

(No Model.)

4 Sheets—Sheet 1.

A. STARK.
GRAIN BINDER.

No. 354,813.

Patented Dec. 21, 1886.

Fig. 1.

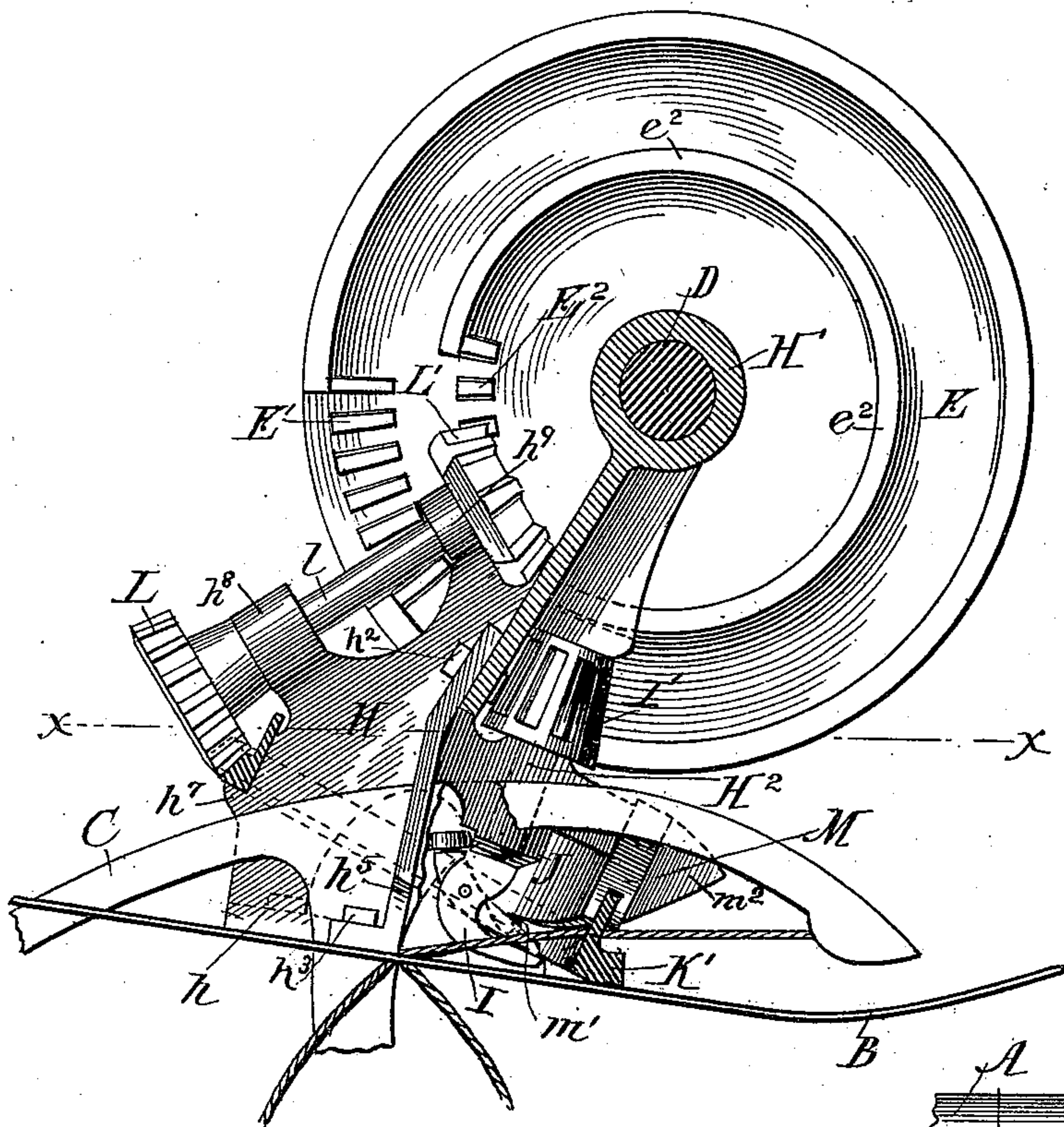


Fig. 10.

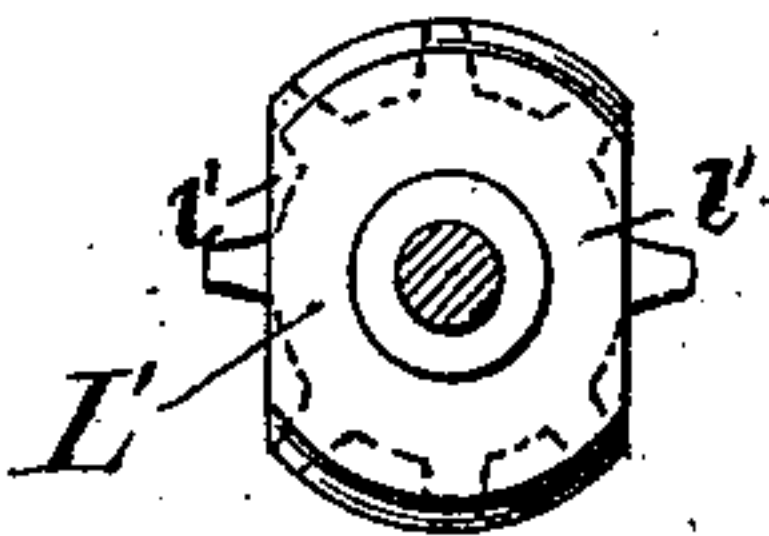


Fig. 3.

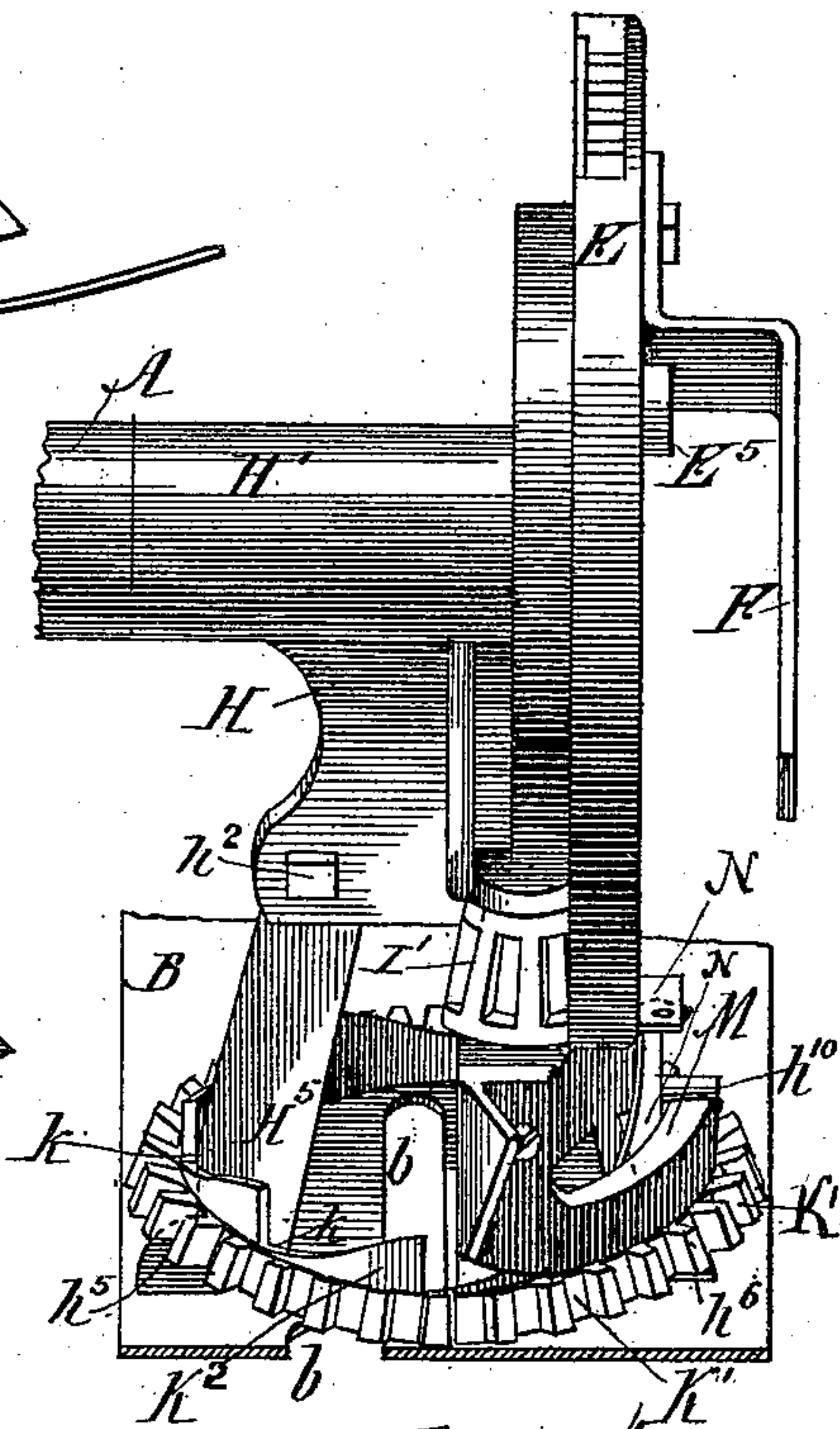
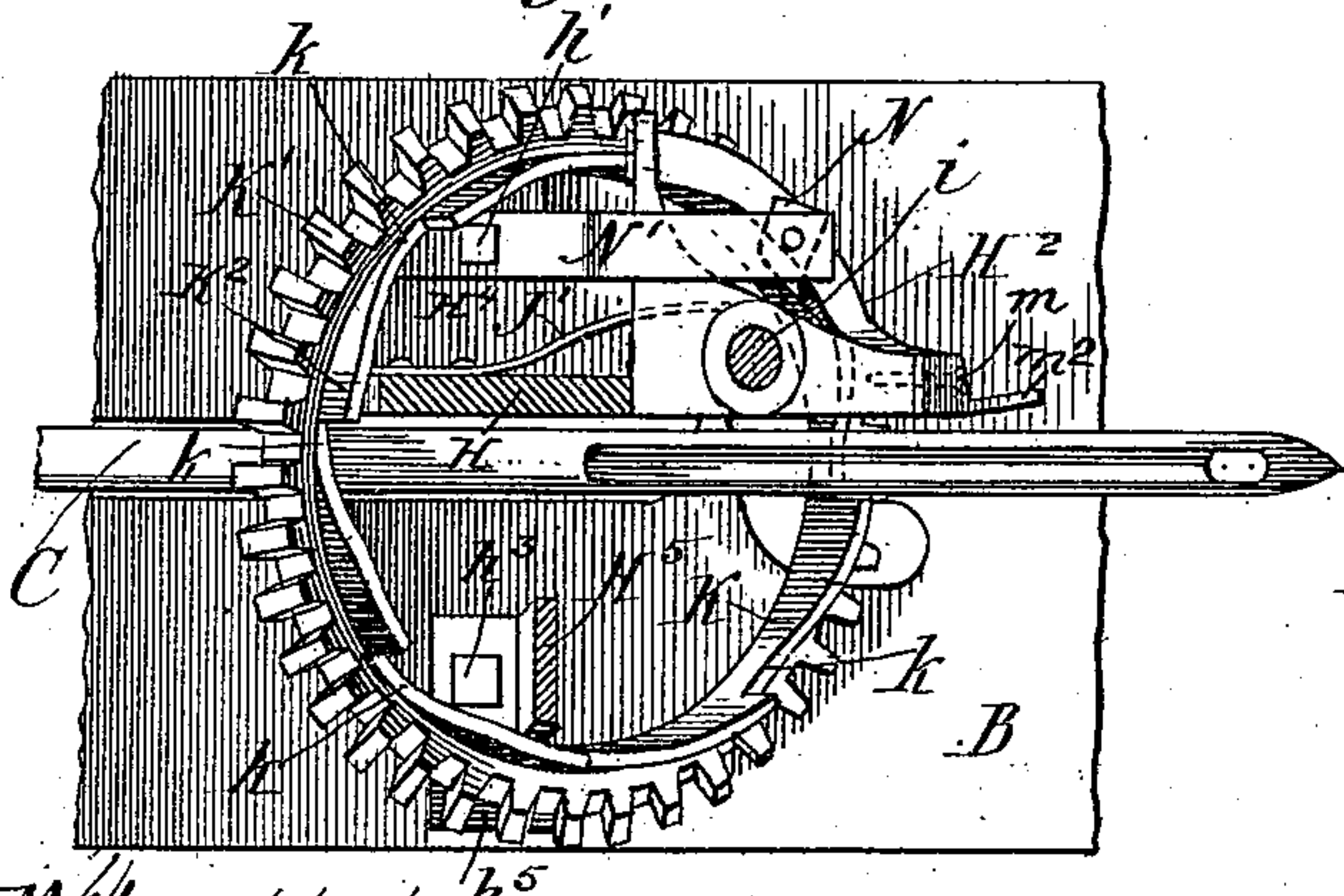


Fig. 4.



Witnesses:

Frank S. Blanchard

Fred. G. Dietrich

Inventor

Andrew Stark

By Chas. S. Burton
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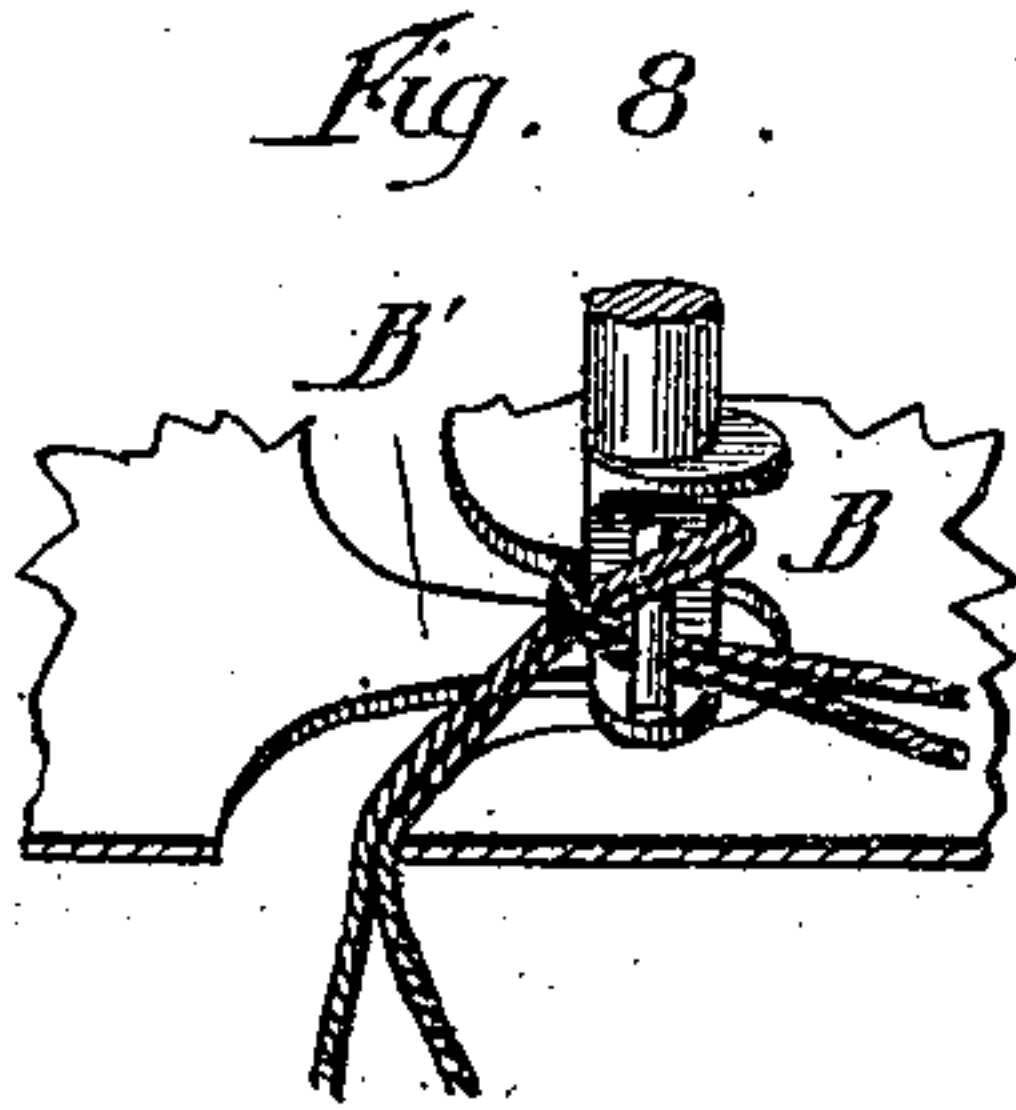
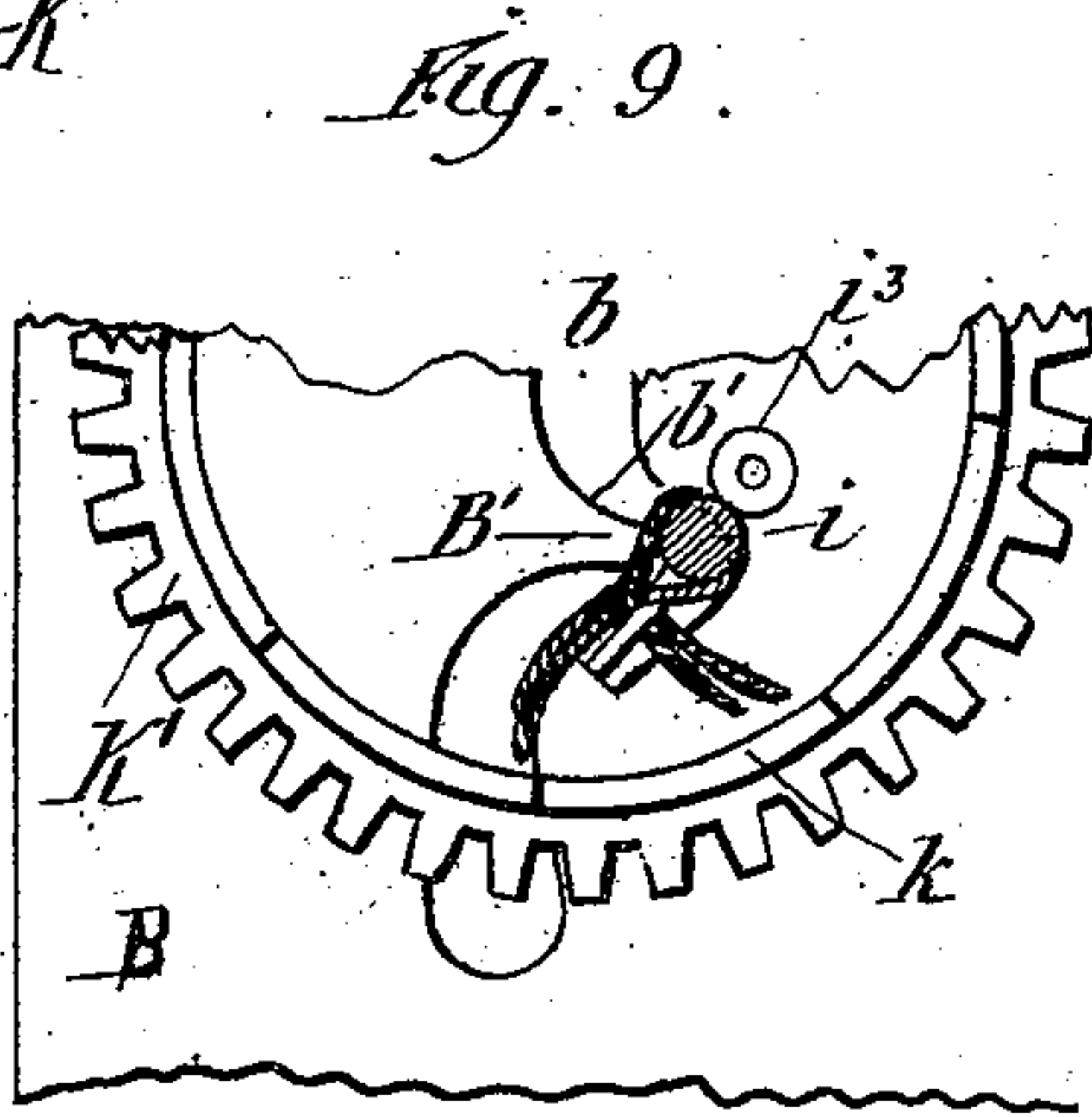
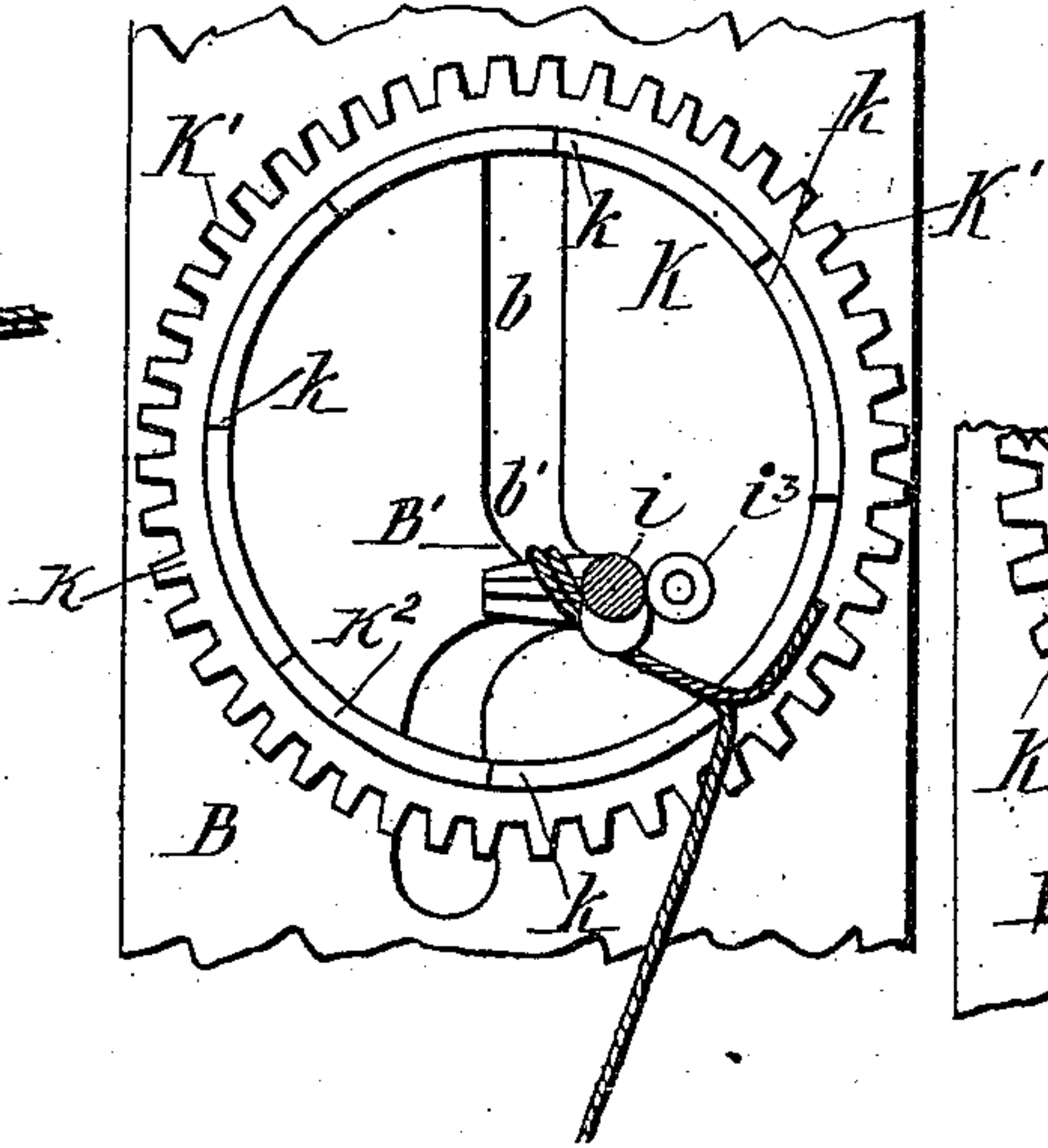
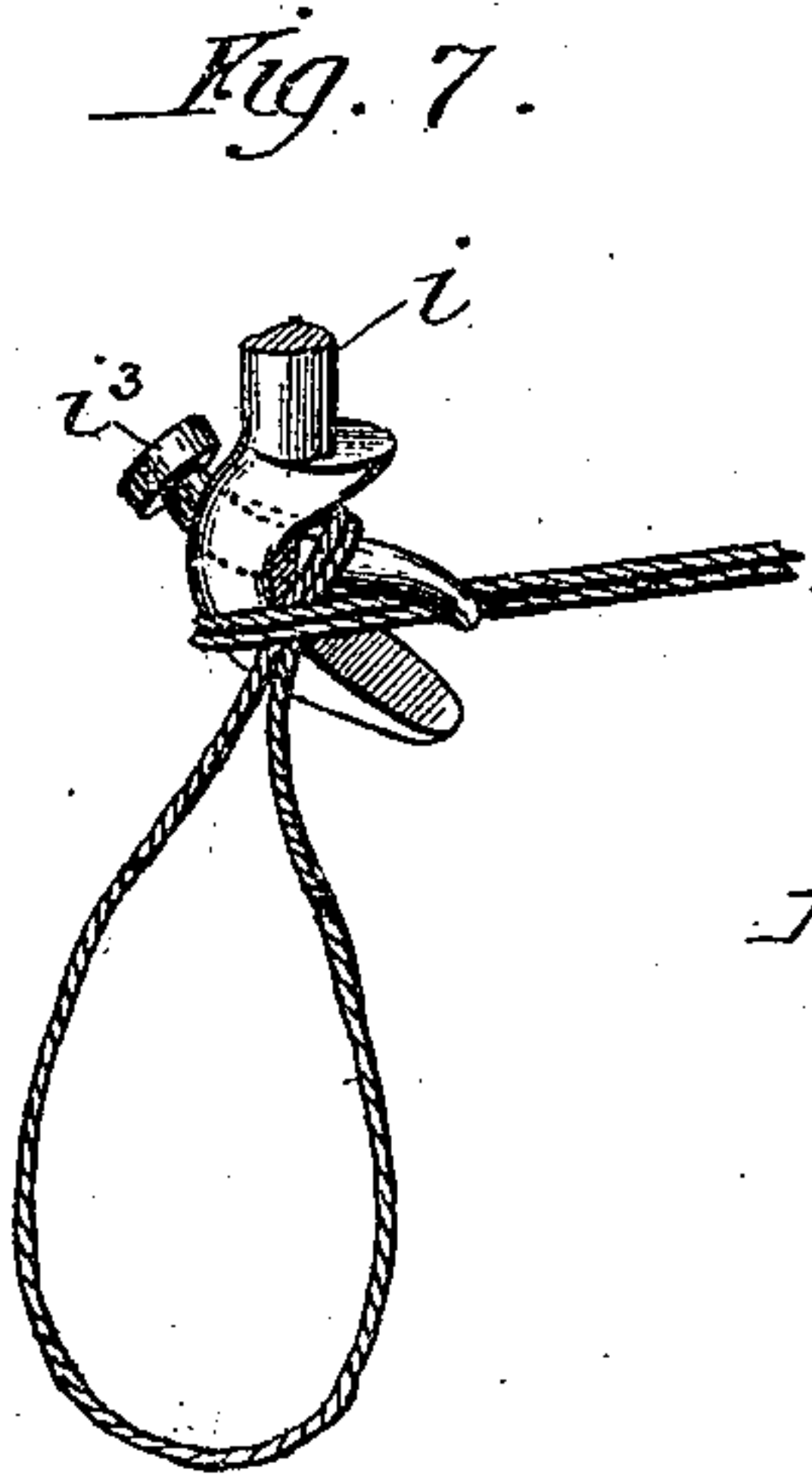
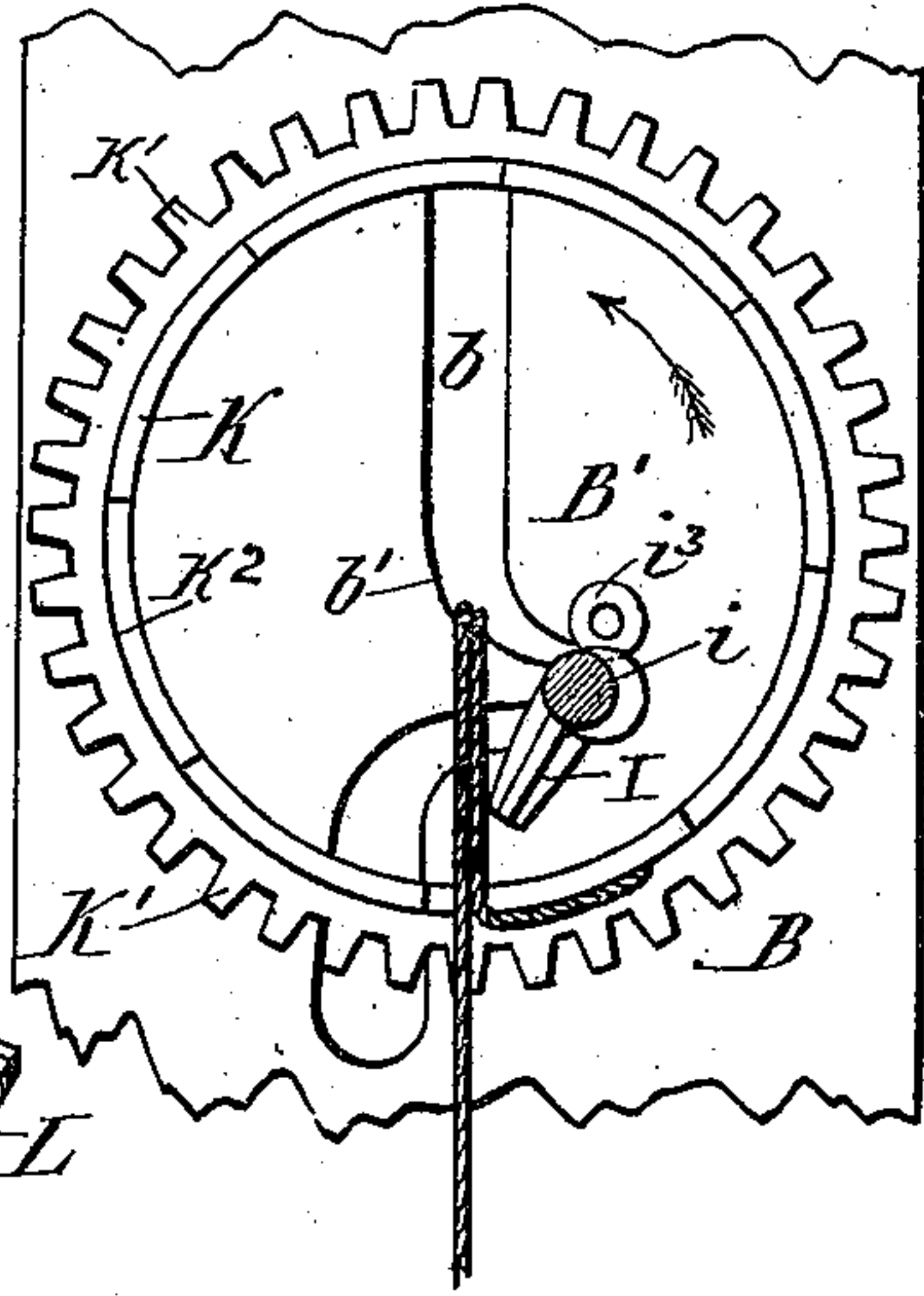
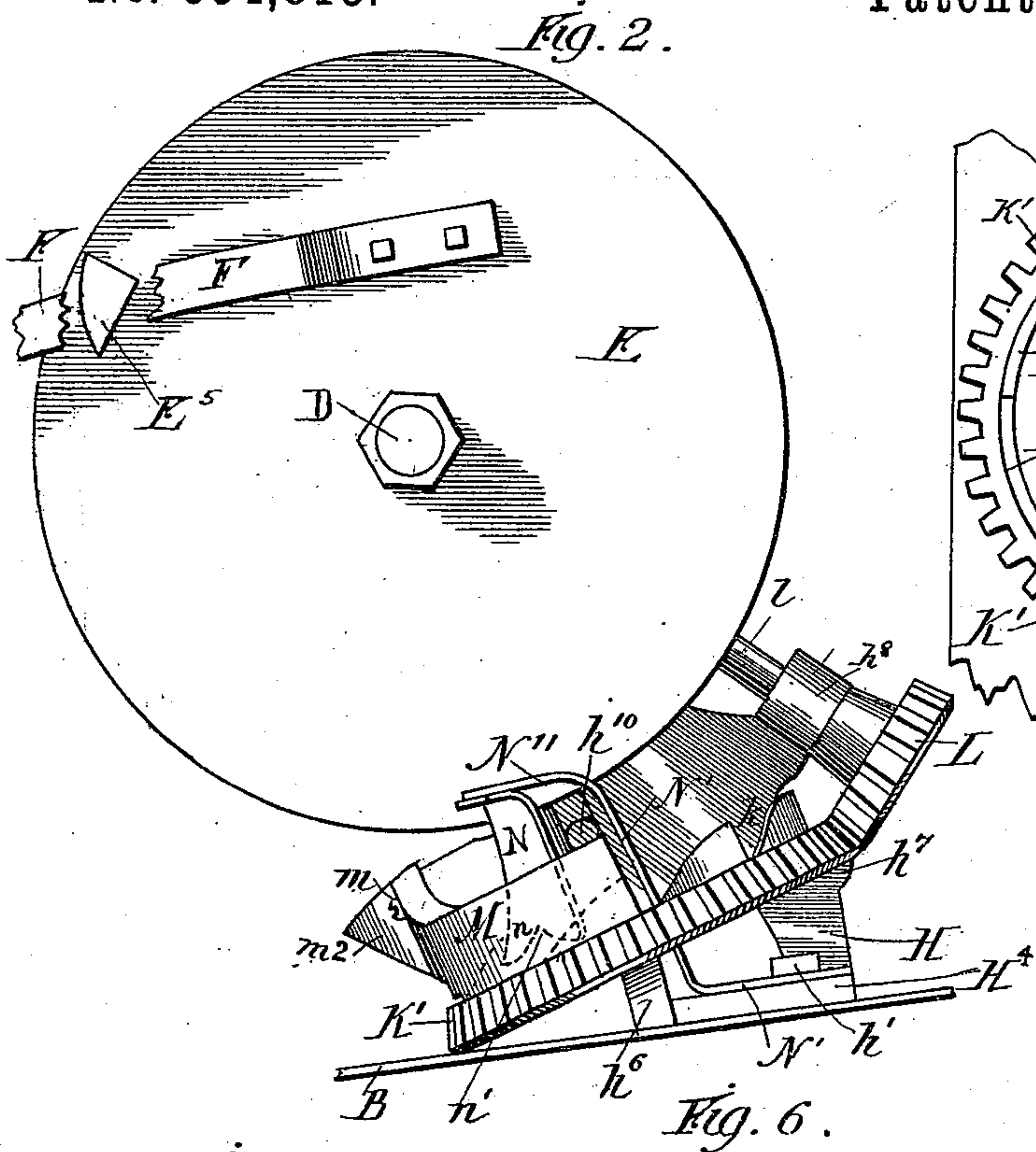
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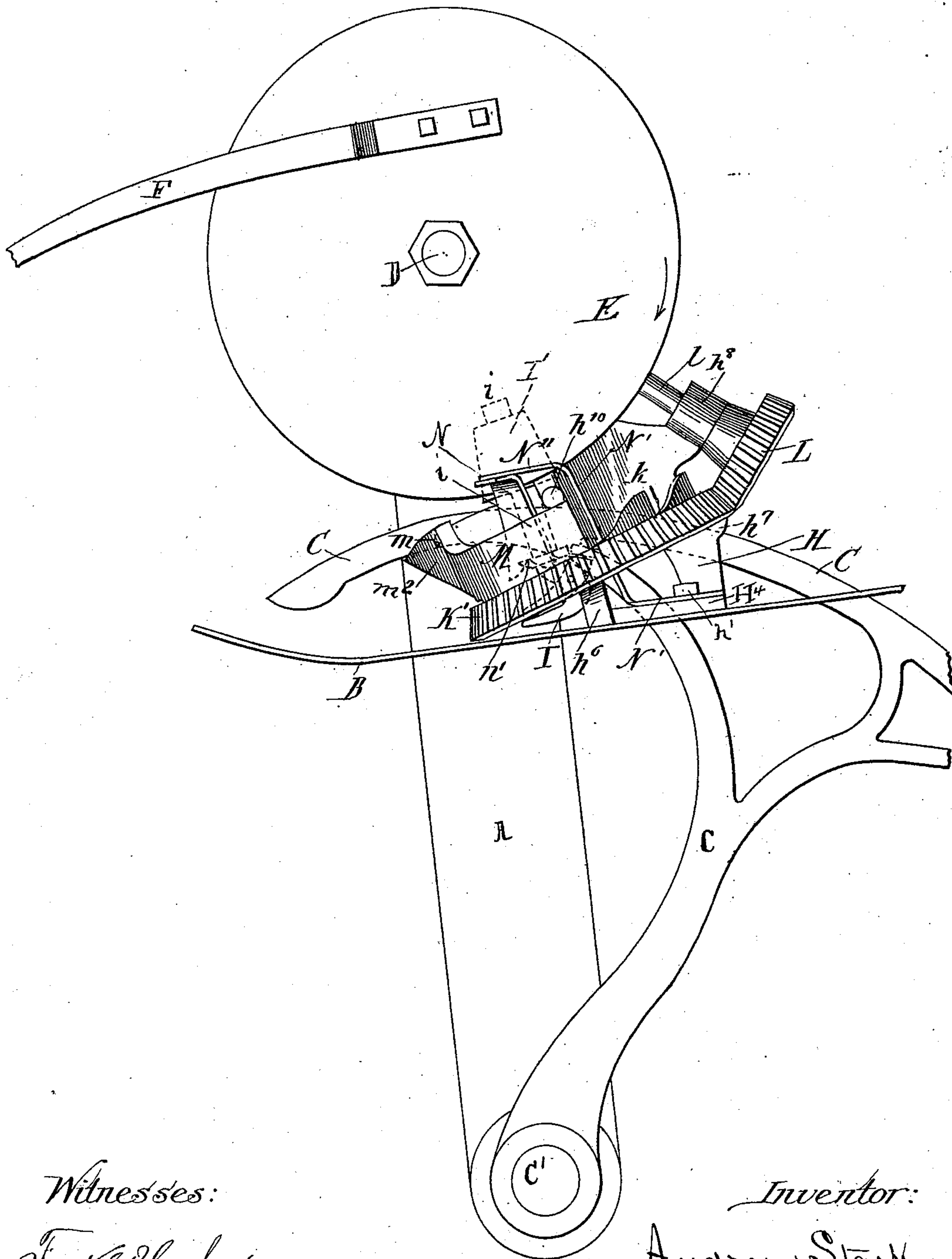
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Fig. 11.



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Fig. 12.

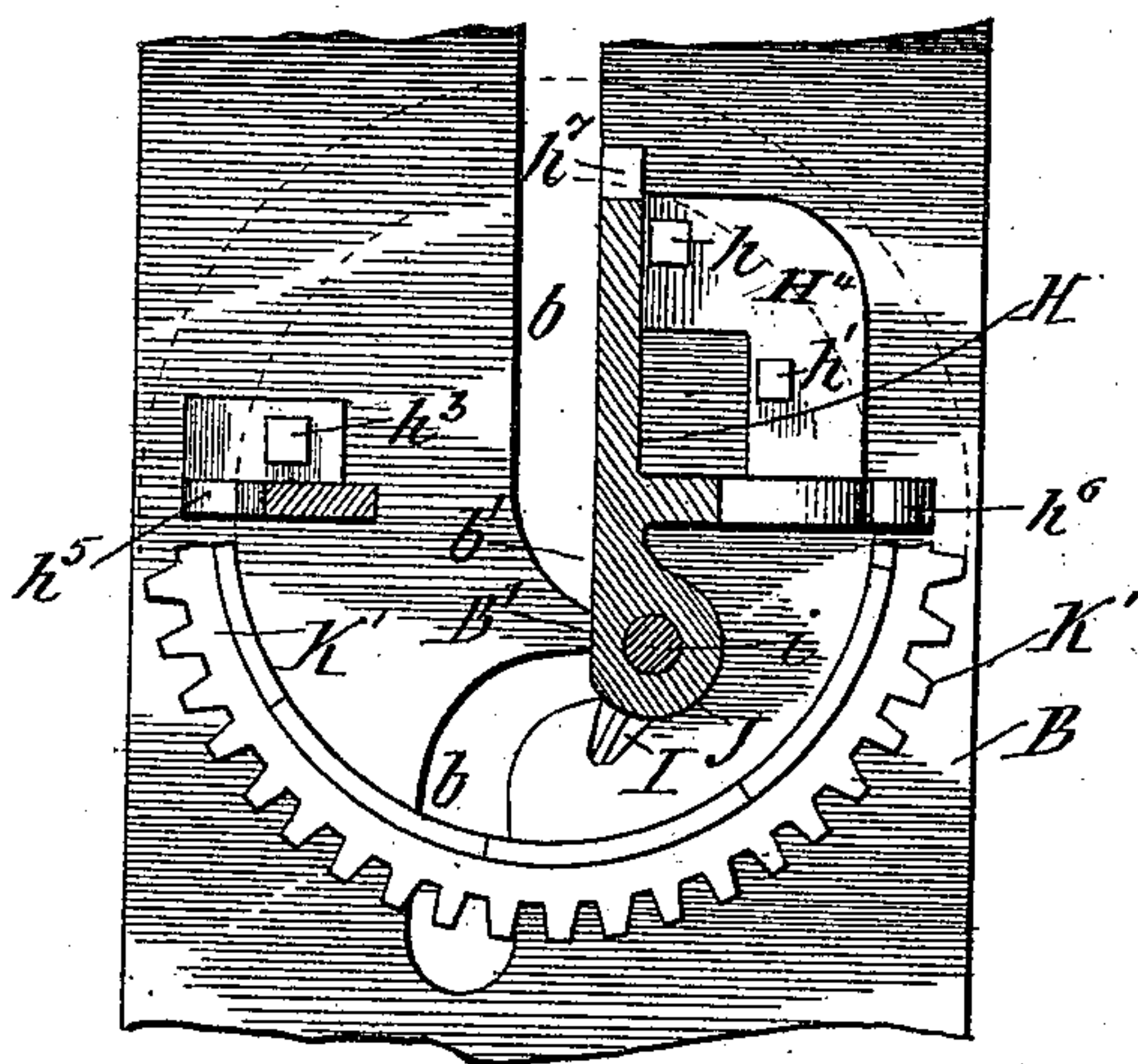
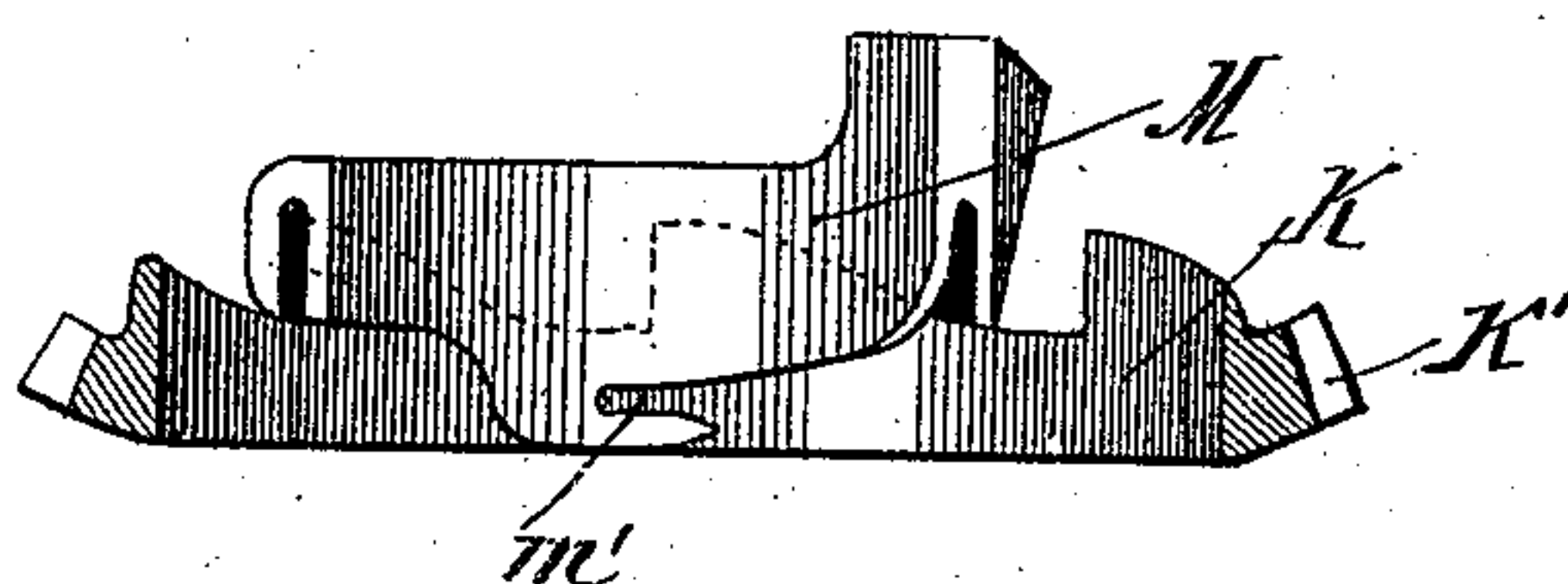


Fig. 13.



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UNITED STATES PATENT OFFICE.

ANDREW STARK, OF CHICAGO, ILLINOIS.

GRAIN-BINDER.

SPECIFICATION forming part of Letters Patent No. 354,813, dated December 21, 1886.

Application filed September 10, 1885. Serial No. 176,742. (No model.)

To all whom it may concern:

Be it known that I, ANDREW STARK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grain-Binders, which are fully described in the following specification.

This invention is an improvement upon the knot-forming mechanism of a grain-binder, and relates particularly to the cord-holder.

It consists of a cylindrical cord-holding ring revolved about the knotter-bill, having notches in one edge to receive and carry the cord into proper position to be seized by the knotter-bill, and by the same motion carrying the cord to a suitable clamp co-operating with the said ring to hold the ends of the cord.

In the drawings, Figure 1 is a rear elevation. Fig. 2 is a front elevation. Fig. 3 is an inner side elevation. Fig. 4 is a sectional plan of the parts below the plane xx on Fig. 1. Figs. 5, 6, 7, 8, and 9 are detail views showing successive positions of the knotter-bill relative to the breast-plate and to the cord-holder. Fig. 10 is a detail plan of the mutilated pinion that drives the holder-ring. Fig. 11 is a front elevation showing the relative positions of the needle and the knotter-actuating wheel. Fig. 12 is a partly-sectional plan of the knotter-frame and breast-plate, showing how they are fastened together. Fig. 13 is a sectional elevation of the inside of the cord-holder ring and cord-clamp, section being taken on the line ww , Fig. 12.

A is the binder-frame. B is the breast-plate. C is the needle. C' is the needle rock-shaft. D is the main shaft of the binder. E is the knotter-actuating wheel. F is the discharger. G is the binding-cord. H is the knotter-frame. I is the knotter-bill.

The knotter-frame H has the sleeve H', for the binder driving-shaft D, on which it is thereby hung in the usual manner. It has also the journal-box H², for the knotter-bill shaft or spindle i , said box and shaft being set laterally oblique to the plane passing longitudinally through the shafts C' and D, and inward therefrom. The frame H is secured to the breast-plate B by the bolts h and h' , through the flange H⁴. It has also the brace or hanger H⁵, secured to it by the bolt h^2 , and to the breast-plate B by the bolt h^3 . The knotter-bill I is actuated in the usual manner by the

gear-segment E' on the knotter-actuating wheel E. The breast-plate B has the usual slot, b , for the needle to pass and carry the cord to the knotter; but the form of the slot is such as to produce the tongue B', standing transversely across the general direction of the slot b , and terminating directly below the knotter-bill shaft i , and having the obliquely-curved edge b' on the inner side.

K is the cord-holder ring. It is an open ring, being in effect a short cylinder having the equidistant notches k on its upper edge and the bevel-gear rim K' on its outer surface at the lower edge. It encircles the knotter-bill I, its axis being preferably about parallel to that of the knotter-bill and being inclined upward on the inner side—the side from which the needle advances toward the bundle—and being sustained upon the shoulders h^5 , h^6 , and h^7 of the frame H, the first being on the brace or hanger H⁵. It is placed in position on the shoulders h^6 and h^7 before the brace H⁵ is put into place, and before the breast-plate B is fastened to the frame H. The brace or hanger H⁵ being put into place, with its shoulder h^5 under the rim of the ring, secures it, and on the three bearings it is revolved by means of the bevel-pinion L, meshing with the bevel-gear rim K'. Said pinion L is fixed on one end of the shaft l , which is journaled in the bearings h^8 and h^9 on the frame H, and carried by the bevel-pinion L', on its upper end meshing with the gear-segment E² on the knotter-actuating wheel E. The pinion L' has two delay-surfaces, l' , directly opposite each other. Said delay-surfaces co-operate with the delay-surface e^2 on the knotter-actuating wheel E, to hold the pinion and its shaft and the cord-holder ring K stationary, except while the segment E² is engaged with the gear-teeth of the pinion L. Said pinion and shaft and the holder-ring K, therefore, stand at rest, except during a very small part of the revolution of the knotter-actuating wheel, and the pinion L' and shaft l and pinion L make but half a revolution for each full revolution of the knotter-actuating wheel. The pinion L, by such half-revolution, is adapted to rotate the ring K the distance from notch to notch.

By placing the axis of the knotter-bill laterally oblique to the plane in which lie the axes of the knotter-actuating wheel and the needle it is made possible to place the cord-

holder ring at right angles to the knotter-bill axis, as described, so that the jaws revolve in a plane parallel to the ring, and at the same time locate the breast-plate close up under the knotter, and bring its tongue B', from which the bundle is suspended, and by which the cord's position, when the knotter seizes it, is determined, as nearly as possible in line with the axis of the bill, thereby reducing to the minimum the length of cord intervening between the bundle and the knot—that is to say, facilitating tying close to the bundle.

If the axis of the bill were located, as usual, in the plane in which are located the axes of the needle and knotter-actuating wheel, the result above set forth could be attained only by greatly enlarging the ring K, thereby sacrificing compactness or changing the direction of the plane of the ring K, and sacrificing the advantage of that direction.

M is the cord-clamp block. It is secured by the screw or bolt *m* to the frame H, located outward from the knotter-bill and on the same side of the path of the needle as said bill. From its said point of fastening it extends for about ninety degrees around the bill in a curve agreeing with that of the ring K. It is preferably in the form of a clasp or saddle striding the rim K², though it may be made to bear only on the outside of that rim. The inside wing of said clamp-block has the notch *m'* to guide the cord, as hereinafter explained. In addition to the fastening by the bolt *m*, the clamp block M is rendered more rigid by means of the spur *h*¹⁰, jutting out from the frame H and forming a stop or brace for the clamp-block above the end farthest from the bolt *m*. The end adjacent to the path of the needle has the projection or spur *m*² to guide the cord.

N is the cord-cutter. It is a knife or chisel fastened to the free end of the spring or yielding arm N', which is secured in place by the bolt *h'*, which passes through the lug H⁴ of the knotter-frame to secure it to the breast-plate. Said cutter and its spring-arm are, therefore, wholly within the ring K. The cutting-edge *n* has preferably the V-shaped notch *n'* opening downward and adapted to stride the cord, and so sever it more easily than could be done by the direct stroke of a straight cutting-edge.

The cutter is forced down upon the cord in proper time by the cam E⁵, fixed on the front face of the knotter-actuating wheel E in position to impinge upon the upper sloping portion, N'', of the yielding arm N'. It is retracted by the reaction of said spring or yielding arm N' after the cam E⁵ has passed it.

The action of the above-described mechanism is as follows: At starting, the end of the cord is secured in the holder by being grasped between the rim K² and the outer flange or wing of the clamp-block M, whence the cord passes through one of the notches *k*, and back over the tongue B' of the breast-plate B, to the eye of the needle. When the needle rises and carries the cord around the bundle, it passes through the slot *b* in the breast-plate B and

enters the ring K from below, near the inner edge, passes through it and overhangs its outer edge. (See Figs. 1 and 4.) In this process the running cord is carried through the slot *b*, and meeting the transverse tongue B' is laid across it, and thence extends alongside the fastened end of the cord into the notch *k*. (See Fig. 5.) The slope of the tongue B' on its inner side, *b'*, tends to cause the cords lying across it to slide toward the shank of the knotter-bill as the cord is tightened around the bundle. The knotter-bill at this stage stands at rest in the position shown in Figs. 5 and 1, pointing obliquely outward and downward toward the plane of the cord, and with its point a little lower than the cord as it runs from the tongue B' to the notch *k*. (See Fig. 1.) At this stage the gear-segment E² on the knotter-actuating wheel E engages the pinion I' and the ring K is revolved one-eighth of a revolution in the direction of the arrow-head on Fig. 5, carrying the double cord which lies in the notch *k* toward the knotter-bill shank and into the clamp, and stops, leaving the cord running from the tongue B', over the closed jaws of the knotter-bill I, into the clamp. Meanwhile the knotter-bill has started, the gear-segment E' having come into engagement with the pinion I', and the knotter-bill shaft being inclined so that it forms an acute angle, with the cord on the side toward the holder, the cord being stretched from the tongue B' to the clamp, and the bill or jaws being about at right angles to the said axis, the revolution of the bill carries the jaws upward behind the cord and gathers the latter into the angle between the shank and the bill, and when the bill has completed one-eighth of its revolution the position of the said bill, holder, and cord is as shown in Fig. 6, the relation of the bill to the cord having changed ninety degrees, the cord having been carried by the holder forty-five degrees toward the bill, and the bill having revolved forty-five degrees toward the cord. The bill now continuing its revolution, the jaws are opened by the engagement, in the usual manner, of the roll *i*³ with the cam J, and so remain until the bill reaches a position at two hundred and seventy degrees from the starting-point (seen in Fig. 7), where it encounters the cord ends between the clamp and the knotter-bill shank and receives them between its open jaws. The cords are at this point stretched tight from the clamp to the point where they are laid across the bill, and their exact position in the path of the open knotter-jaws is insured by the notch *m'* on the inner wing of the clamp-block M, the cords having been guided by the sloping under edge of the inner wing of the clamp and by the sloping sides of said notch into its angle, as the ring K carried them into the clamp. Up to this point it will be seen that the cord needed to encircle the knotter-jaws may be drawn from the portion of cord surrounding the bundle, but at this stage, the cord being crossed on the knotter bill and drawn tight, no more cord can be drawn from that source; also that in the fur-

ther revolution of the bill the point at which the cord crosses it moves away from the point at which the cord is held in the clamp, and that some cord must be yielded for the purpose.

5 This necessary cord is partly, and may be entirely, furnished by the closing of the jaws of the knotter-bill, which is effected at this stage, the roll i^3 passing off the cam J and coming into contact on the opposite side with the cam J'.
 10 All the slack cord thus furnished is taken up by the revolution of the knotter-bill away from the clamp. The bill while thus closing revolves to the position shown in Fig. 8, where it is fully closed. As it continues its revolution from this
 15 point, tightening the cord between it and the clamp, the cam E^5 on the wheel E engages and depresses the cutter, and its notch n' , striding the taut cords, severs them between the clamp and the bill. The knotter comes to
 20 rest in the position shown in Fig. 9, which was the initial position. Meanwhile the knotter-actuating wheel E, continuing its revolution, the continued pressure of the discharger F against the bundle pulls the ends of the cord out from
 25 the jaws of the knotter-bill, and the tying is completed. Meanwhile, the needle retiring carries the running cord back through the next notch k of the ring K down over the tongue B' , and leaves the cord, as at starting,
 30 ready for a new bundle, and all parts come to rest in the initial position.

I do not confine myself to the use of the holder of the construction described in connection with a knot-tying bill or hook of the
 35 form illustrated; but said holder may be used in connection with any of the forms of knot-tying bills now in use; and I do not intend to be understood by the word "bill" to indicate merely such devices as have a vibrating jaw,
 40 but I include under that term any loop-forming device in a knotter.

The construction of the breast-plate having tongue B' protruding across the needle-slot and terminating in line with the knotter-bill shaft, and the construction which causes the
 45 knotter to carry the cord around the end of said tongue, and the form of the outer portion of the slot, as shewn in the drawings, are not claimed herein, because I have claimed said
 50 features of construction in my application No. 205,050, filed June 14, 1886, which is a division of this application.

I claim—

1. In combination, substantially as herein-
 55 before set forth, the knotter-bill, the cogged cord-holder ring encircling the bill and having cord-receiving notches or apertures, its driving-shaft l and the pinion thereon, and the knotter-actuating wheel having on the same
 60 face the gear-segments which actuate the knotter-bill and the cord-holder ring, whereby the cord-holder ring and the knotter-bill are revolved in opposite directions.

2. In combination, substantially as herein-
 65 before set forth, the needle, the knotter-bill, and the cord-holder ring encircling the latter and the path of the former.

3. In combination, substantially as herein-
 above set forth, the needle, the knotter-bill, and the cord-holder ring encircling the latter 70 and the path of the former and inclined obliquely to said path.

4. In combination with the knotter-bill and the cord-holder ring encircling the bill, the needle actuated to enter the ring on the side 75 toward the bundle and pass obliquely through it, substantially as set forth.

5. In combination with the needle and the knotter-actuating wheel, the knotter-bill having its axis oblique to the plane passing longi- 80 tudinally through the axes of the needle and the knotter-actuating wheel, and the cord-holder ring encircling the knotter-bill, the intersection of its plane with the plane of the needle being substantially at right angles to 85 the plane of the axes of the knotter-bill and knotter-actuating wheel.

6. In combination with the needle and the knotter-actuating wheel, the knotter-bill having its axis oblique to the plane passing longi- 90 tudinally through the axes of the needle and the knotter-actuating wheel, and the cord-holder ring encircling the knotter-bill in a plane at right angles to the axis of the latter, substantially as set forth. 95

7. In combination with the revolving cord-holder ring and the cord-clamp block co-operating therewith to hold the cord, and their sustaining-frame, the cord-cutter fixed to the frame, having its cutting-edge within the ring, 100 substantially as set forth.

8. In combination with the revolving cord-holder ring and the cord-clamp block co-operating therewith, the knotter-bill revolved within the ring, and the cord-cutter having its 105 cutting-edge within the ring, substantially as set forth.

9. The knotter-frame having bearings for the main shaft of the binder and knotter-bill shaft, and provided with ledges to afford bear- 110 ings for the cord-holder ring, located in a circle surrounding the axial line through the knotter-bill-shaft bearing, substantially as set forth.

10. In combination, substantially as herein- 115 before set forth, the knotter-frame having bearings for the main shaft of the binder and knotter-bill shaft, and having ledges to serve as bearings for the holder-ring, included within one half of the circle of said ring, and the 120 hanger H^5 , having an additional ledge to support said ring and secured to said frame, with said ledge located in the other half of said circle.

In testimony whereof I have hereunto set 125 my hand, in the presence of two witnesses, at Chicago, Illinois, this 22d day of August, A. D. 1885.

ANDREW STARK.

Witnesses:

CHAS. S. BURTON,
 FRANCIS W. RUSKE.