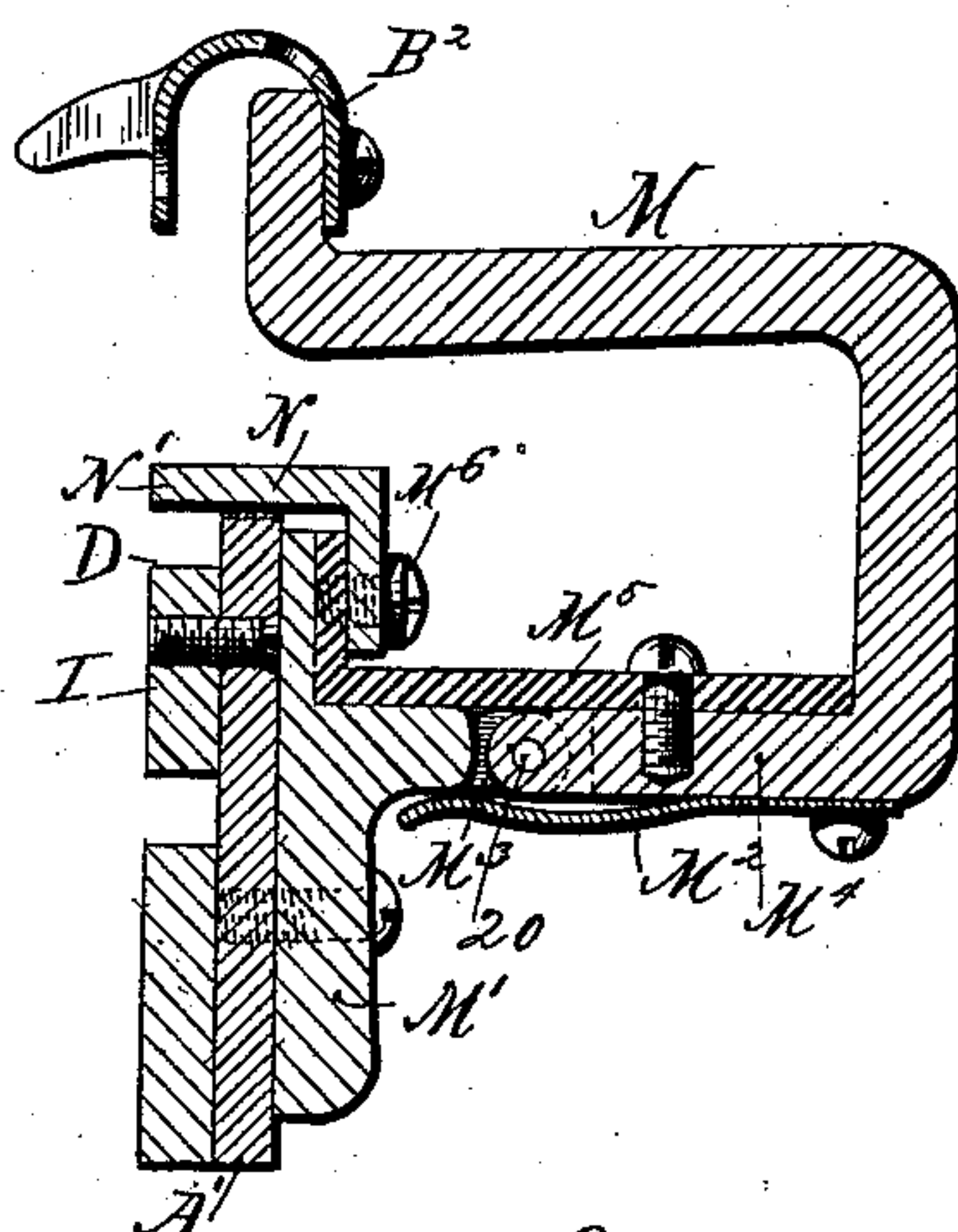


FIG. 6.

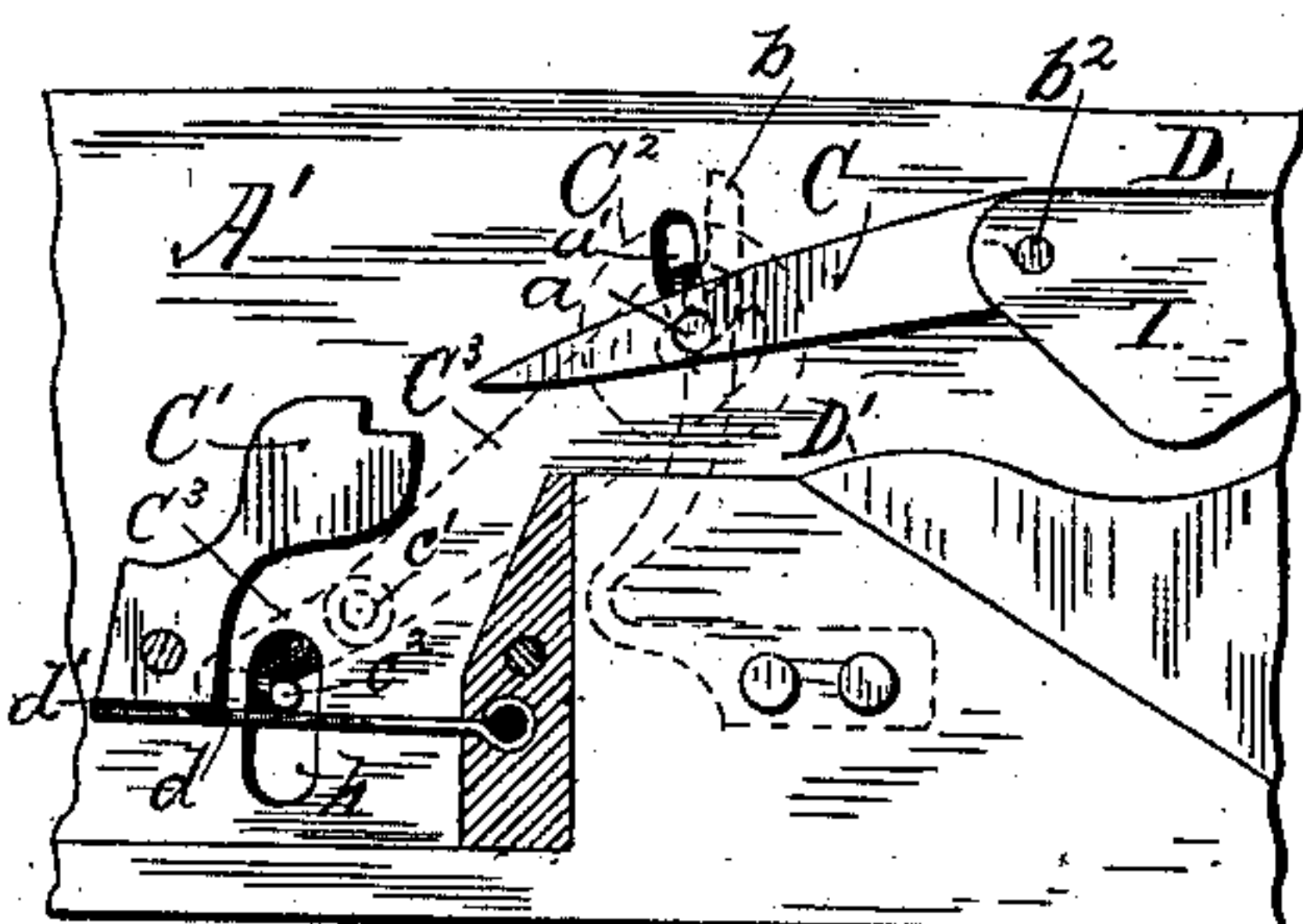


FIG. 7.

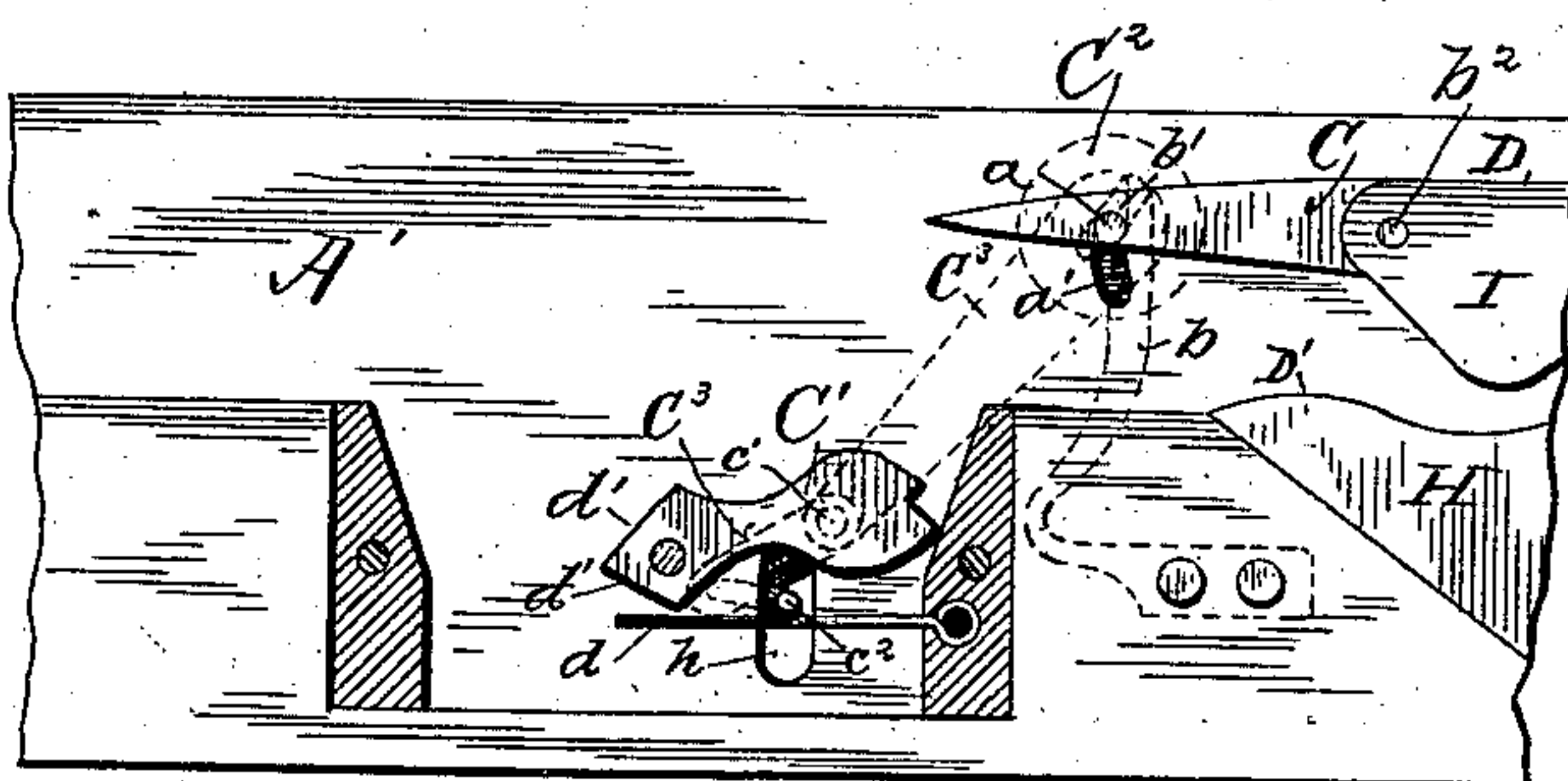


FIG. 8.

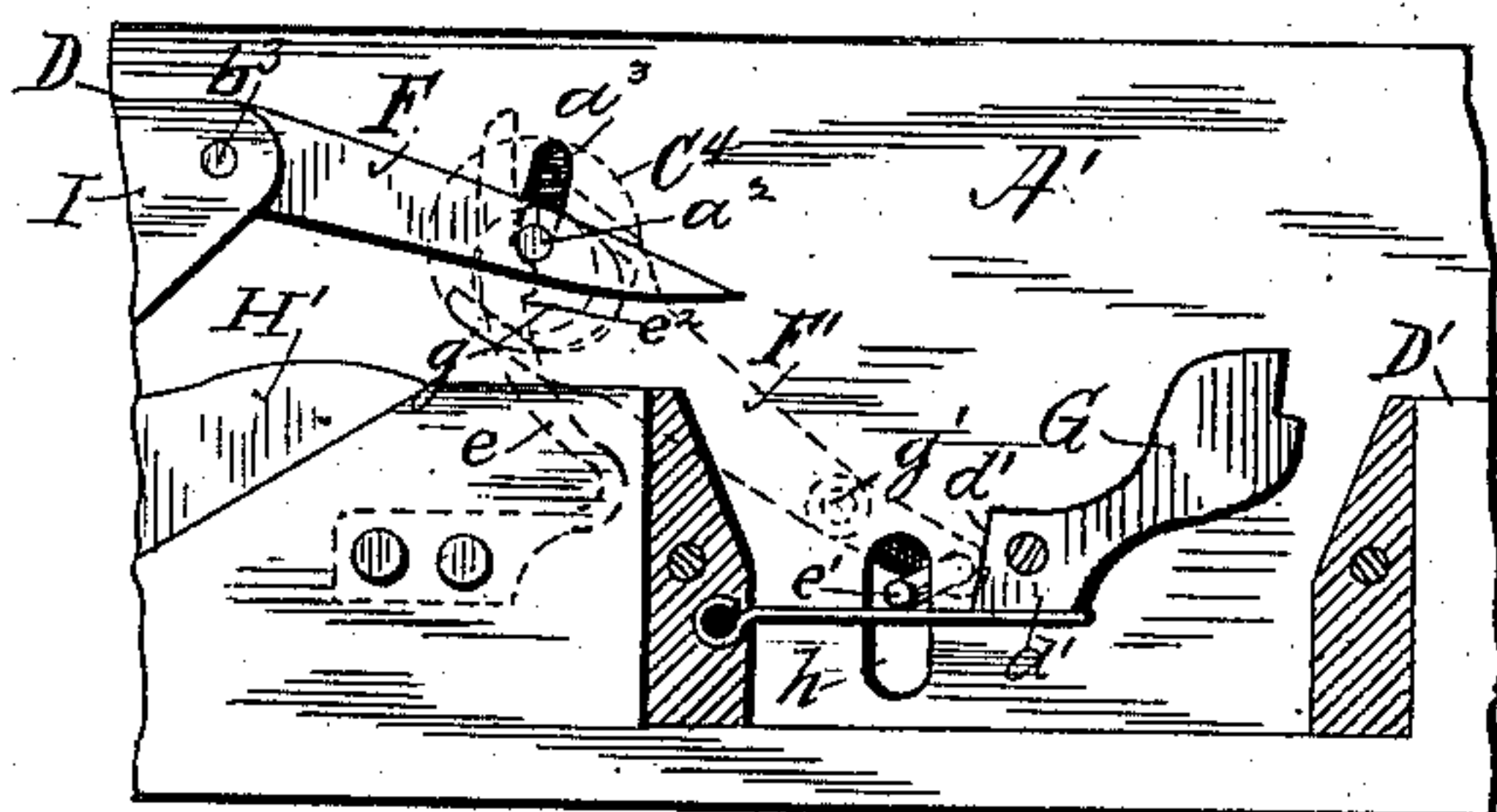


FIG. 9.

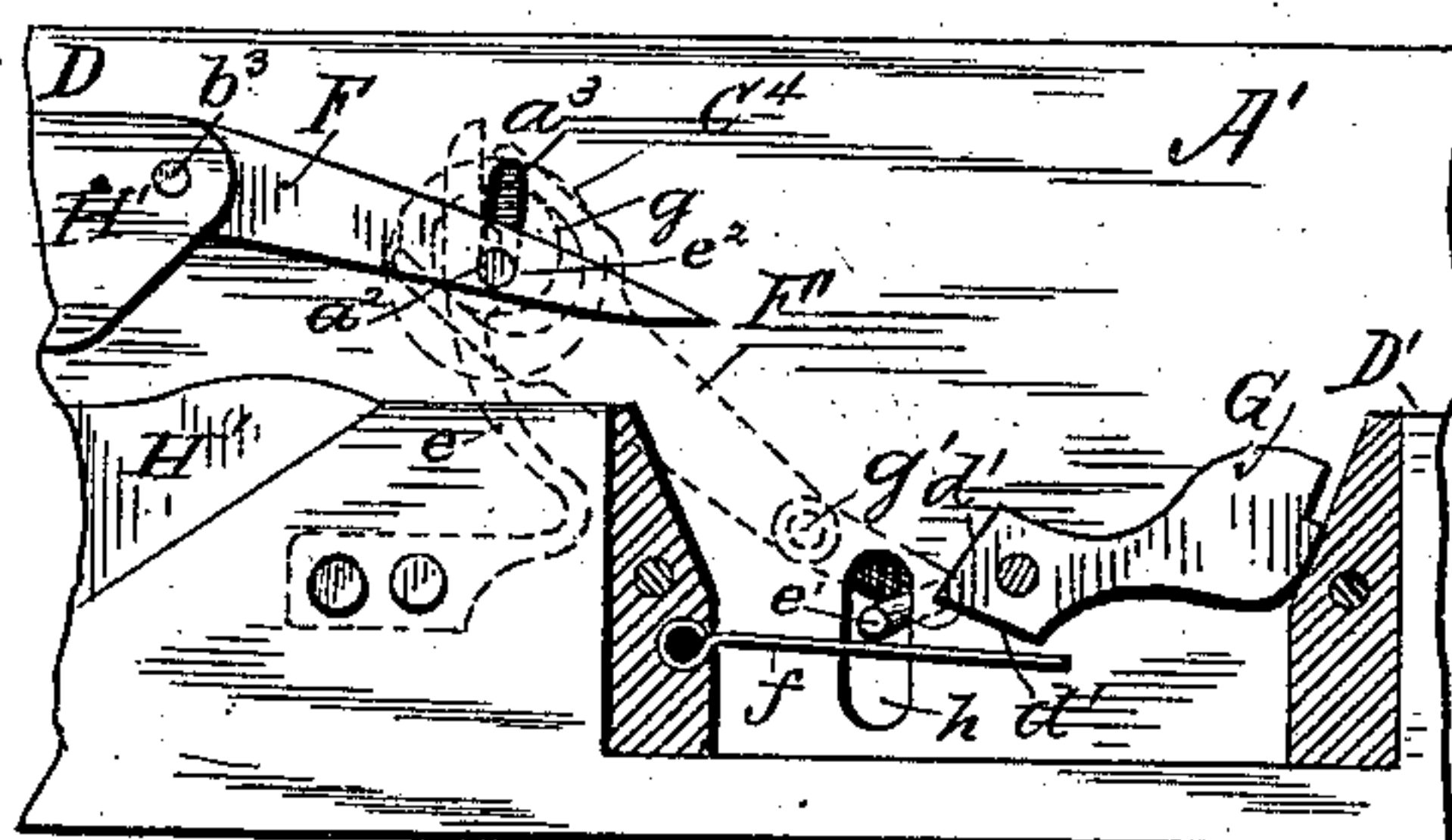


FIG. 10.

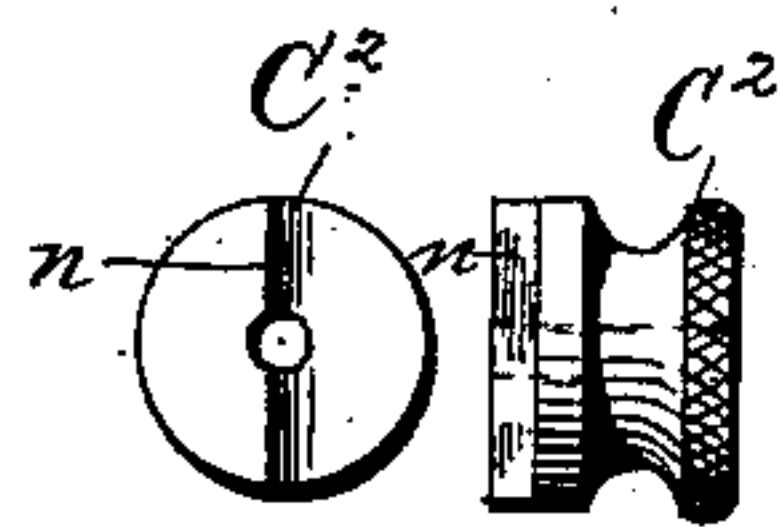


FIG. 11.

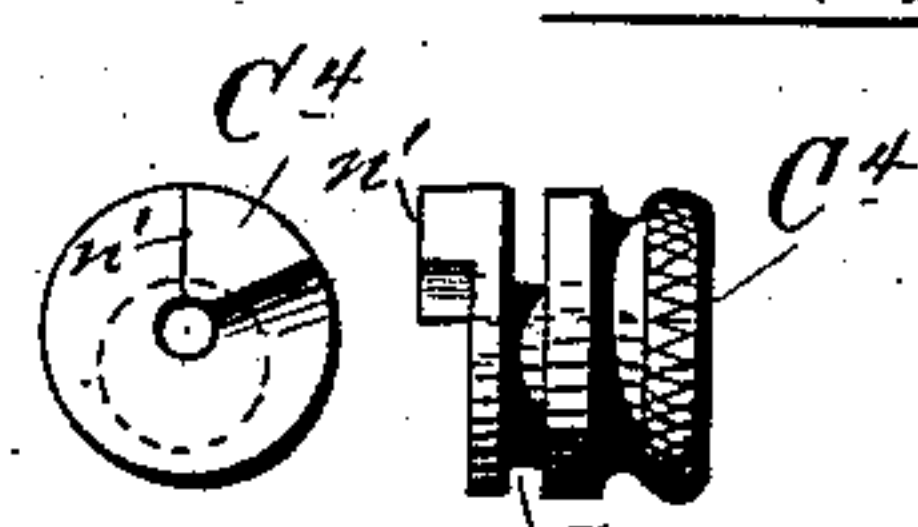


FIG. 12.

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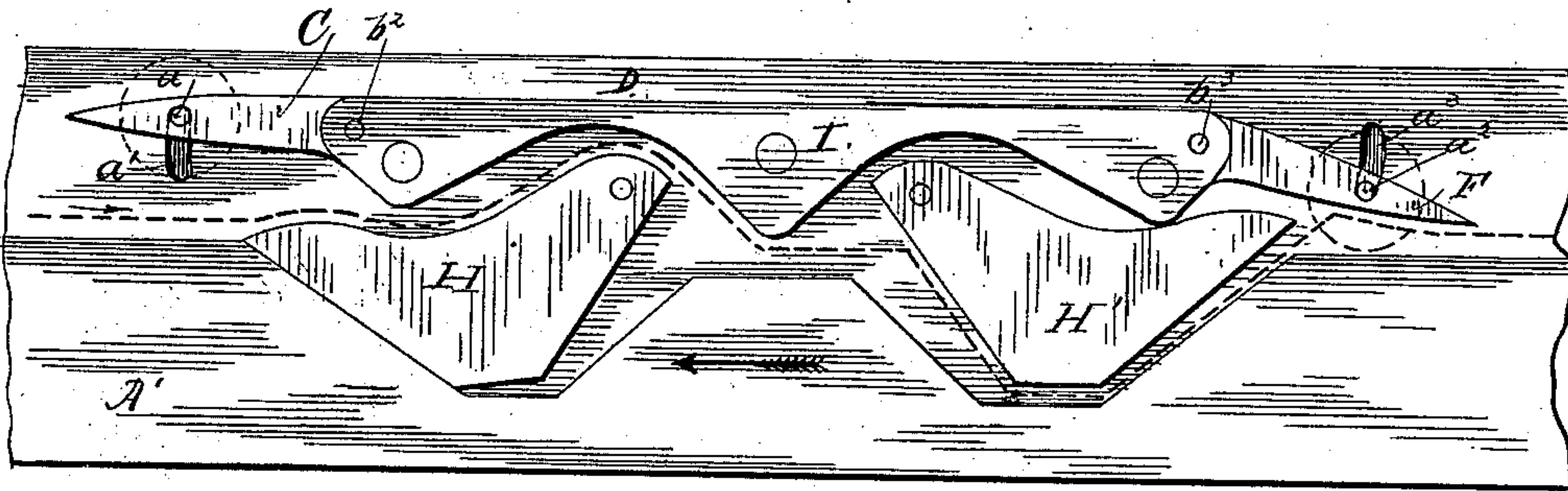


FIG. 13.

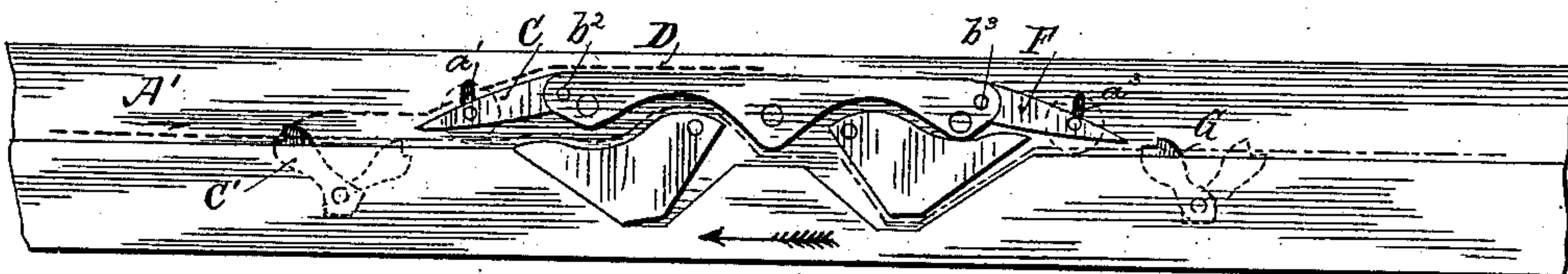


FIG. 14.

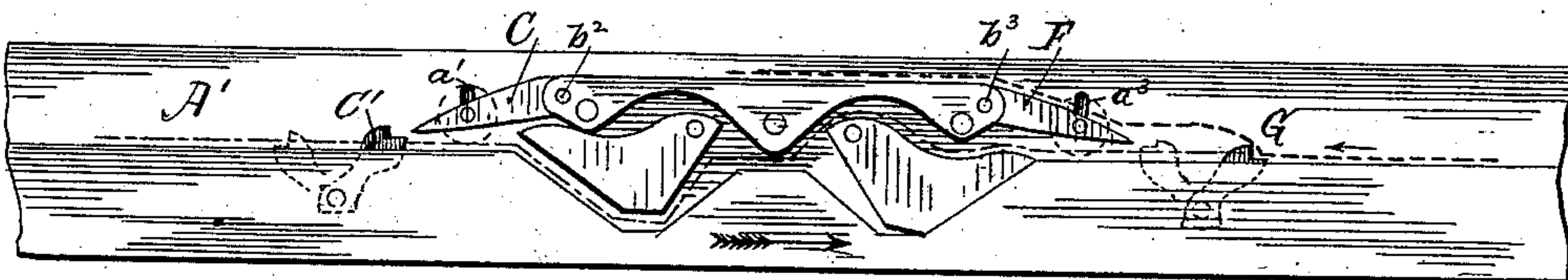


FIG. 15.

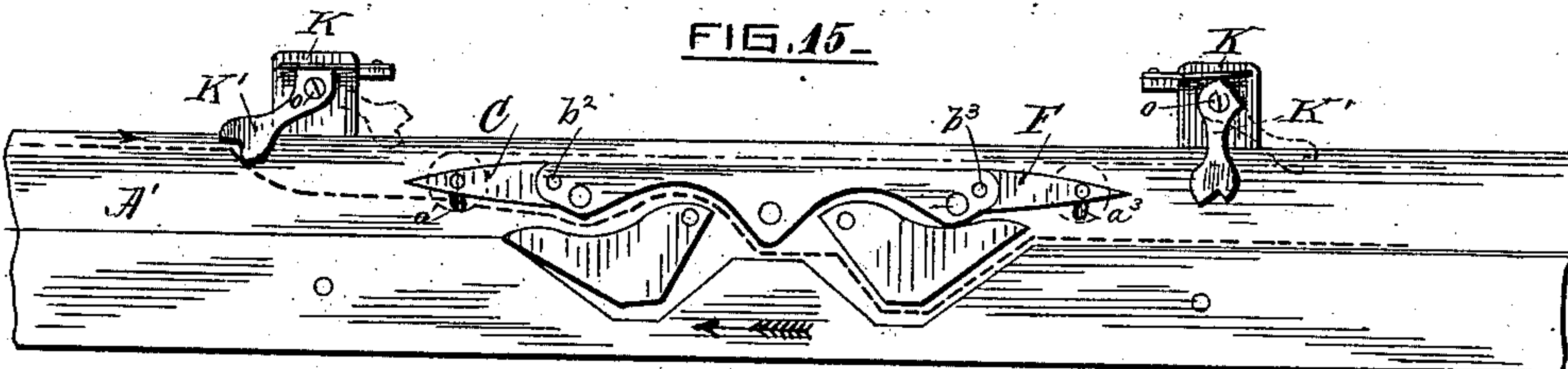


FIG. 16.

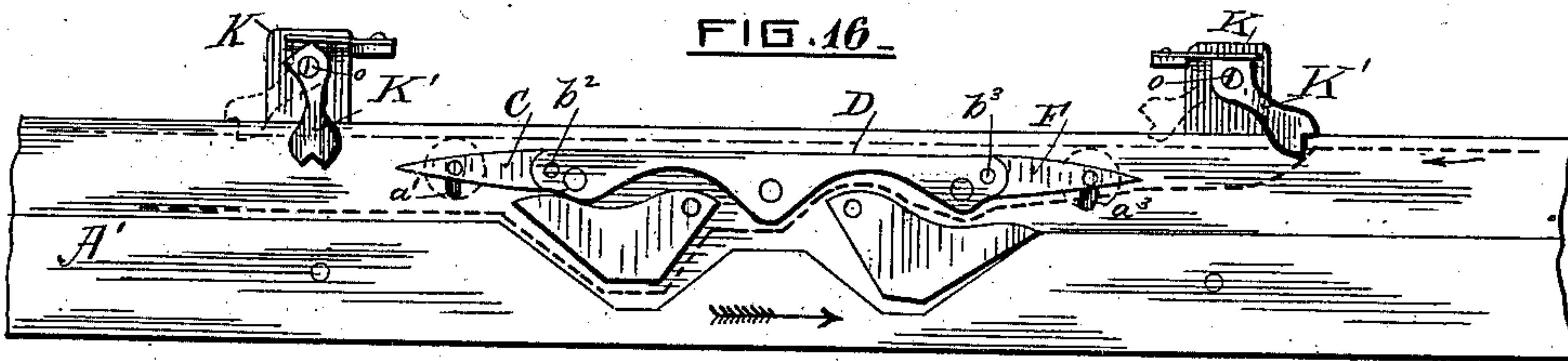


FIG. 17.

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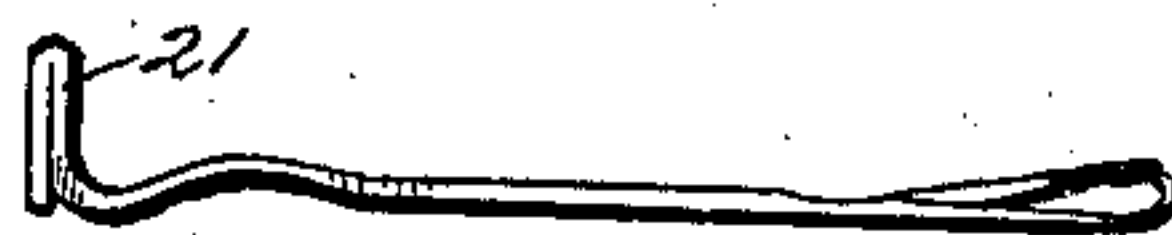


FIG. 18.

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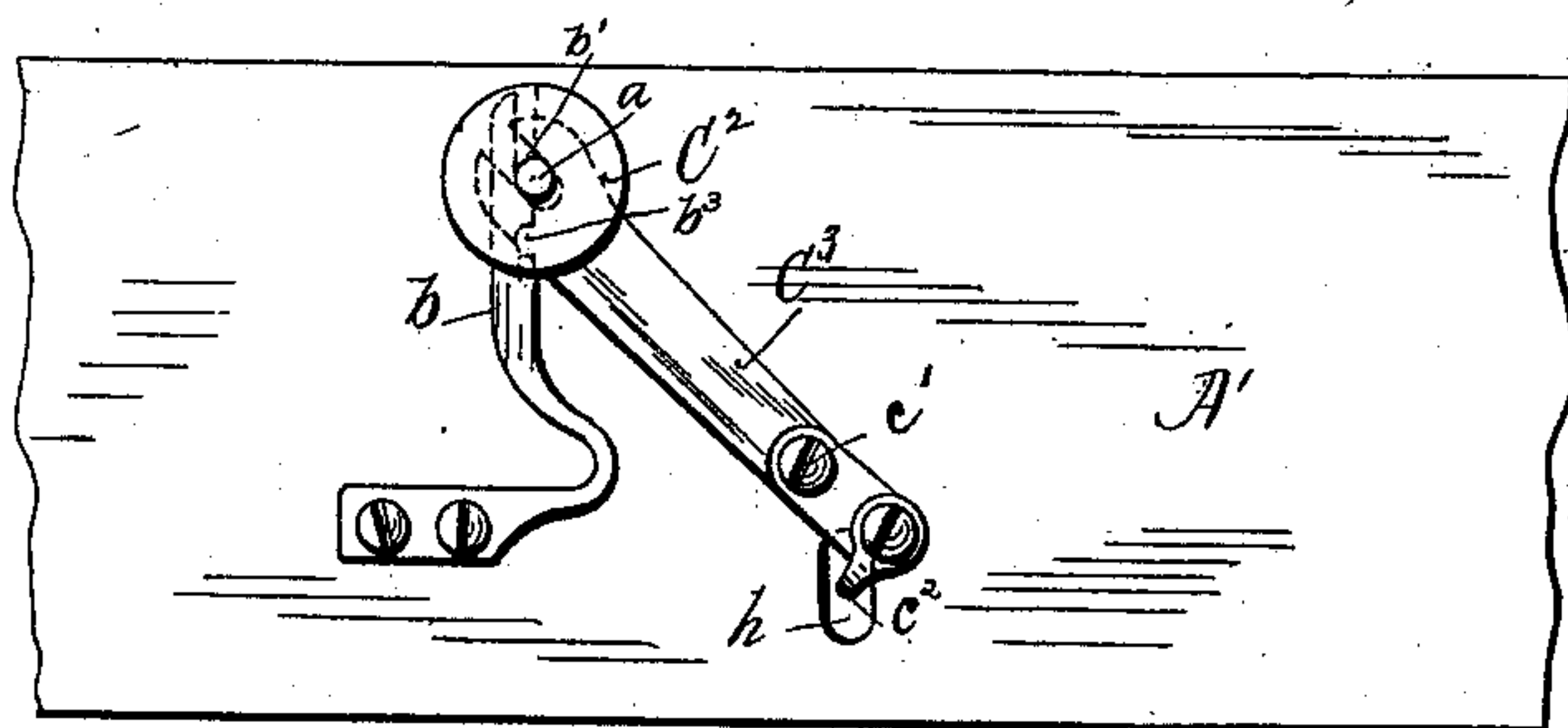


FIG. 19.

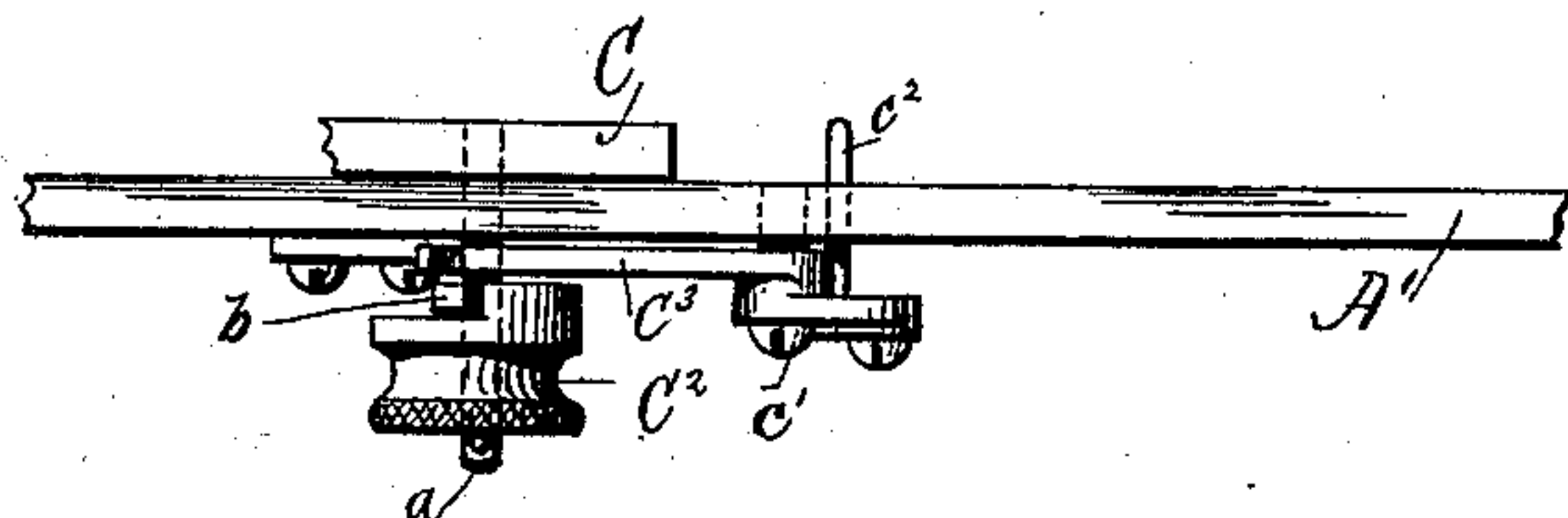


FIG. 20.

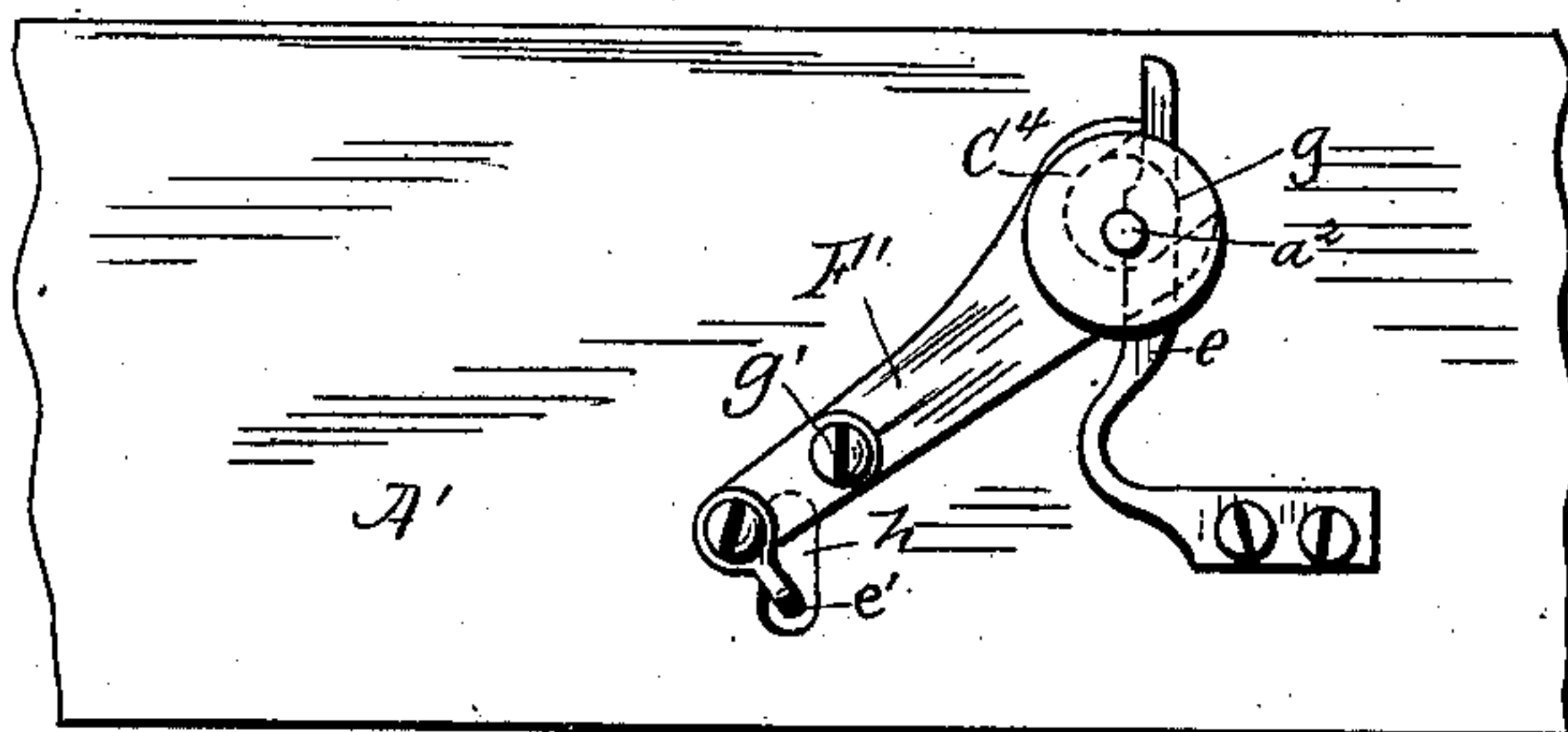


FIG. 21.

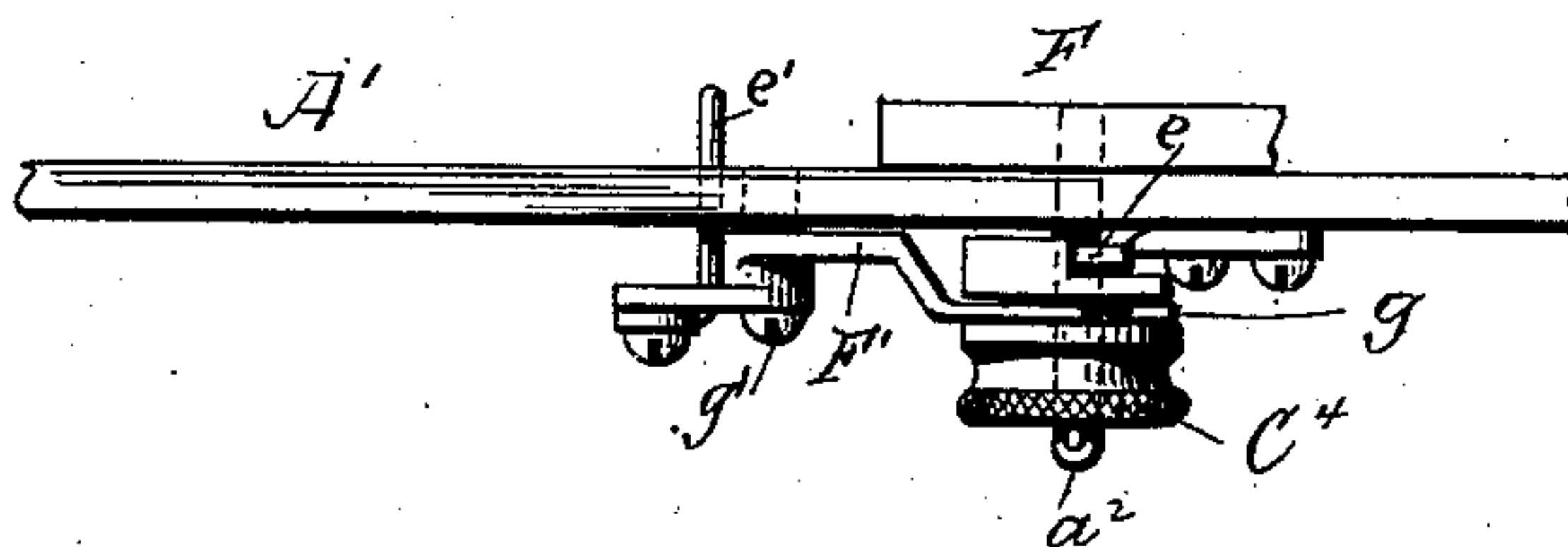


FIG. 22.

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UNITED STATES PATENT OFFICE.

GEORGE C. CONVERSE, OF BROOKFIELD, MASSACHUSETTS, ASSIGNOR, BY
MESNE ASSIGNMENTS, TO LUCY CONVERSE, OF SAME PLACE.

CIRCULAR-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 351,624, dated October 26, 1886.

Application filed May 15, 1886. Serial No. 202,323. (No model.)

To all whom it may concern:

Be it known that I, GEORGE C. CONVERSE, of Brookfield, in the county of Worcester and Commonwealth of Massachusetts, have invented certain new and useful Improvements in Circular-Knitting Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a top or plan view of so much of a circular-knitting machine as is necessary to illustrate my present invention. Fig. 2 represents a portion of the cam-cylinder in elevation, together with vertical sections of certain parts supported thereby, which will be hereinafter described. Fig. 3 represents an inside view of a detached part, as will be hereinafter described. Fig. 4 represents a top view of a detached part, as will be hereinafter described. Fig. 5 represents an inside view of a section of the cam-cylinder with pivoted cams removed; also an inside view of the yarn-guide and needle-evener, as will be hereinafter described. Fig. 6 represents a vertical section of Fig. 5, indicated by line *xx* and arrow, same figure, as will be hereinafter more fully described. Figs. 7, 8, 9, and 10 represent inside views of sections of the cam-cylinder with devices attached thereto for raising the needles for narrowing in knitting heels and toes of stockings, as will be hereinafter more fully described. Figs. 11 and 12 represent inside end and top views of the cams for operating, through connecting mechanism, the springs of the needle-lifter fingers and the hinged needle-guides and their holding-springs, as will be hereinafter more fully described. Fig. 13, Sheet 3, represents an inside view of a section of the cam-cylinder with cams and hinged needle-guides attached, as will be hereinafter more fully described. Figs. 14 and 15 represent, upon a reduced scale, similar views of cam-cylinder, cams, and needle-guides with the needle-lifters attached, as will be hereinafter described; and Figs. 16 and 17 also represent, upon a reduced scale, the parts shown in Fig. 13, with the needle-droppers attached, as will be hereinafter described. Fig. 18 represents a side view of the needle employed in my machine, which is of

the ordinary and well-known form of construction. Fig. 19 represents a section of the cam-cylinder in elevation, with certain devices attached to the outer side thereof, the same to be described hereinafter. Fig. 20 represents a top or plan view of the parts shown in Fig. 19, with section of one of the needle-guides, the same to be described hereinafter. Fig. 21 represents a section of the cam-cylinder in elevation, with certain devices attached to the outer side thereof, the same to be described hereinafter; and Fig. 22 represents a top or plan view of the parts shown in Fig. 19, with section of one of the needle-guides, the same to be described hereinafter.

To enable those skilled in the art to which my invention relates, I will proceed to describe the same more in detail.

As my present improvements are additional to and improvements on the machine described in the Letters Patent granted to me March 30, 1886, No. 339,046, it will only be necessary to describe the application of the special improvements which form the subject-matter of this application for a patent to said machine, and which may be described as follows:

In Figs. 5, 7, 8, 9, 10, and 13 to 17, inclusive, the sections of the cam-cylinder, cams, and needle-guides are shown spread out in a plane, for the purpose of illustrating the operation of the parts more clearly; but it will be understood that the cam-cylinder is made in circular form, as shown in Fig. 1, and the other parts in curved form to correspond thereto, so far as necessary. In Fig. 1 many of the parts (details) are left off, as they would, if there represented, tend to confuse; but such omitted parts are shown in other figures.

In the drawings, the part marked A is the frame, in which the base A² of the cam-cylinder A¹ is fitted to rest and turn in the usual manner, being held in place by buttons A³.

B represents the needle-cylinder, which is also made in the usual manner, and is provided with needles of ordinary construction.

My present improvements relating, as they do, to mechanism for lifting and dropping or lowering the needles in narrowing and widening in knitting the heels and toes of stockings, I will now describe the improvements which

I have made upon the invention secured to me by my said Letters Patent of March 30, 1886.

Assuming that the operator has by means of the operating crank B', section of which is shown in Fig. 1, turned the cam-cylinder so as to bring the yarn-guide B² toward him, then the right-hand needle-guide C and lifter-finger C', when arranged for plain or circular knitting, will be in the positions shown in Fig. 8, and to arrange said guide C and lifting-finger C' for lifting the needles for narrowing in knitting the heels and toes of stockings the operator takes hold of cam C², which turns on pin a, on the outside of cylinder A', the inner end of said pin a passing through slot a' in cylinder A' and fastened to needle-guide C, and turns it so as to force spring b back from pin a, thereby releasing pin a from notch b' in the spring, when the needle-guide C is turned down on its pivot b² to the position shown in Fig. 7, where it is held by pin a taking into notch b³ in spring b, and is also in position to receive and elevate a needle to the upper needle-path, D, while by the same operation of lowering the inner end of needle-guide C lever C³ is turned on its pivot c', thereby raising its lower end and pin c², attached thereto, and allows spring d to press up against one of the flat sides d' of lifting-finger C', as shown in Fig. 7, after said finger has passed out from under the front half of the needles, the back half of the needles having been raised out of work by hand in the usual manner, previous to commencing to knit a heel or toe.

In Figs. 9 and 10 the devices for raising the needles on the left-hand side are shown, and differ somewhat from those shown in Figs. 7 and 8. The needle-guide F, pivoted at b³, corresponds with needle-guide C, spring e corresponds with spring b and spring f', and lifting-finger G corresponds with spring d and lifting-finger C', and the lower end of the lever F', with its pin e', corresponds with the lower end of lever C³ and its pin c², both pins working in similar slots, h, in the cam-cylinder A'; but the upper end of lever F is provided with a wide slot (shown in dotted lines) to receive the eccentric g of the cam C⁴, fitted to turn on pin a², which passes through a slot, a³, in cylinder A', and is rigidly fastened to the needle-guide F, while lever C³ has only a narrow slot (shown in dotted lines) to receive the pin a in needle-guide C.

The operation of the left-hand side lifting mechanism (shown in Figs. 9 and 10) is as follows: In Fig. 10 the parts are shown arranged for circular knitting, pin a² in needle-guide F standing in the lower notch, e², in spring e, while cam C⁴ is turned so as to bring its eccentric g up, thereby turning lever F' on its pivot g' and depressing its pin e' in slot h, which carries down spring f and allows lifting-finger G to fall down below the lower needle-path, D'. To adjust the parts shown in Fig. 10 for raising the needles, cam C⁴ is turned to bring its eccentric g down, thereby turning the up-

per end of lever F' down and the lower end of the same lever, with its pin e', up, thereby relieving spring f, which then presses up against one of the flat sides d' of lifter G, thereby forcing the latter up into the position shown in Fig. 9 as soon as it has passed out from under the needles.

Referring now to Sheet 3 of the drawings, and for convenience of explanation, it is supposed that the cam-cylinder has been turned one-half of a revolution from the position assumed to be shown in Figs. 5 and 7 to 10, inclusive, Sheet 2, and what was called the "left-hand lifter" in describing those figures is now shown in Sheet 3 upon the right hand side, and only a part of the devices are represented in the figures on Sheet 3, since by this arrangement the parts shown can be more clearly illustrated and better explained and understood.

In Fig. 13 the parts are arranged for circular knitting, and the dotted line indicates the path of the needles while the motion of the cam-cylinder A' is in the direction indicated by the large arrow. The needles pass under the needle-guide C, which is raised, thence over cam H, and under and in contact with one-half of the upper cam, I, thence under cam H', and up against and out under the needle-guide F, which is turned down, as shown in Fig. 10, and acts as a needle-guard, to prevent the needles from being thrown too high as they pass out of contact with cam H'. If it were not for needle-guard F, the needles would be thrown up so high as to free the latches of the needles from the loops and drop stitches, thus making defective work, which must be raveled out.

Figs. 14 and 15 show the parts arranged for lifting the needles for narrowing in knitting heels and toes of stockings, and the operation of the parts shown is the same as described in my said patent of March 30, 1886, with the exception that the needle-guides C and F are hinged, so they can be adjusted by my present invention, as before explained. In Fig. 14 the dotted line indicates the course of the needles when raised from the left of the figure, while the dotted line in Fig. 15 indicates the path of the needles when lifted from the right of Figs. 14 and 15.

In Figs. 1, 2, 3, 4, 16, and 17 are represented the devices for dropping or putting down the needles in widening in knitting the heels and toes of stockings, and such devices will now be described.

To the outside of cam-cylinder A' are fastened on opposite sides two upright pieces, J, J, having slotted tops, forming cars J' J', between which are hinged the dropper-finger frames K K, to which are pivoted the dropper-fingers K' K', the outer notched ends of which are not materially different from the outer ends of the lifter-fingers; but the pivoted ends have but one flat side, i, each, which rest against the flat springs k when arranged for dropping the needle, as shown in Figs. 3, 16,

and 17. From one side of frame K extends a projection, *s*, to which a flat spring, *k*, is fastened at *s'*. In Fig. 4 spring *k* is shown broken off to expose the parts below when the dropper-finger is in the position shown in Fig. 3. It will be seen that the dropper-fingers *K' K'* are not pivoted so as to be held back against the frames *K K*, but that a space, *t*, is left between the back of the finger and the face of the frame when the finger is in the position shown in Figs. 3 and 4, and this construction is for a threefold purpose—viz, to permit the finger to hang down close to the inside of the cam-cylinder when it hangs in a perpendicular position or is swung from one side to the other; also to give it freedom in its motions in passing over the needle-shanks and between the cam-cylinder and needle-cylinder; also to permit the lower end of the dropper-finger to move in toward the needle-cylinder so as to strike the heel or shank of the needle close up to the body of the needle when it is set to drop or put down a needle, as shown in Figs. 3 and 4, and on the left-hand end of Fig. 16 and right-hand end of Fig. 17. By this arrangement the notched end of the dropper-finger strikes against the shank of the needle close up to the needle-cylinder, thereby obviating a tendency of the needle to tip over out of place during the operation. It will be understood that the needles are of the common and ordinary construction. The dropper-fingers are moved toward the needle-cylinder, when set, by means of two side cams, *u u*, upon the frames *K K*, the lower ends of the cams being wider and thinner than at their tops, leaving a wedge-shaped space, *L*, between them and the flat spring *k*, the pivoted ends of the fingers turning in the wide portions and the narrow parts of the fingers hanging in the narrow portions when hanging down in vertical positions. When the dropper-fingers are swung up either way from the center, they are gradually moved out by cams *u u*, and the entire finger is moved toward the needle-cylinder, as before explained, the pivots *o* being long enough to permit the pivoted ends to move in at the same time. (See Fig. 4.) A spring, *n*, is fastened at *w'* to the outside of each upright piece *J*, the upper or free end of said spring extending up in front of the tongue *K²* of the frame *K*, and the action of said spring is such as to keep the frame *K* and its finger in proper position when turned up on the edge of the cam-cylinder *A'*, during the operation of widening in knitting the toes and heels of stockings, shoulders *K³* of frames *K* resting on the top edge of the cam-cylinder, as indicated in Fig. 2. Springs *w* also act to keep frame *K* steady and from being accidentally thrown up when the machine is in use for circular knitting, and in which case said frames and their dropper-fingers are turned back, as shown, Fig. 1.

In Figs. 16 and 17, which are on a reduced scale, cams *u u* on frames *K* are not shown, those figures being specially designed to illus-

trate the relative positions of needle-guides, needle-operating cams, needle-paths, and dropper-fingers. The face of cam-piece *C²* is cut away about one-half, to leave a cam face or shoulder, *n*, to fit against and operate spring-lever *b*, while the face of cam-piece *C⁴* is cut away much more, to give said piece freedom to turn sufficient to operate lever *F'* by its eccentric *g*, without its cam or shoulder *n'* coming in contact with its spring-lever *e*.

The yarn-guide *M* is hinged at 20 to a piece, *M'*, fastened to the outer side of the cam-cylinder *A'* with a spring, *M²*, fastened upon its under side, which, acting on the projection *M³*, keeps the yarn-guide up in position for knitting; as shown in Figs. 1, 5, and 6, but permits it to be turned back out of the way when it is desired to remove the needle-cylinder. Upon the inside of the lower arm, *M⁴*, of the yarn-guide is fastened piece *M⁵*, and to which in turn is fastened at *M⁶* the needle-evener *N*. The front double-beveled end, *N'*, projects in over the upper needle-path, *D*, and which device serves the purpose of evening the needles by acting upon their shanks 21 as they pass under the same. The needles when put up by hand preparatory to knitting the heels and toes of stockings, as well as when lifted by the machine in narrowing, are liable to stand at different heights; but with this evener they are all caught under its points 22 and forced down to a uniform and proper lever, and by fastening said evener to the yarn-guide *M* and hinging the latter, as shown, both the yarn-guide and evener can be turned back out of the way for the removal of the needle-cylinder, and that too by one motion of the parts, which is a great convenience in the practical operation of the machine.

Those skilled in the art will understand that the mechanisms of both the lifter-fingers and dropper-fingers are so combined with the other operating parts of the machine that the top stationary cam, *I*, can be and is extended out at each end so as to serve the purpose of arresting the upward motions of cams *H H'* when the needles pass under them, and of supports to hinge the needle-guides *F* and *C* to; and, further, that said needle-guides are connected with their respective lifter and dropper fingers by means of their respective levers, *F'* and *C³*, whereby the operator can set and adjust needle-guide *C* and lifter-finger *C'* by cam-piece *C²*, and needle-guide *F* and its lifting-finger *G* by means of cam-piece *C⁴*, which construction renders the machine very simple and sure of operation and adjustment, thereby insuring not only good work, but greatly increased production over the methods in use prior to my present invention.

To adjust the machine for widening or putting down the needles in knitting the heels and toes of stockings, after the narrowing operation has taken place, as fully explained in my former patent, the operator standing in front of the machine with the yarn-guide *M* on the opposite side to him, the parts then be-

ing in the position shown in Fig. 1, by means of crank B' or other proper devices, turns cam-cylinder A' to the right to bring the needle-dropper on his left, as shown in Fig. 1, up in front of him or nearly opposite the position in which the yarn-guide is shown in said Fig. 1, and in which case the needle-dropper finger to the left of the operator as he thus stands is the one standing on the same side of the cam-cylinder A' as (and nearly over) the needle-lifter finger C', lever C², needle-guide C, and cam-piece C². He then takes hold of cam-piece C², turns it so as to press its cam-shoulder *n* against spring *b*, forcing it back, frees pin *a* from the notch in said spring, after which he lifts cam-piece C², thereby raising needle-guide C and its pin *a* into the positions shown in Fig. 8, where they will be securely held by pin *a*, taking into the upper notch in spring *b*, the latter springing back as soon as the operator takes his finger off of cam-piece C². By the same operation which raises and sets the needle-guide C spring *d* is depressed by pin *c*², thereby allowing the lifter-finger C' to fall down below the lower needle-path, D', as fully shown in Fig. 8. The operator now turns up frame K and its needle-dropping finger K' into the position shown in Figs. 2 and 3, dropper-finger K' standing with its notched free end pointing downward to the right, (see Fig. 3,) and the devices are now in positions for putting down the first needle on the right, and which is accomplished by turning the cam-cylinder to the right, when the notch in the end of dropper-finger K' will take hold of the shank 21 of the first elevated needle out of work on the right of the operator and force it down below the point of needle-guide C, and by which guide C it is guided into the path of the working-needles, (Indicated by dotted lines, Fig. 16.) The motion of cam-cylinder A' is continued to the right until the other needle-dropper has been moved around to the right, and has passed in front and a little to the right of the operator, when the machine is stopped, and the operator takes hold of cam-piece C¹ and turns it so as to bring its cam-shoulder *n'* against spring *e*, and forces said spring back and releases pin *a*² from the lower notch in said spring, after which he lifts cam-piece C¹, thereby lifting needle-guide F to the position shown in Figs. 16 and 17, and the upper end of lever F' is also raised, so that pin *a*² will take into the upper notch in spring *e*. By this operation pin *e'* will depress spring *f*, and allow lifter-finger G to fall below the lower needle path, D'. He then turns up the other frame, K, and its needle-dropper finger K', the same as the first set were turned up, with the exception that its needle-dropper finger points downward to the left of the operator, while the first put up pointed downward to the right. The machine is now adjusted for putting down the needles on both sides by a reciprocating or back and forth motion of the cam-cylinder. By the motion of the cam-cylinder to the right of the

operator in putting down the first needle on his right, and before the second dropper-finger was set, the dropper-finger, when it came in contact with the shank 21 of the needle to be put down, was in the position shown in full lines on the left in Fig. 16. (It will be understood that Figs. 13 to 17, inclusive, are supposed to represent views of the machine when the cam-cylinder has been turned a half-revolution from the position of the parts as seen in Figs. 7 to 10, inclusive.)

In the operation of the machine in putting down the first needle, the dropper-finger K' is swung down and then back to the position shown in dotted lines on the left in Fig. 16, and in which position its free end rides on top of the shanks of the needles that are up and out of use. The second needle-dropper finger being set as above explained, the motion of the cam-cylinder is reversed and turned to the left of the operator, and when said second-named dropper-finger reaches the first elevated needle on the operator's left its position is represented in full lines on the right in Fig. 17, and its notched end strikes the shank of the needle and forces it and the needle down, and its shank passes under the point of needle-guide F, by which it is guided into the needle-path of the working-needles, (indicated by dotted lines in the same figure,) while the dropper-finger K' is turned, during the still further movement of the cam-cylinder, to the left of the operator, from the position shown in full lines on the right-hand side, Fig. 17, in which position it first strikes the shank of a needle, to put it down to the position shown in dotted lines on the same end of Fig. 17, and in which position it rides on top of the shanks of the needles that are up and out of work on the left of the operator, until the first dropper-finger set has been moved to and over the space above the shanks of the needles in use, and until it comes in contact with the shank of the first elevated needle on the left of the operator, when the needle-dropper is turned back and set in its original position, in full lines on the left end of Fig. 16 and dotted lines on left end, Fig. 17. The motion of the cam-cylinder is now reversed, and another needle is put down to the right of the operator, and the other dropper-finger, as it is moved to the right of the operator, passes over in turn the space occupied by the shanks of the needles in use, and is turned back and set in position, as shown in full lines on right-hand end of Fig. 17 and dotted lines on the right-hand end of Fig. 16, by the shank of the first elevated needle to the right of the operator. The motion of the cam-cylinder is again reversed, and the operation repeated until all the needles have been put down which were raised by the machine in narrowing. The operator then takes hold of the finger-dropper frame K, which is located over the needle-guide C, and turns it back, together with its dropper-finger K', to the position shown on the left in Fig. 1, and leaves needle-guide C in

the elevated position shown in Figs. 8 and 13. He then takes hold of the other dropper-finger frame K—the one located over the needle-guide F—and turns it back, together with its dropper-finger K', to the position shown on the right of Fig. 1. He now takes hold of cam-piece C⁴ and turns its cam-shoulder *n'* against spring *e*, releases pin *a*² from the upper notch therein, and depresses the upper end of lever F' and pin *a*² until the latter takes into the lower notch in spring *e*, then reverses the motion of said cam-piece C⁴ and turns its eccentric up, thereby depressing the lower end of lever F' and its pin *e'*, the latter forcing down spring *f* and allowing needle-lifter finger G to drop down below the lower needle-path, D', the parts then being adjusted to the relative positions shown in Fig. 10, and the machine is again ready for circular knitting after the back half of the needles are put down by hand, in the usual manner.

It may here be remarked that before commencing to narrow, in knitting the heels and toes of stockings, it is always customary to raise the back half of the needles by hand, and that mode is followed in this instance, and when the narrowing and widening are completed they are put down again by hand before commencing circular knitting. Needle-guides C and F are adjusted by the above movements of parts to the respective positions shown in Fig. 13.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination, with the needle-cylinder and needles, cam-cylinder A', provided with frame-pieces J J, hinged pieces K K, provided with projections *s s*, with flat springs *k k* secured thereto, of curved needle-dropper fingers K' K', provided with pivoted flat-sided ends *i*, and arranged to move back and forth on their pivots between cam-cylinder and needle-cylinder while in operation, substantially as and for the purposes set forth.

2. The combination, with the frame-pieces K K and loosely-pivoted curved needle dropper-fingers K' K', of the side cams, *u u*, substantially as and for the purposes set forth.

3. The combination, with the slotted pieces J J, adapted to be rigidly fastened to the outside of cam-cylinder A, and pieces K, having the tongues K², of springs *w w*, fastened at their lower ends to the pieces J J, with their upper and free ends standing between the ears J' J' and back of the tongues K², substantially as and for the purposes set forth.

4. The combination, with the needle-cylinder A' and yarn-guide M, hinged at 20 to the projection M³, of the needle-shank or heel-evener N, substantially as and for the purposes set forth.

5. The combination, with the cam-cylinder A' and lifter-fingers C' and G, of hinged needle-guides C F and cam-pieces C³ C⁴ and their respective pins *a a*², for adjusting the latter, substantially as and for the purposes set forth.

6. The combination, with the stationary cam I and slotted cam-cylinder A', of hinged needle-guides C and F, provided with pins *a a*² and notched springs *b* and *e*, substantially as and for the purposes set forth.

7. The combination, with needle-guide C, pin *a*, and needle-lifting finger C' and its spring *d*, of lever C³, provided with pin *e*² and cam-piece C², substantially as and for the purposes set forth.

8. The combination, with needle-guide F, pin *a*², and needle-lifting finger G and its spring *f*, of lever F', provided with pin *e'*, and cam-piece C⁴, provided with eccentric *g*, substantially as and for the purposes set forth.

GEORGE C. CONVERSE.

Witnesses:

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WILLIAM C. CURTIS.