

# T. Crane, Straight Knitting Machine.

N<sup>o</sup> 91,214.

Patented June 15, 1869.

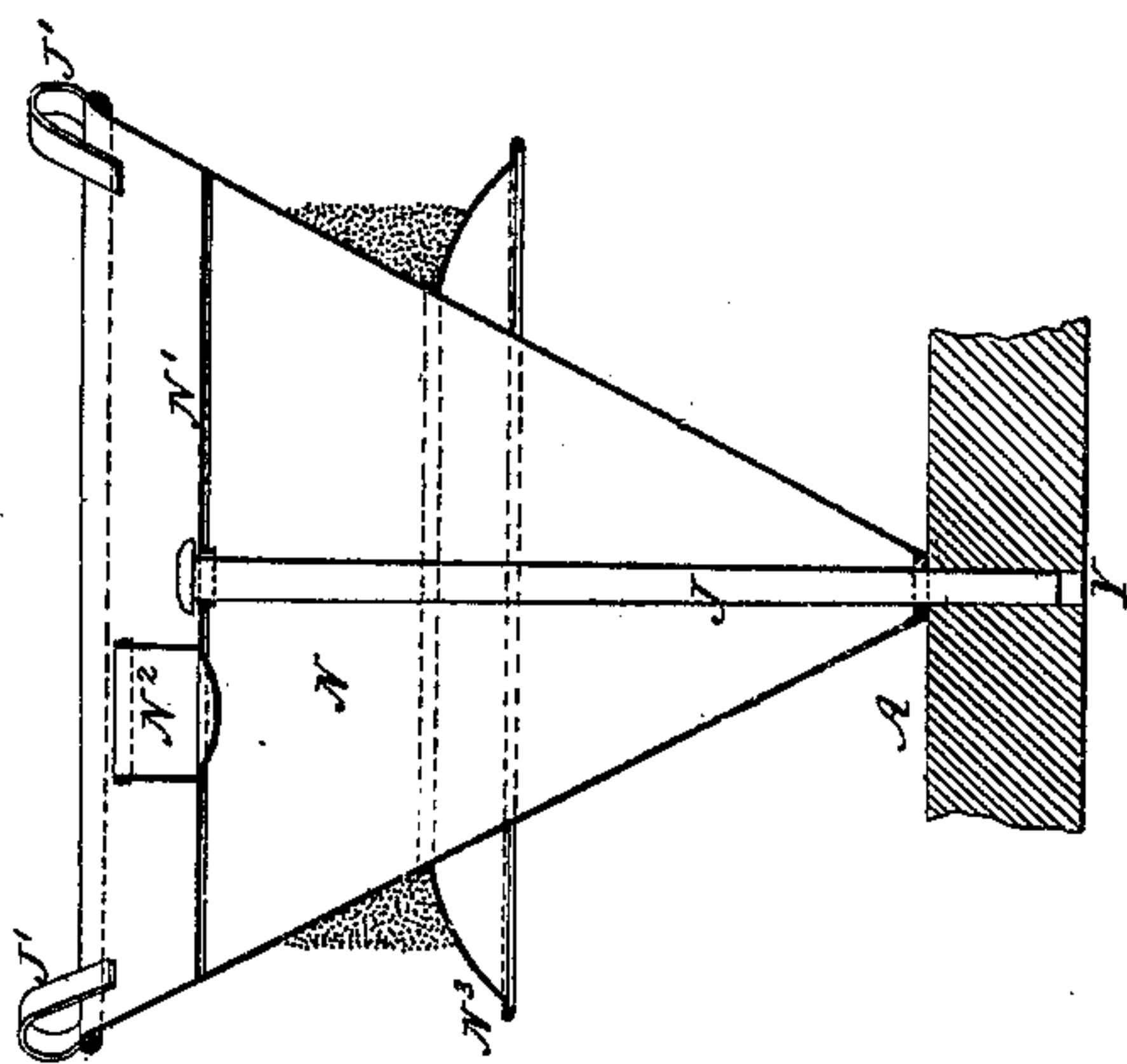


Fig. 3.

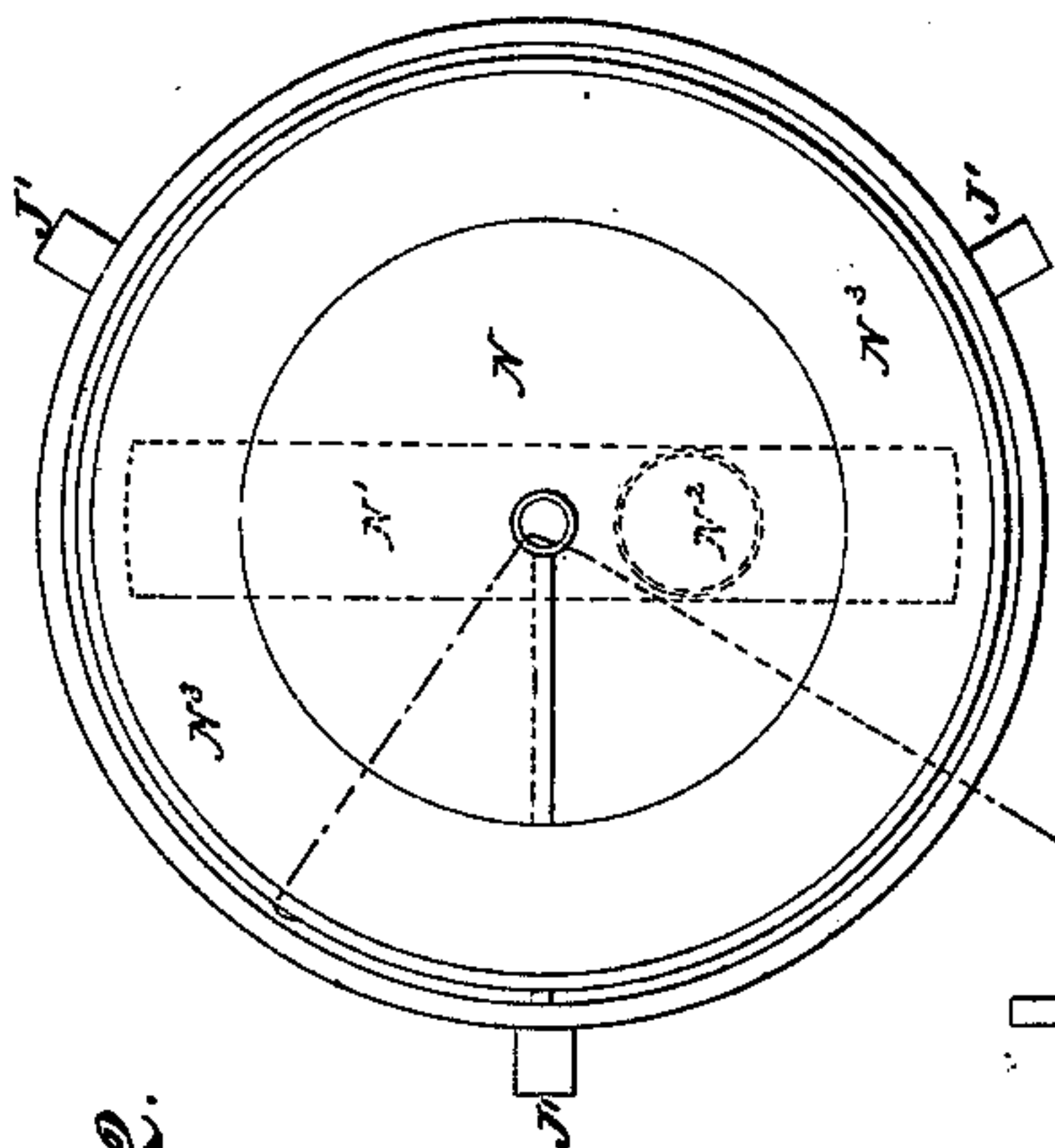
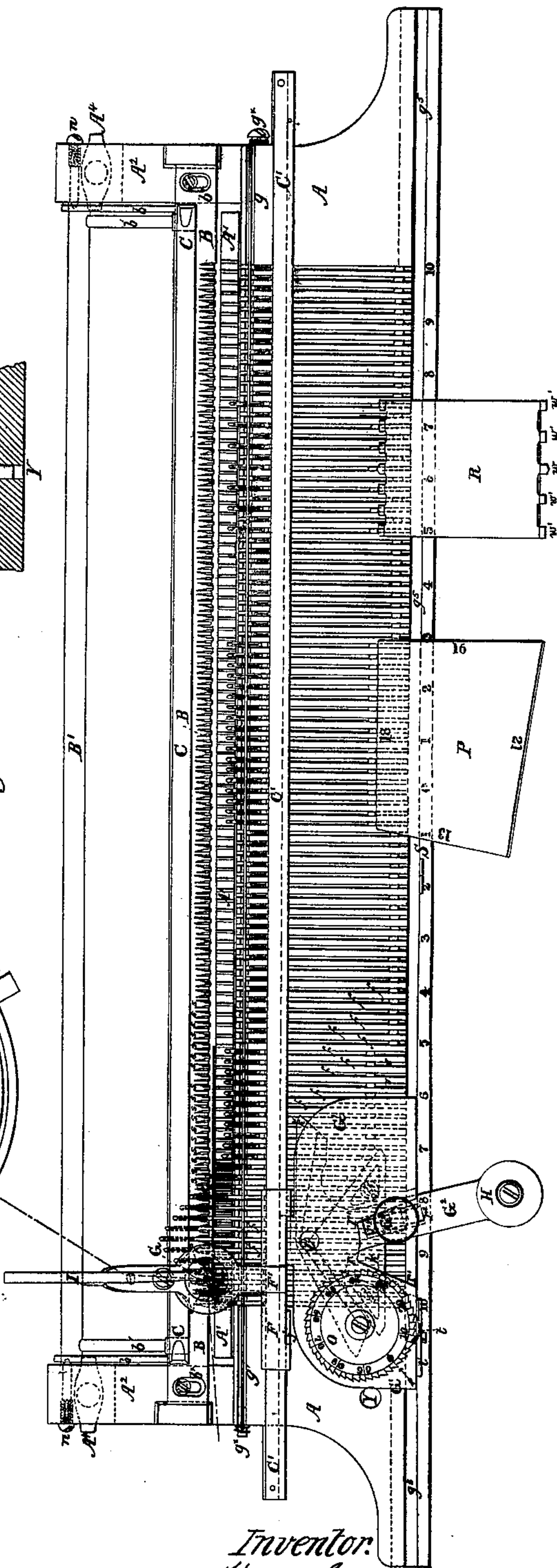


Fig. 2.

Fig. 1.



Witnesses.  
R. H. Campbell.  
J. H. Campbell.

Inventor.  
Thomas Crane  
by  
Mason Smith & Lawrence.

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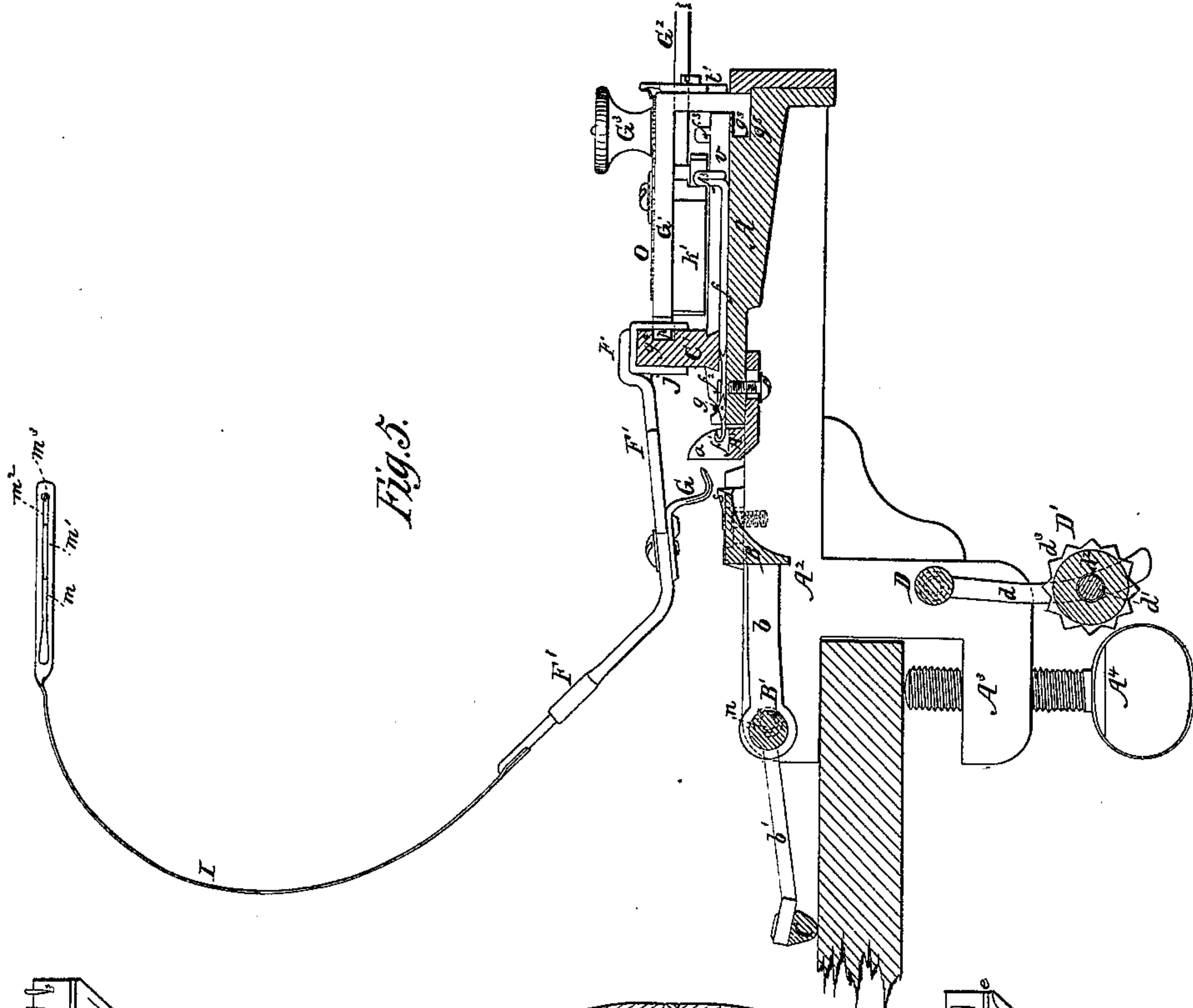


Fig. 5.

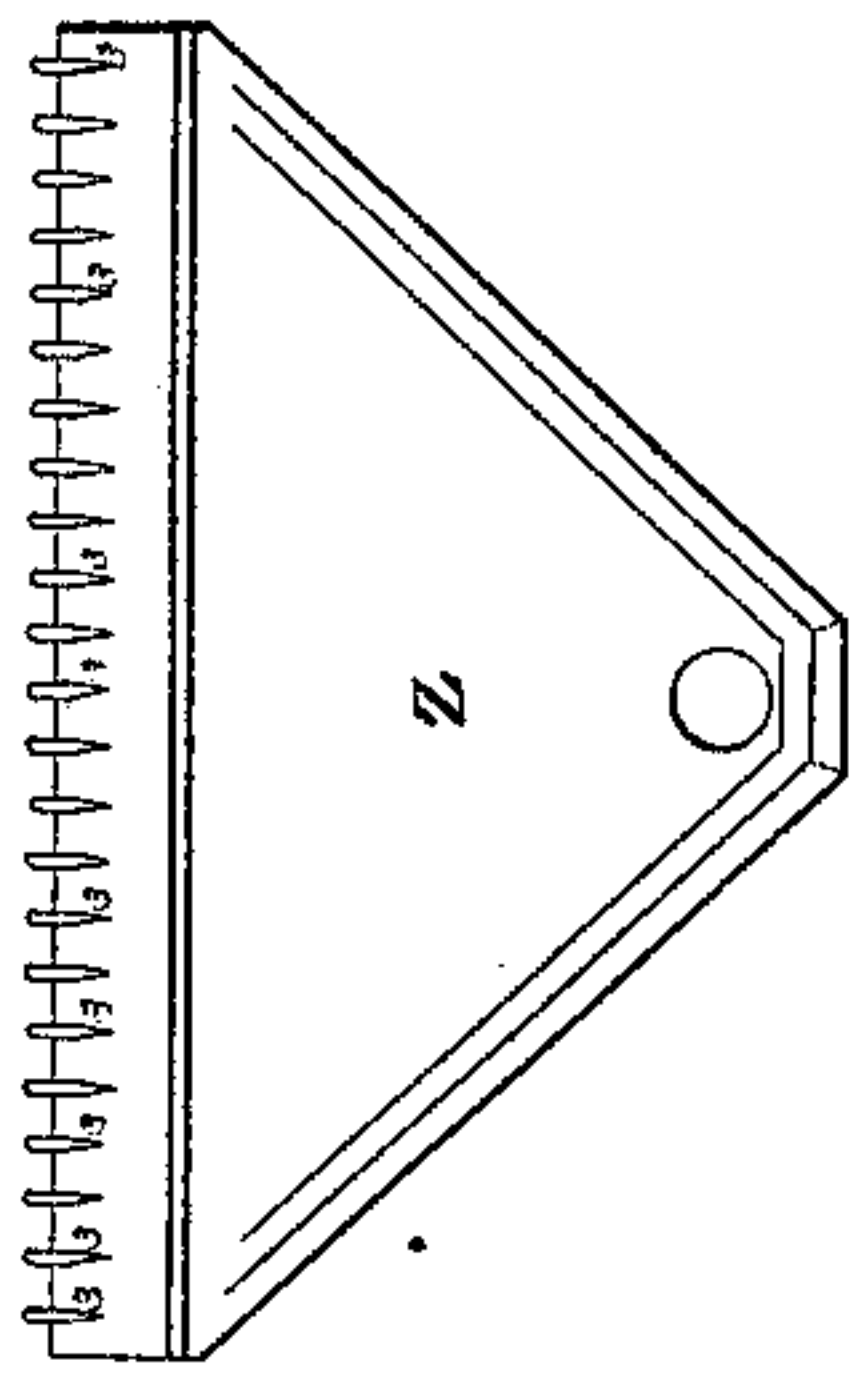


Fig. 7.

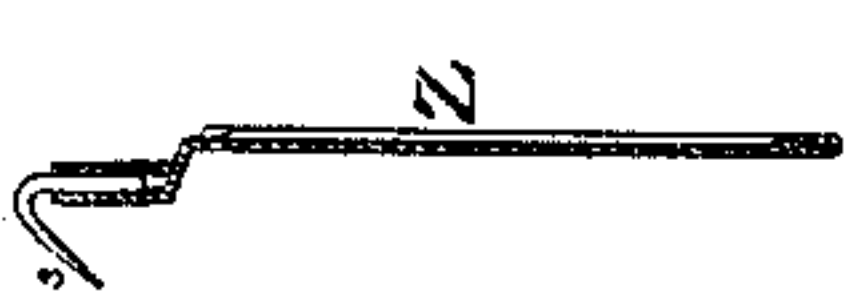


Fig. 8.

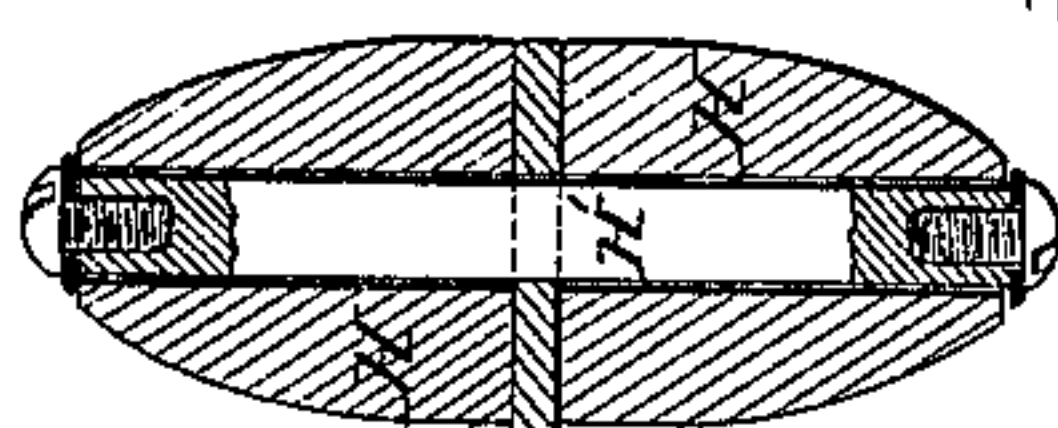


Fig. 6.

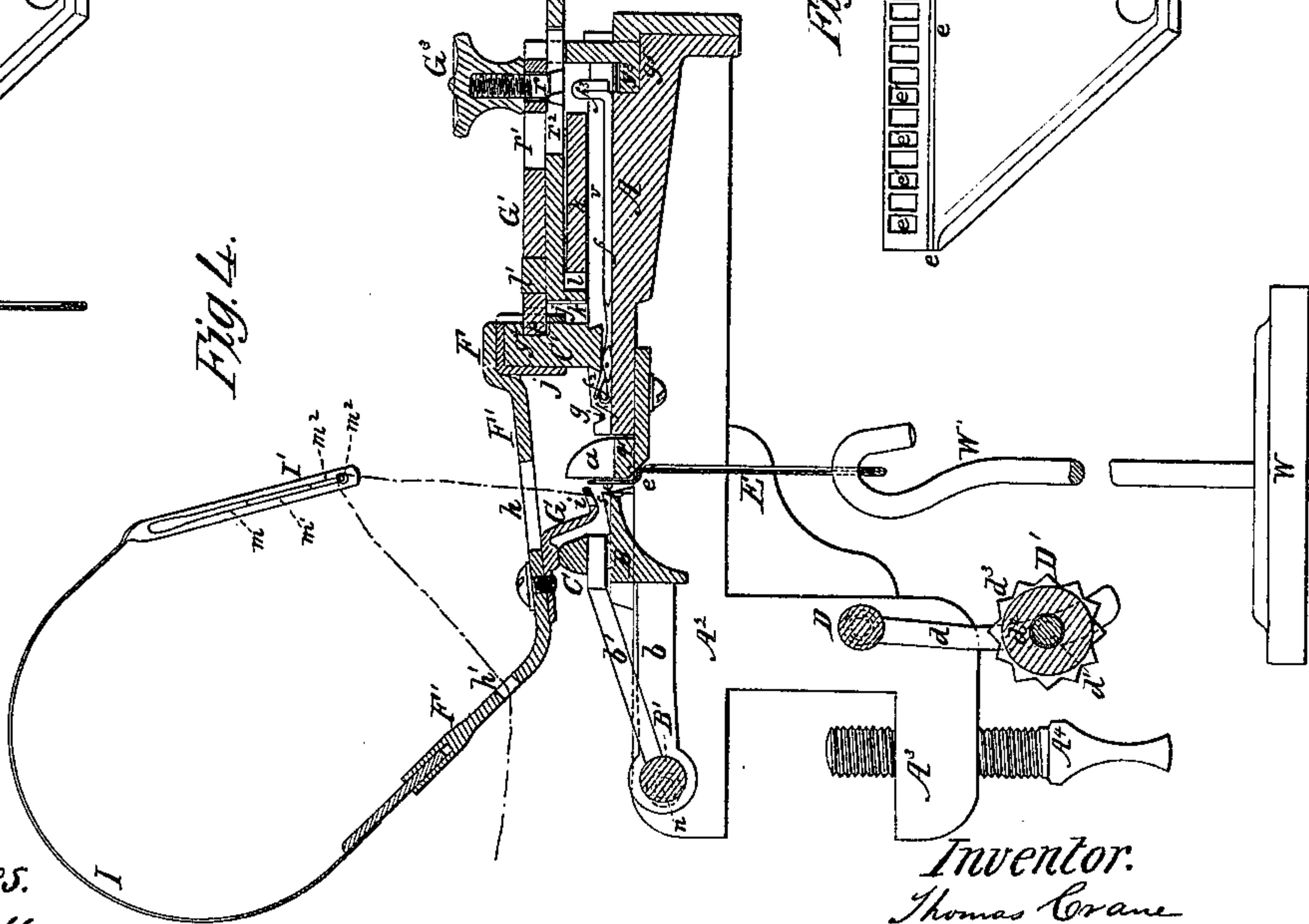


Fig. 4.

Witnesses.  
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Fig. 13.

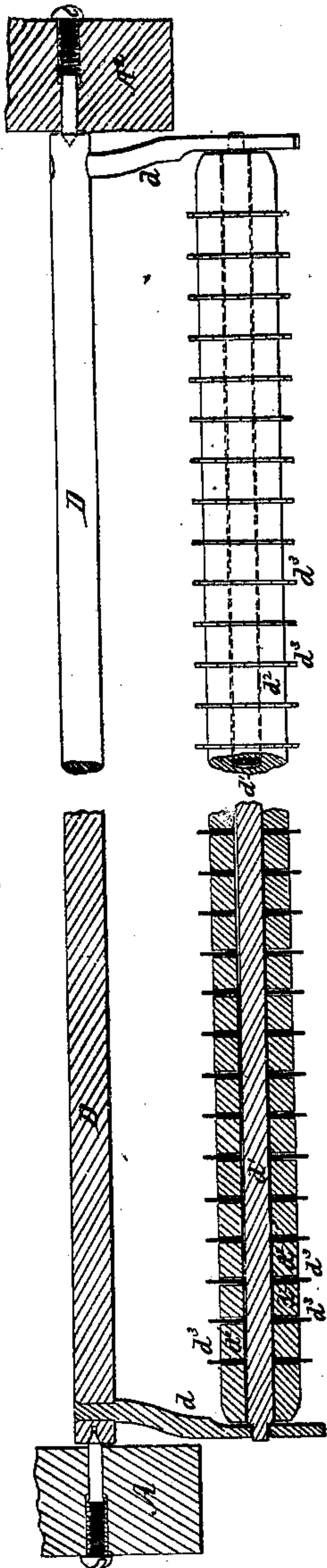


Fig. 11.

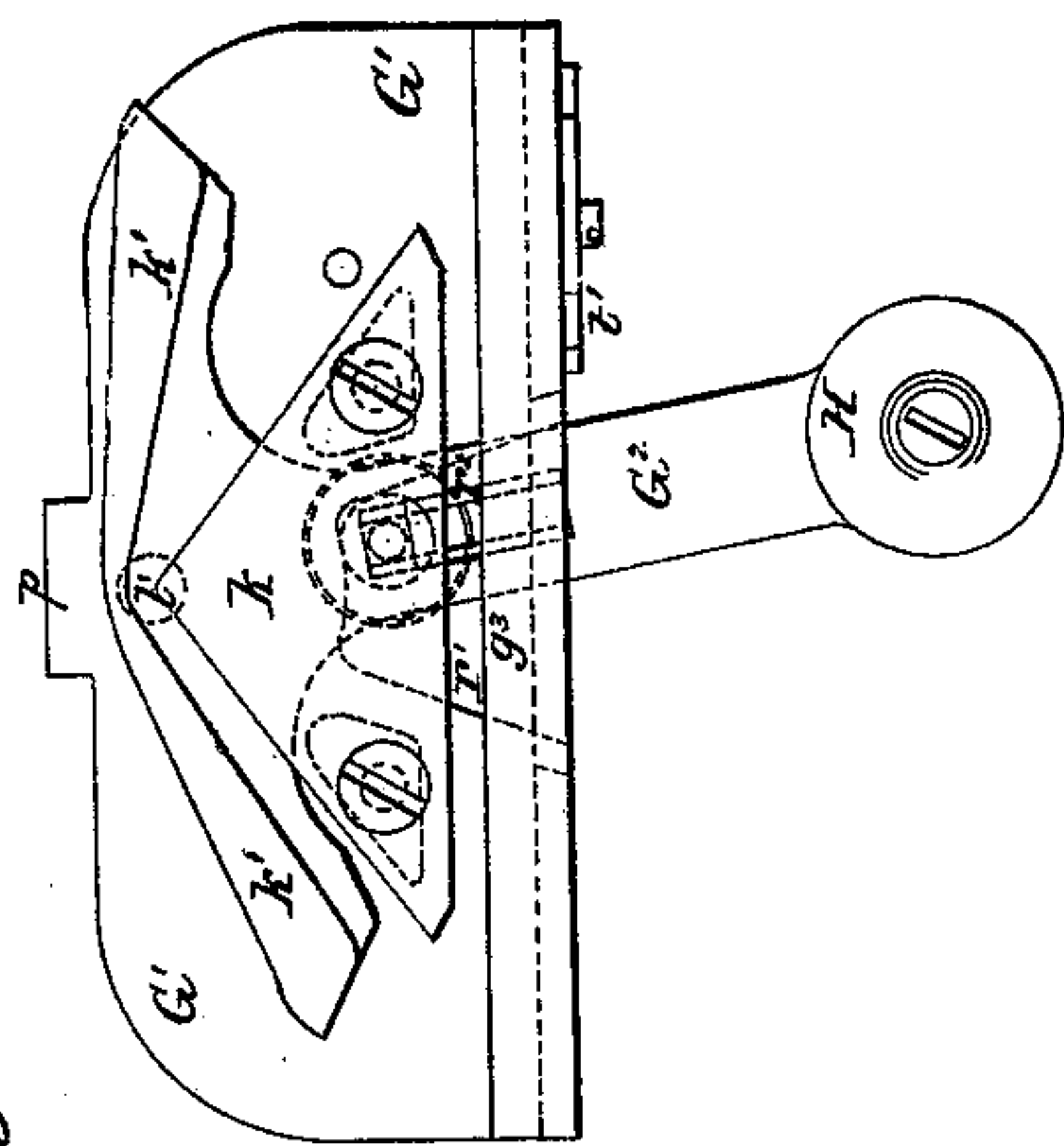


Fig. 12.

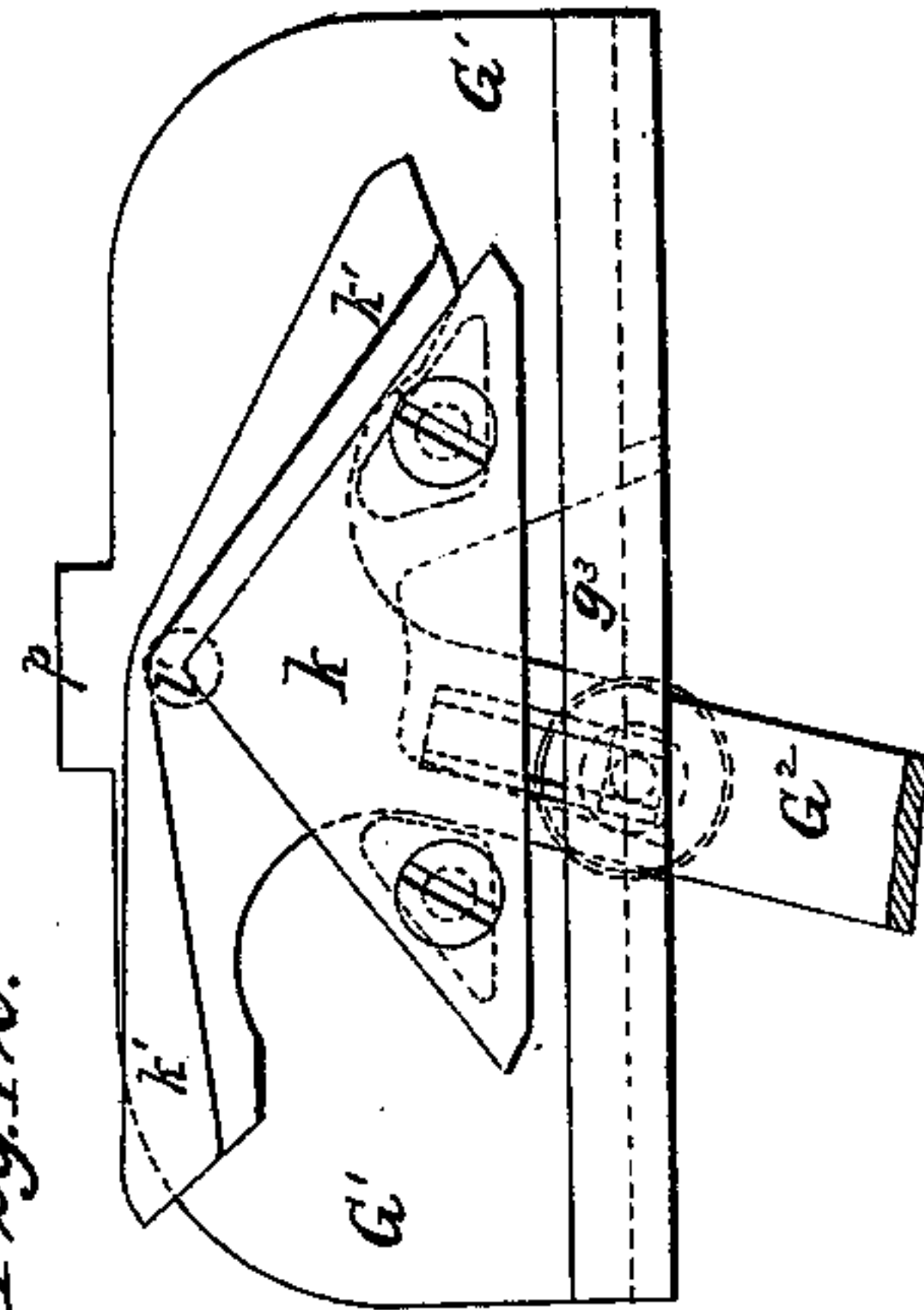


Fig. 9.

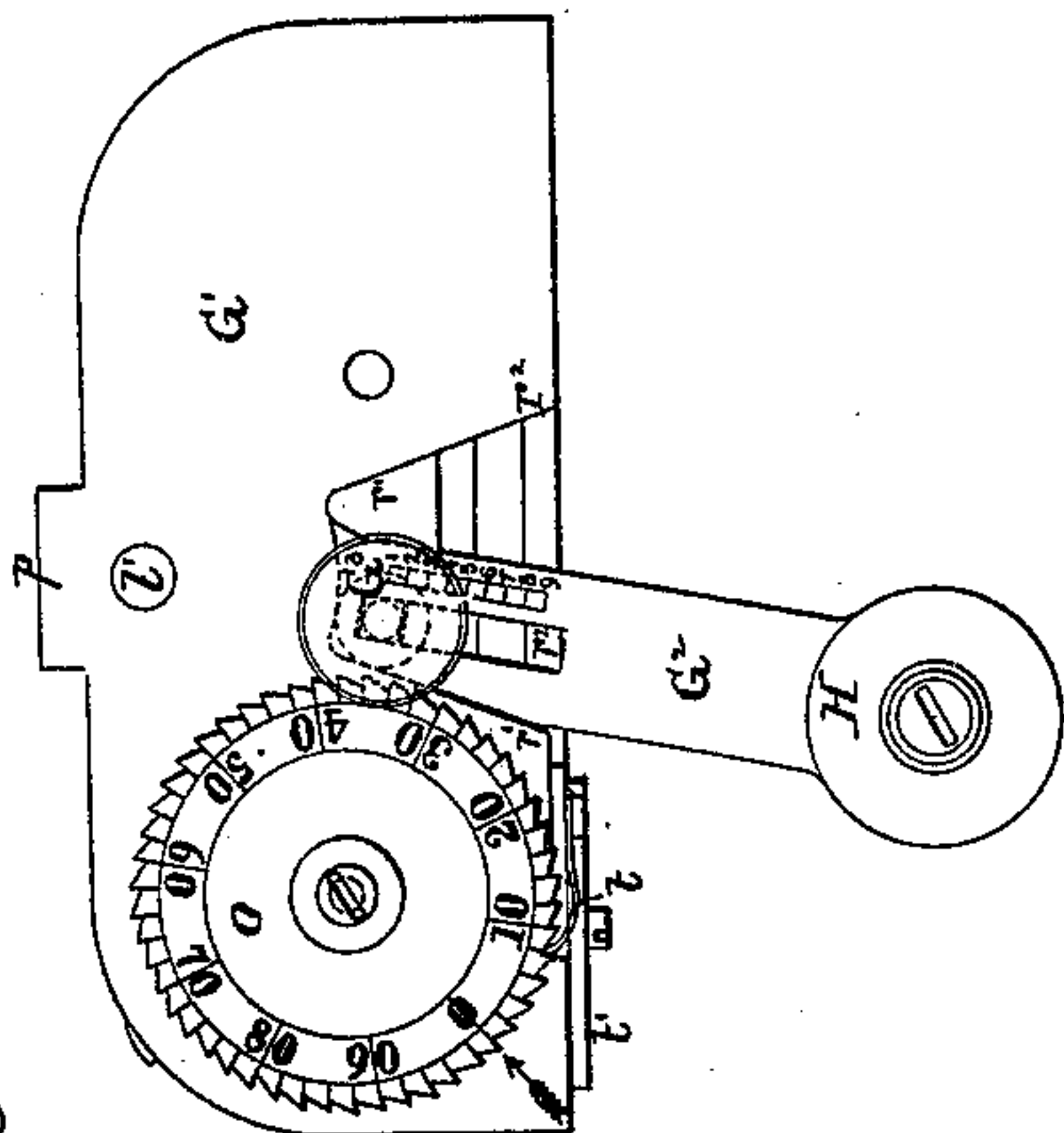


Fig. 10.

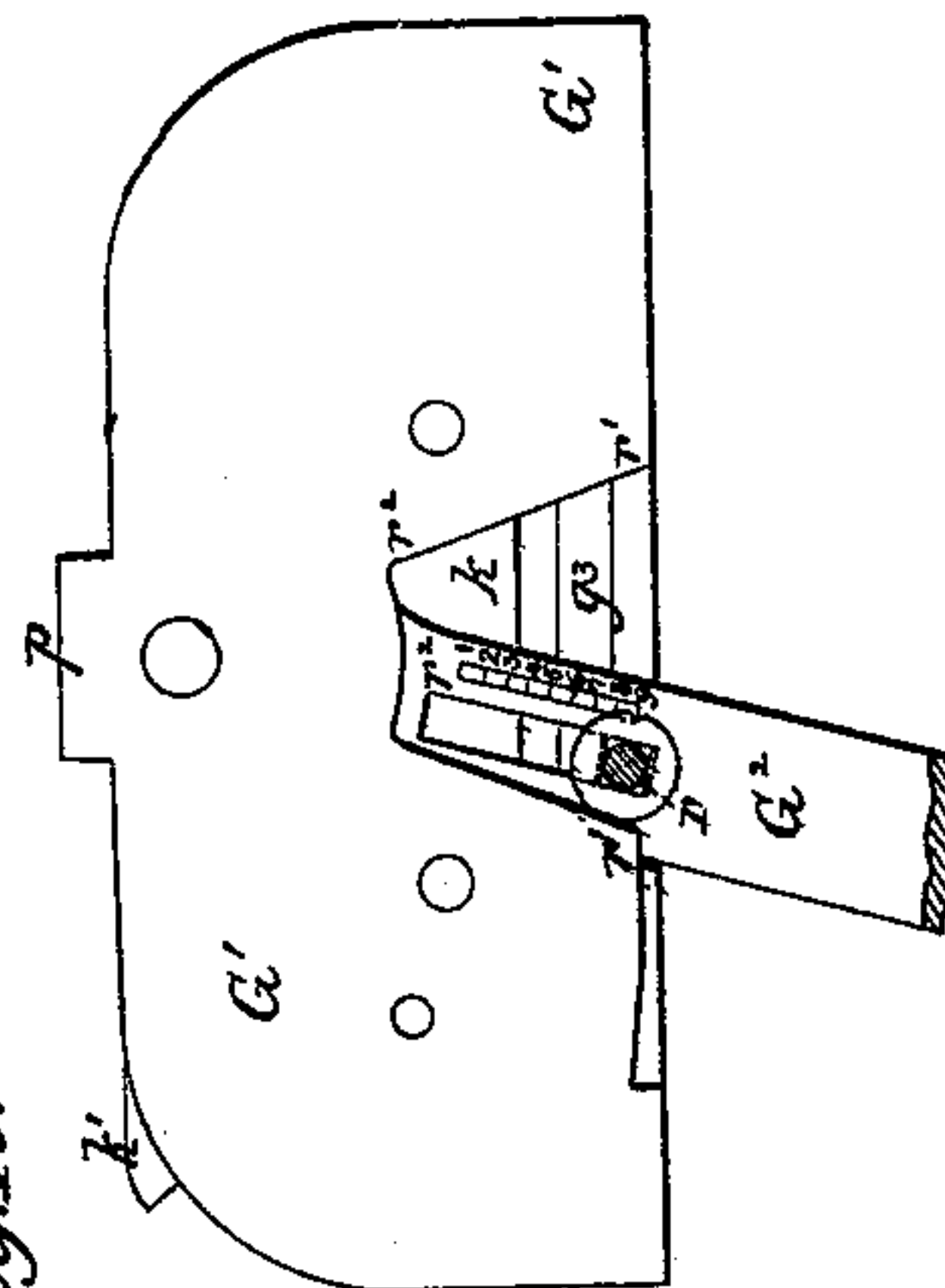


Fig. 13.

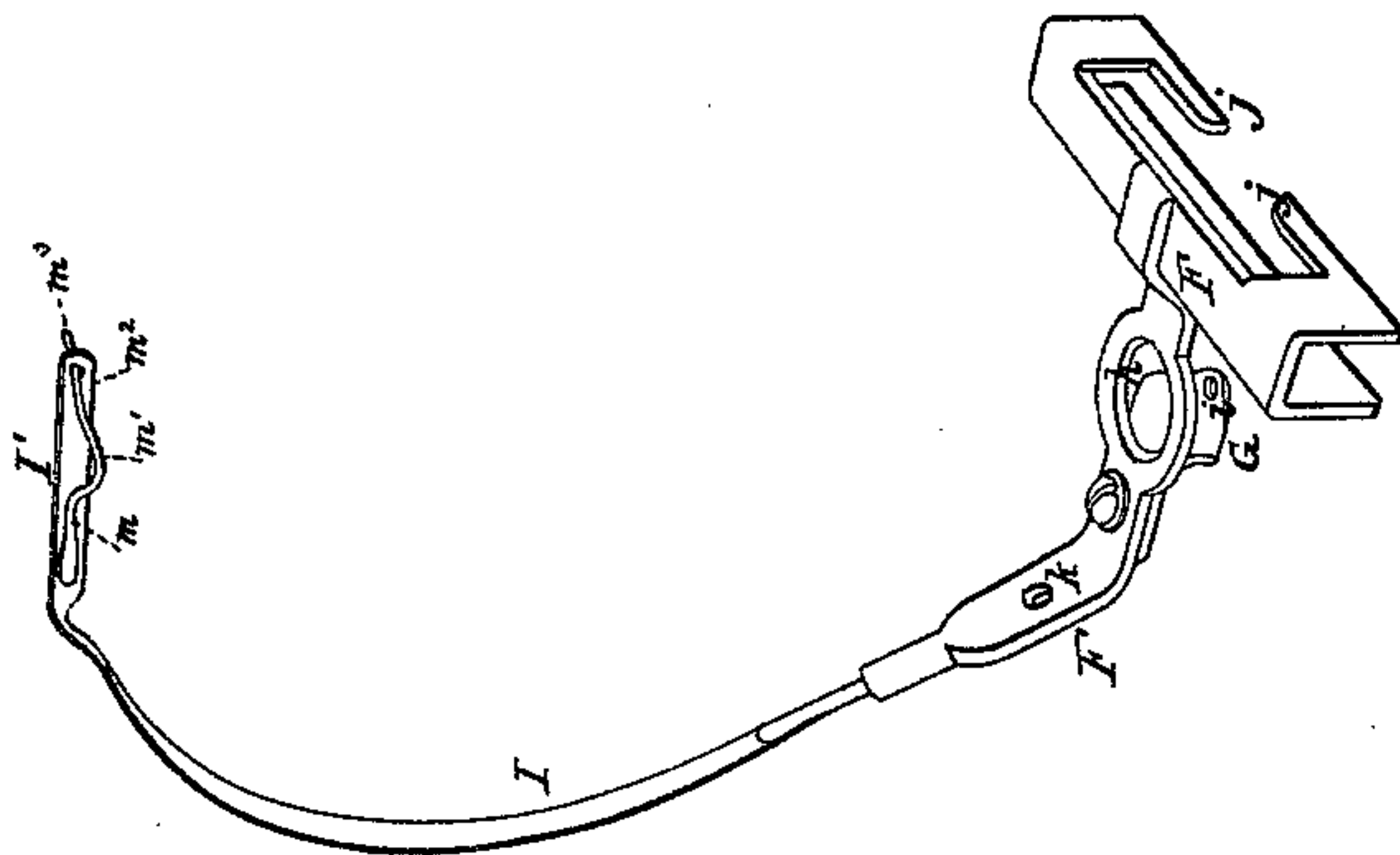
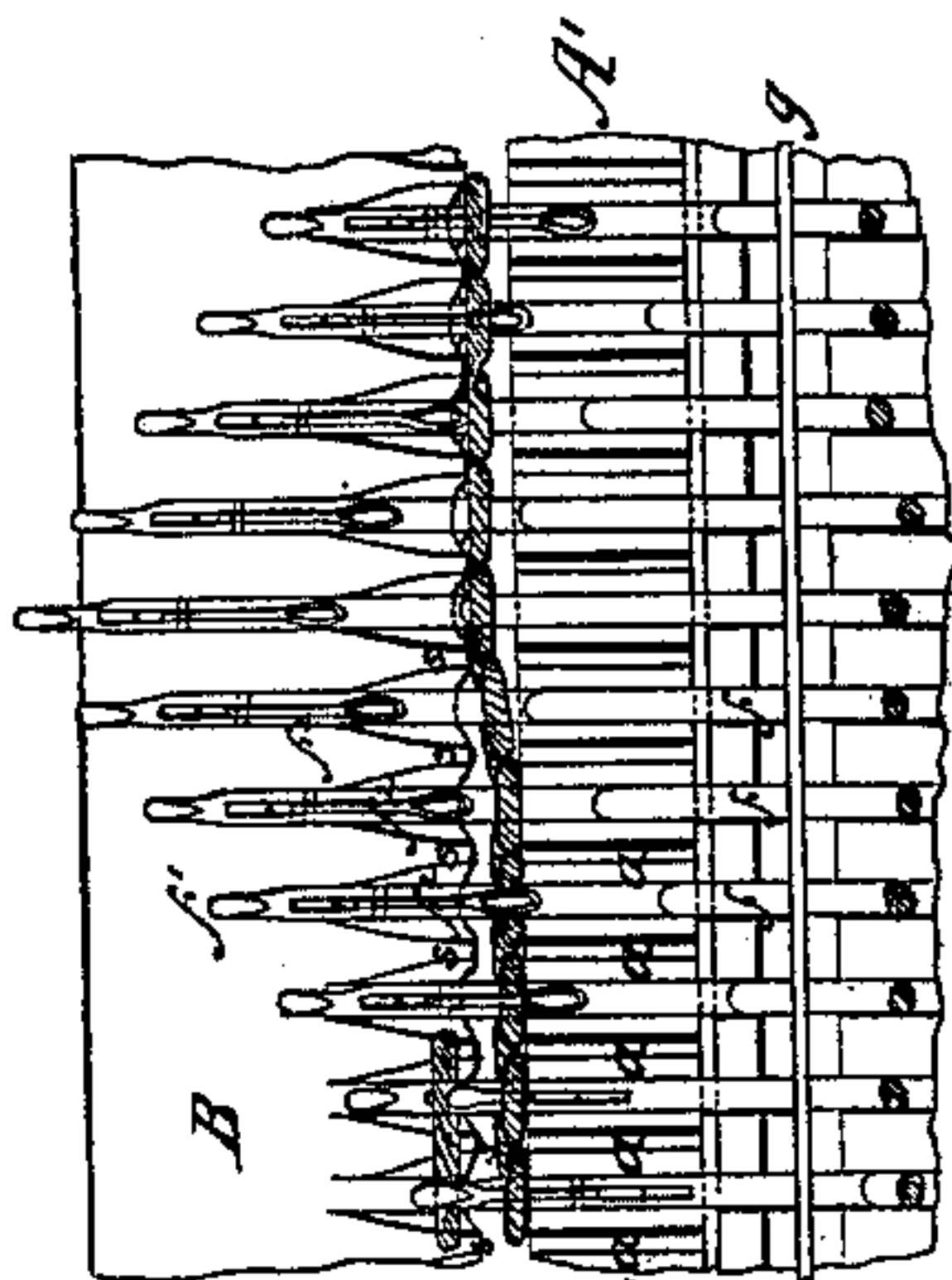


Fig. 14.



Witnesses.  
R. W. Campbell.  
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by  
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# UNITED STATES PATENT OFFICE.

THOMAS CRANE, OF FORT ATKINSON, WISCONSIN.

## IMPROVEMENT IN KNITTING-MACHINES.

*Specification forming part of Letters Patent No. 91,214, dated June 15, 1869.*

*To all whom it may concern:*

Be it known that I, THOMAS CRANE, of Fort Atkinson, in the county of Jefferson and State of Wisconsin, have invented certain new and useful Improvements in Knitting Machinery; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1, Plate 1, is a view of the top of the machine complete, representing the cam-carriage at one end thereof, and its cam in the act of moving the needles to form the loops; also representing two needle-movers, and the manner of using them to adjust a given number of needles into or out of operation. Fig. 2, Plate 1, is a top view of the spool which supplies the yarn to the yarn-carrier. Fig. 3, Plate 1, is a vertical central section through the spool, representing it inverted and applied to a spindle, as it would appear when arranged for reeling yarn upon it. Fig. 4, Plate 2, is a vertical section taken transversely through the bed of the machine, through the cam-carriage, through the yarn-carrier, and also through the latch-holder and work-holder, all of which parts are represented in working position. Fig. 5, Plate 2, is a vertical section taken transversely through the machine, representing the end of the cam-carriage, and showing the tension-spring, the work-holder, and the latch-holder out of working position. Fig. 6, Plate 2, is a view showing the construction of the improved setting-up plate, which is represented in section and in position against the jack bar in Fig. 4. Figs. 7 and 8, Plate 2, represent the construction of my improved work-hook by which a weight is attached at any point to the work for drawing it down in place while knitting. Figs. 9, 10, 11 and 12, Plate 3, show the construction of the cam-carriage, the counting device, and the adjustable gage-screw for regulating the tightness of the loops. Fig. 13, Plate 3, is a perspective view of the tension-spring yarn carrier and distributor. Fig. 14, Plate 3, is a top view of a portion of the work-holder and jack-bar enlarged, showing the operation of the teeth of the work-holder upon the loops, as the needles are moved forward to receive the yarn in their hooks.

Fig. 15, Plate 3, is a sectional and side view of the temple for keeping the work spread out evenly directly below the work-holder, during the operation of knitting.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates in part to certain novel improvements on that class of knitting machinery wherein rectilinear reciprocating latch-needles are arranged in a row parallel to each other and operated by means of a cam which receives a rectilinear reciprocating motion over the needle-bed, and which causes the needles to advance and receive the yarn and then recede far enough to cast off the loops.

1. One object of my invention is to arrange a bar in front of and slightly above the plane of the needles, so that while the hooked ends of the needles will pass back and forth beneath said bar, it will operate as a latch-holder and prevent the latches when thrown back from liability of falling on the top of the hooked points when the needles advance to receive the yarn from a yarn-distributor; also to so arrange said bar that it will serve as a support for the outer end of the yarn-carrier to keep the yarn-distributor always at a given height over the needles as they advance to receive the yarn, as will be hereinafter explained.

2. Another object of my invention is to connect a latch-holding bar with a movable work-holder in such manner that when said bar is turned over out of working position it will move the work-holder a sufficient distance away from the jack-bar to allow free access to and inspection of the work upon the needles, as will be hereinafter explained.

3. Another object of my invention is to apply a fine wire in a groove made in the needle-bed just in rear of and parallel to the jacks, in such manner that such wire shall serve as a means for shutting the latches when the needles are drawn fully back; also as a means for opening the latches when the needles are moved forward to a working position, and also as a means for holding back the needles and preventing them from being casually thrown forward when it is desired to keep any number of needles out of working position, as will be hereinafter explained.



4. Another object of my invention is to construct that edge of the work-holder lying nearest the jack-bar with teeth which are arranged at regular distances apart on the upper surface of the work-holder, and which form short grooves, channels, or spaces between them for receiving the ends of the needles as the latter advance to receive the yarn, said teeth being beveled or curved on their under front edges and formed directly upon the bed by grooving the same in such manner that the bases of the teeth are on a plane with bases of the needle-grooves, and so that they will hold back the work and allow the needles to slip freely through the loops upon them far enough to bring the loops back of the latches, thereby preventing the work from rising or moving forward with the needles, as will be hereinafter described.

5. Another object of my invention is to provide for regulating the length of the loops, for the purpose of knitting loose or tight, by applying an adjustable set-screw to the arm which oscillates the needle-cam, and arranging said screw within a flaring opening in the cam-carriage, said parts being so made that the length of vibration and throw of the cam can be increased or diminished at pleasure, as will be hereinafter explained.

6. Another object of my invention is to so construct the slide of the tension-spring or yarn-carrier that this slide and its attachments can be readily removed from or applied to its guide-way and cam-carriage at any point in the stroke of the latter across the needle-bed; at the same time to construct said slide with hooks upon it, which will alternately receive a tongue on the cam-carriage, and keep the slide down in place while in operation, as will be hereinafter explained.

7. Another object of my invention is to apply to a bow-spring for producing an upward tension of the yarn, an auxiliary tension-spring which will cause the bow-spring to operate uniformly at all times upon the yarn and take up any slack which might be produced in the yarn during the operation of knitting, as will be hereinafter described.

8. Another object of my invention is to so construct the device which is applied to the yarn-carrier, for distributing the yarn upon the needles, that it will serve as a means for insuring the delivery of the yarn upon the needles in front of the latches, and preventing the latches from closing upon the hooks before the yarn is laid therein, as will be hereinafter explained.

9. Another object of my invention is to provide for counting and recording the number of strokes of the cam-carriage over the needle-bed, independently of the vibrating movements of the cam-arm, by means of a rotary toothed counting-wheel, and a vibrating dog on the cam-carriage, and a stationary cam upon the needle-bed, as will be hereinafter described.

10. Another object of my invention is to ap-

ply to the arm, by which the needle-cam and cam-carriage are moved, a sectional handle, each one of the sections of which is free to turn about a fixed stem, so that when said handle is grasped in the hand the sections will both rock freely, and allow the cam to be oscillated without restraint, as will be hereinafter explained.

11. Another object of my invention is to provide for using the yarn-carrying spool as a reel, when it is desired to wind yarn upon it, by providing said spool with a tubular finger-piece or thimble, and employing a rod which is to be inserted through the center of the spool and into a hole made in one end of the needle-bed when the reeling is to be performed, as will be hereinafter explained.

12. Another object of my invention is to employ, in conjunction with a straight knitting-machine, a swinging temple, which is constructed of rolling toothed sections, and arranged beneath the needle-bed in such manner that it will serve as a means for keeping the work distended and allowing it to be drawn down uniformly, as will be hereinafter described.

13. Another object of my invention is to provide means for readily moving into or out of operation any desired or given number of needles, according to the character of the work to be performed.

To enable others skilled in the art to understand my invention, I will describe its construction and operation.

In the accompanying drawings, A represents the needle-bed, which has grooves or channels, *v*, in its upper surface, extending transversely across it in parallel lines, for the purpose of receiving the needles and allowing them to reciprocate freely.

To the bottom side of this needle-bed, and secured rigidly thereto, is the jack-bar A<sup>1</sup>, which is constructed with thin blades or jacks *a* upon it, projecting perpendicularly upward in front of and above the front straight edge of the needle-bed A, so as to allow the needle in grooves *v* to pass back and forth between them while knitting. If desirable, the jacks may be constructed upon the front edge of the needle-bed, instead of being made upon a separate bar, A<sup>1</sup>, as described.

In the rear of the row of jacks *a*, a dovetail groove is made in the needle-bed in a direction with the length thereof, into which is inserted a straight bar, C', which I shall call a gib, as it serves as a means of keeping the needles down in place in their grooves and preventing them from being casually drawn out of place endwise. This gib C' also serves as an elevated support and guideway for a reciprocating slide F of the yarn-carrier, and also as one of the guides for the cam-carriage G'. The extremities of the gib C' extend beyond the extremities of the front portion of the needle-bed A, as shown in Fig. 1, and are provided with stop-pins for preventing the



yarn-carrier and cam-carriage from being moved off the ends of the machine while knitting. In the back side, and near the upper edge of said gib C', a groove,  $g^4$ , is made in a direction with its length, which receives a narrow tongue,  $p$ , formed on the front edge of the cam-carriage  $G^1$ , in the middle of the length thereof; the back edge of the said carriage is turned downward and forward, forming two right angles and a tongue,  $g^3$ , which latter is fitted into an L-shaped groove,  $g^5$ , made in the upper surface of the needle-bed in rear of the grooved surface which receives the needles, as shown in Figs. 1, 4, and 5. The grooves  $g^4$  and  $g^5$  extend from end to end of the needle-bed A, so that the cam-carriage can be introduced in place from either end.

Beneath the upper horizontal portion of the cam-carriage  $G^1$  are two V-shaped cams,  $k$   $k'$ , shown clearly in Figs. 11 and 12, one of which,  $k$ , is rigidly fixed to the carriage, and the other is pivoted at  $l'$  to it, so as to oscillate horizontally, to allow it to assume the two positions shown by Figs. 11 and 12.

The oscillating cam  $k'$  has an arm,  $G^2$ , formed on it and extending backward through a slot made through the fixed cam  $k$  and also through a slot or opening,  $r^1$ , made through the back of the carriage, and to the rear end of said arm  $G^2$  a rod,  $H'$ , is secured fast, which extends perpendicularly above and below it, and receives two sections,  $H$   $H$ , that form a handle to be grasped by the operator for moving the carriage and its cam. The two sections  $H$   $H$  forming the handle should be allowed to turn freely about their rod or stem  $H'$ , so that the arm  $G^2$  and its cam  $k'$  can be vibrated freely while the sections of the handle are held firmly in the hand.

A portion of the top plate of the cam-carriage  $G^1$  is cut away, so as to form a flaring or tapering opening,  $r^2$ , through it; and through the arm  $G^2$  an oblong slot,  $r^2$ , is made beneath the opening  $r^1$  through which passes a screw,  $n$ , having a clamp-nut,  $G^3$ , upon it. By loosening the nut  $G^3$  and moving it toward or from the pivot-pin  $l'$ , the throw of the cam  $k'$  can be lengthened or shortened, and the work knit more or less tight, as may be required. For the purpose of effecting said adjustment with accuracy the arm  $G^2$  may be marked off or graduated and numbered as shown in Figs. 9 and 10, which marks will indicate the different degrees of tightness or looseness of the fabric which can be knit by adjusting the nut  $G^3$  as described.

The two cams  $k$   $k'$  operate upon the up-turned portions  $f^3$  of the needles, to move these needles up to and from the work, substantially as the cam described in my Letters Patent No. 73,697, with this difference: the rear cam  $k$  is fixed to the carriage  $G$  and does not oscillate with the front cam  $k'$ ; consequently there will be more space between the ends of the cams when open, as in Figs. 11 and 12, in going forward or backward, than could be practically

made if both cams oscillated together. By this means the cams will gather in needles which may be moved casually out of a direct line either forward or backward.

In front of the jack-bar  $A^1$  is a bar, B, which is parallel to said bar  $A^1$ , and which is guided at its extremities by means of oblong slots and set-screws  $b \times b$ , or in any other suitable manner. This bar B I shall term a work-holder, as it is designed for preventing the work from being carried forward by the needles when they advance to receive the yarn to form new loops. It is constructed with teeth  $s$  upon its upper surface at its rear edge, or that edge next the jacks, which teeth leave spaces between them in which the needles play as they advance and recede. A work-holder made adjustable and provided with teeth upon its edge is not new, broadly considered, but I am not aware that teeth have been produced upon the upper surface of a work-holder in such manner that they serve as guides for the needles and at the same time prevent the loops upon the needles from being carried forward as represented in Fig. 14, Plate 3. It will also be seen that by having the teeth or elevations  $s$  on top of the work-holder instead of upon its edge next the work, these teeth  $s$  will not catch into the work, but allow it to be drawn down as fast as new loops are produced.

The extremities of the work-holder B are supported upon the forward extended portions  $A^2$  of the needle-bed, which portions are constructed with jaws  $A^3$  beneath them for receiving the edge of a table or other object and allowing the machine to be secured to such object by means of the clamp-screws  $A^4$ . (Shown in Figs. 4 and 5.) Two arms  $b$   $b$  are secured to the work-holder near its extremities, which arms project forward and are attached eccentrically to an oscillating rod,  $B'$ , which has its end bearings in the forward extensions  $A^2$ , and which is parallel to said work-holder, as shown in Fig. 1.

To the rod  $B'$  two arms  $b' b'$  are secured, carrying upon their opposite extremities a bar, C, which in cross-section may be made of the shape shown in Figs. 4 and 5, or of any other suitable shape. This bar C I term a latch-holder, as it is designed to serve for preventing the needle-latches  $f^2$ , when open, from falling on the hooks  $f^1$  of the needles when the needles are passing under it.

This latch-holder C is supported upon the work-holder B when in working position, as shown in Figs. 1 and 4, so that the hooked ends of the needles can pass freely beneath it when they advance to receive yarn, and when out of working position the holder C is turned forward and rests upon the object to which the machine is confined, as shown in Fig. 5.

In my Letters Patent, dated January 28, 1868, I described a thin strip of metal arranged so as to pick up and throw back the latches of the needles, as the latter advanced to receive yarn from a distributor. The lower edge of



this strip was so arranged that the hooked ends of the needles could not pass beneath it without having the latches turned back. The bar C is so arranged with relation to the termination of the forward strokes of the needles that it prevents the needle-latches, which in this case are always thrown back by the loops of yarn upon the needles as the needles advance, from being thrown over upon the hooks and closing the hooks.

It also serves as a rest for the yarn-carrier and as a handle by which to move the work-holder B far enough from the jacks to obtain access to the work or to use a setting-up plate at the commencement of knitting. Between the jacks *a a* and the gib C' is a fine wire, *g*, which is let into a groove or channel made in the upper surface of the needle-bed A, and which is held under tension by means of studs *g\** inserted into the ends of the needle-bed, as shown in Fig. 1. This wire serves as a needle-holder and also as a latch shutter and opener. It is let into the surface of the needle-bed across the needle-receiving grooves *v* far enough to allow the hooked ends of the needles *f* to abut against it when the needles are drawn behind it and then gently pressed forward against it. This wire is designed to prevent needles, which it is required to hold back out of operation, from being casually thrown forward into operation, by offering a slight resistance to their forward movement.

It is also designed to and will open the latches *f*<sup>2</sup> of the needles as they are moved forward into working position, and it will also close the latches *f*<sup>2</sup> of needles in the act of moving them back out of working position. When needles are out of working position their hooked ends are behind the wire *g*, and their upturned shanks *f*<sup>3</sup> are in line with the space back of cam *k*, as shown in Fig. 4. The needles are moved out of and into working position by a plate, P, or its equivalent, or by the fingers.

The yarn-carrier consists of a slide, F, an arm, F', a distributor, G, and a bow-spring, I, carrying a tension spring on its free end. The slide F fits over the upper edge of the gib C', and has its rear vertical side opened, so as to form two hooks, *j j*, between the opposite ends of which a space is left for receiving through it the tongue *p* on the cam-carriage G<sup>1</sup>. This slide is shown clearly by Fig. 13, Plate 3, wherein it will be seen that the length of the opening above the hooks *j j* is greater than the width of the tongue *p*, thereby allowing the slide and the carriage to have movements independent of each other, and also allowing the slide to be readily applied to and removed from its gib C' at any point in the stroke of the carriage G<sup>1</sup>. The hooks *j j*, over which the tongue *p* is alternately moved during the reciprocations of the carriage and slide, are designed for allowing the said tongue *p* to hold the slide down in place upon its gib or guideway.

An arm, F', is secured rigidly to the slide F in the middle of its length, and projects over the work-holder B, over the latch-holder C, and is turned upward, as shown in Figs. 1, 4, and 5. This arm F' has a bow-spring, I, secured to its upturned end, which has its free end I' twisted at right angles, or one-quarter around, so as to serve, in conjunction with spring *m*, as an auxiliary tension-device for preventing the yarn from being fed too freely to the work. The yarn is carried from a spool, N, or other suitable yarn-holder, and passed up through a hole, *h'*, through arm F', thence up and over a portion, *m*<sup>3</sup>, of the tension device *m*, thence down and through an opening, *i*, which is made through a tapering and curved distributor, G. The wire *m* is bent, so as to form an eye, *m*<sup>1</sup>, a clamping portion, *m*<sup>2</sup>, and a hook, *m*<sup>3</sup>, which latter passes through a hole made through the twisted portion I' of the bow-spring. The twisted portion I' serves, in conjunction with the straight portion *m*<sup>2</sup> of the wire *m*, for receiving and clamping the yarn, so that the free end of the bow-spring I will be drawn down considerably before the yarn will be allowed to slip between said clamping portions. This will keep the yarn under proper tension at all times, and prevent it from being supplied too freely to the needles.

The distributor G, which lays the yarn upon the needles, so that the hooks on the needles will take the yarn, consists of a triangular plate, curved as shown in Figs. 4 and 5, and perforated at *i* to receive yarn through its depressed angle. This distributor G is secured to the bottom side of the arm F', so that its perforated end shall lie just over the front edge of the work-holder, allowing space enough between it and this work-holder for the movement of the needles to receive the yarn. The eye-portion of the distributor G is made with angling edges, for the purpose of guiding and holding up the needle-latches until the yarn is delivered into the hooks of the needles, and then allowing the latches to fall upon the hooks as quickly as the yarn is delivered into them, during the movement of the yarn-carrier from one end to the other of the machine. Without such a device, G, the needle-latches would be liable sometimes to fall upon the hooks of the needles before receiving the yarn.

Angling yarn-distributors have heretofore been used in knitting machinery, but such devices were made angling for the sole purpose of forming depressed points or edges which would raise the latches of the needles to allow yarn to be delivered into the hooks of the needles. It will be seen that my distributor is arranged wholly above the plane of the needles, and is constructed with two angling edges so arranged as to hold back the needle-latches while the yarn is being delivered across the needle-hooks, and at the same time allow the needles to recede and the latches to gradually close over the yarn in the hooks, without liability of breaking the loops last formed



upon the needles. The distributor is not a latch-opener, but a latch-holder, to prevent latches from being closed before yarn is delivered into the hooks of the needles.

It will be seen by reference to Fig. 4, Plate 2, that when the latch-holder C is in working position, it affords a support for the arm F' of the yarn-carrier, and prevents this arm from sagging, which would cause the distributor G to strike the needles or their latches, and derange the machine.

On top of the cam-carrying carriage G<sup>1</sup> is a circular plate, O, having ratchet-teeth around its periphery, which plate is properly graduated and numbered, and centrally pivoted to the said carriage, so as to rotate. On the back edge of the carriage G<sup>1</sup> a cam-lever, t', is pivoted, so as to vibrate freely, and to the upper end of this lever t' a spring-pawl, t, is secured, so as to engage with the teeth of the counting-wheel o, and to move this wheel a certain distance about its axis at every vibration of the cam-lever t'. At the middle of the length of the needle-bed, and in the same vertical plane as lever t', is a double-inclined cam, S, which will act upon the lower end of the cam-lever t' every time the carriage G<sup>1</sup> is moved forward or backward, so that, when the carriage makes two strokes, the wheel o will indicate, by a fixed arrow or other mark on the carriage, said movements. Heretofore counter-plates have been operated by pawls placed upon vibrating arms of cam-carriages; but I now operate the counter-plate or wheel by a fixed cam on the needle-bed, so as not to interfere with the vibrating movements of said arm.

Between the vertical portions of the jaws A<sup>3</sup> is an oscillating rod, D, having arms d depending from it, carrying a bar, d<sup>1</sup>, which is parallel to the toothed edge of the work-holder B. Upon this bar I loosely place a number of short cylindrical sections, d<sup>2</sup>, between which are circular toothed wheels d<sup>3</sup>, the diameter of which is slightly greater than that of the interposed spacing sections d<sup>2</sup>, as clearly shown in Fig. 15, Plate 3. The spurred wheels d<sup>3</sup> are free to turn around the bar d<sup>1</sup> independently of each other, and are designed to catch into the work and keep it distended in width during the operation of knitting. This device serves as a temple, and is made up of independently turning sections, so that none of these sections will drag or act unequally upon the work; also to allow of the use of this temple while knitting gored work, where one portion of the work is knit longer than another portion, and is drawn down over one part of the temple while the portion of work which is not being lengthened is held distended by another part of the temple.

The spool which I have shown in Figs. 2 and 3 is intended for paying off yarn during the operation of knitting. It consists of a cone, N, which is provided with legs J' at its base, and also with an annular flange, N<sup>3</sup>, some distance above its base, which flange forms, in

conjunction with the wide flaring base of the cone, a receptacle for yarn, as shown in Fig. 3. The cone N is also provided with a bar, N<sup>1</sup>, which is secured diametrically across it, a little above its base, and which is constructed with a tube or thimble, N<sup>2</sup>, on one side of a central hole made through said bar.

When the spool is to be supplied with yarn it is inverted over a hole, Y, made in or through the needle-bed A, near one end thereof, so that the apex of the spool rests upon said needle-bed. A rod, J, is then dropped through the center of the spool, so that its lower end will enter the hole Y, thus holding the spool in an upright position and allowing it to be rotated by inserting the finger into the thimble N<sup>2</sup>. In this manner the spool is adapted to serve as a reel for winding yarn upon it. When the spool has been supplied with yarn, the rod J is removed and the yarn carried up outside of the cone N, passed in through its apex, and thence carried out and off to the yarn-carrier, as shown in Fig. 2.

To commence the operation of knitting, it is necessary to employ a device for producing loops upon the needles at the first passage of the yarn-carrier over the needles, so that at every subsequent passage of the yarn-carrier new loops will be formed and the old loops cast off the needles. For this purpose plates having rows of wire hooks affixed to their edges have been used, but are attended with objections which I am enabled to overcome by the setting-up device shown in Figs. 4 and 6, Plate 2. This device consists of a plate, E, having a row of rectangular holes, e', made through it near its upper straight edge and above a shoulder, e, which is parallel to said row of holes. The holes e' correspond in width and distance apart to the spaces between the jacks a, and the shoulder or bend at e is intended to abut against the lower surface at the front edge of the jack-bar A<sup>1</sup>, as shown in Fig. 4, when the holes e' are in proper position in front of the needles to allow the needles to pass freely through them. This plate E is made tapering, as shown, and it is perforated to receive a hook, W'', carrying a drawing-down weight, W, as shown in Fig. 4.

When the set-up device is properly adjusted in front of the jacks a, and the yarn-carrier is passed once across the needles, yarn will be laid upon the needles and drawn through the openings e' in the form of loops. The set-up device is then drawn down, so that at the next throw of the needles they will pass over its upper edge, receive yarn, cast off the first loops, and form new loops. A weight is then attached to the set-up device, and the work proceeded with without further attention to it. The set-up device represented in Fig. 6 is made for only twenty-two needles; but in practice this device will be made of such length and with a proper number of openings e' through it to adapt it for all the needles used upon the needle-bed of the machine.

In knitting some varieties of work it will



be necessary to employ a device, which can be readily attached to the work at different points, for the purpose of employing a drawing-down weight. Such a device is represented by Figs. 7 and 8, and consists of a triangular plate, Z, having a hole, 3, made through it for receiving a weight hook, and also having a number of sharp-pointed hooks or fingers, 3 3 3, secured at regular distances apart along its upper straight edge. The hooks 3 3 are bent in planes at right angles to the flat surface of the plate Z, and are designed for hooking into the knit fabric at any point for the purpose of readily attaching a weight to the fabric and detaching it therefrom, and having such weight draw down uniformly upon the entire width of the fabric.

It will be seen by reference to Figs. 7 and 8, Plate 2, that the hooks 3 3 are made of round wire inserted and firmly secured into the upper straight edge of plate Z, and that the pointed portions of the hooks are bent downward and outward, so that, by presenting the flat surface of the plate Z to work hanging from the needles of the knitting-machine, the hooks will readily enter the work, simply by lateral thrust, and thus attach this plate Z to it, and take a firm hold without liability of tearing the loops, notwithstanding this plate should be loaded heavily.

I am aware that hooked set-up plates, adapted for receiving weights for drawing down knit fabrics during the commencement of knitting, are not new, and, broadly considered, I lay no claim to such device. The device which I have described for attaching a weight at any desired point of the fabric is not a set-up device, and cannot be used as such; nor can the set-up devices hitherto used be made to serve the purpose described for my work-hook.

In Fig. 1 I have represented two devices, which are designed for moving needles into and out of working position. The plate P is designed for moving any given number of needles, lying side by side, out of working position or into working position. In the operation of knitting stockings it is frequently necessary to skip a given number of needles, and to recover these needles again. For this purpose a flat plate, P, is used, which has unequal sides, which are numbered according to the number of needles each side will cover. To use such plate, the edge or side corresponding in length to the number of needles it is desired to move is adjusted against the up-turned shanks  $f^3$  of the needles, and held in an inclined position upon the needle-bed, as shown in Fig. 1. Such a device not only serves as a means for readily moving the needles, but it renders it unnecessary to count off the number of needles which it is required to move, as the numbers stamped upon the several sides or edges of the plate P will indicate at a glance the number of needles which such edges will move.

Sometimes it is found necessary to move out of and into working position every alternate needle, or to move the needles in alternate rows. To effect this with facility, I use a plate, R, having teeth  $w w$  and  $w'$  formed on one or two of its edges. The central tooth  $w'$  is pointed, so that it will enter one of the needle-grooves  $v$  in the needle-bed, and thus guide the other teeth  $w$ . The teeth are all properly spaced, so that they will take some of the needles and skip or leave others. Those teeth on plate R which are represented as in the act of moving some of the needles in Fig. 1, are spaced for taking every alternate needle; and those teeth which are represented on the opposite edge of the plate R are spaced so as to leave two needles between every two which are moved. If desired, other arrangements of teeth may be adopted, according to the kind of stitch or work which it is desired to produce.

The figures marked on the back edge of the needle-bed will indicate in inches the width of material which is being knit.

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

1. The bar C, arranged across the machine in a plane parallel to the needle-bed, and constructed as described, so that it may be turned or moved back from the work, to allow access to the work, and also, when in working position, will prevent the needle-latches from casually falling forward upon the hooks of the needles as the latter advance to receive yarn from a distributor, G, substantially as described.

2. The latch-holder C and the work-holder B, so connected that they will both move together, substantially as described.

3. A latch-holder, C, so arranged that it will serve as an auxiliary support for the arm  $F'$  of the yarn-carrier, substantially as described.

4. The work-holder B, having teeth or guides  $s s$  rising from its upper surface, said teeth being beveled or curved on their under front edges, and formed directly upon the bed by grooving the same in such a manner that the bases of the teeth are on a plane with the bases of the needle-grooves, all substantially as described.

5. The device  $g$ , for the purpose described.

6. Adjustable nut  $G^3$ , applied to the vibrating arm  $G^2$  of the carriage G, and arranged within a flaring opening,  $v'$ , made in said carriage, or their respective equivalents, for regulating the throw of needles, substantially as described.

7. The slide F of the yarn-carrier, constructed with an opening in one side, and with hooks  $j j$  for receiving a tongue,  $p$ , on the cam-carriage, substantially as described.

8. The auxiliary tension-spring, applied to a bow-spring, I, substantially as described.

9. The perforated, curved, and angular



yarn-distributor, wholly arranged above the plane of the hooked ends of the needles, and so arranged as to allow the needle-latches to close gradually upon the hooks during the act of distributing the yarn, substantially as described.

10. An upwardly-acting tension-device, in combination with a yarn-distributor, G, which is constructed substantially as described, to guide the latches of the needles, as set forth.

11. The pawl *t* and cam-lever *t'* on the cam-carriage G, in combination with a cam, S, on the needle-bed or frame A, said parts being adapted for communicating an intermittent rotary motion to the counting-plate O, substantially as described.

12. The vibrating arm G<sup>2</sup>, fixed rod H', and turning-sections H, combined with the cam-carrying slide, substantially as described.

13. A vibrating cam, *k'*, in combination with a cam, *k*, which is rigidly fixed to the

cam-carriage, the cams being constructed and operating substantially as described.

14. The conical spool N, having a flange, N<sup>3</sup>, a cross-bar, N<sup>1</sup>, and a thimble, N<sup>2</sup>, in combination with the pin J, all constructed as and for the purpose described.

15. The spurred sectional roller D', constructed and applied so as to operate upon narrow knit work in the same manner as it operates upon wide work, substantially as described.

16. The arrangement of a swinging temple beneath knitting devices, substantially as described.

17. The knitting-machine-needle mover R, constructed with a guide, *w*, and teeth *w'*, as and for the purpose set forth.

THOMAS CRANE.

Witnesses:

N. F. HOPKINS,  
S. BOURNER.