

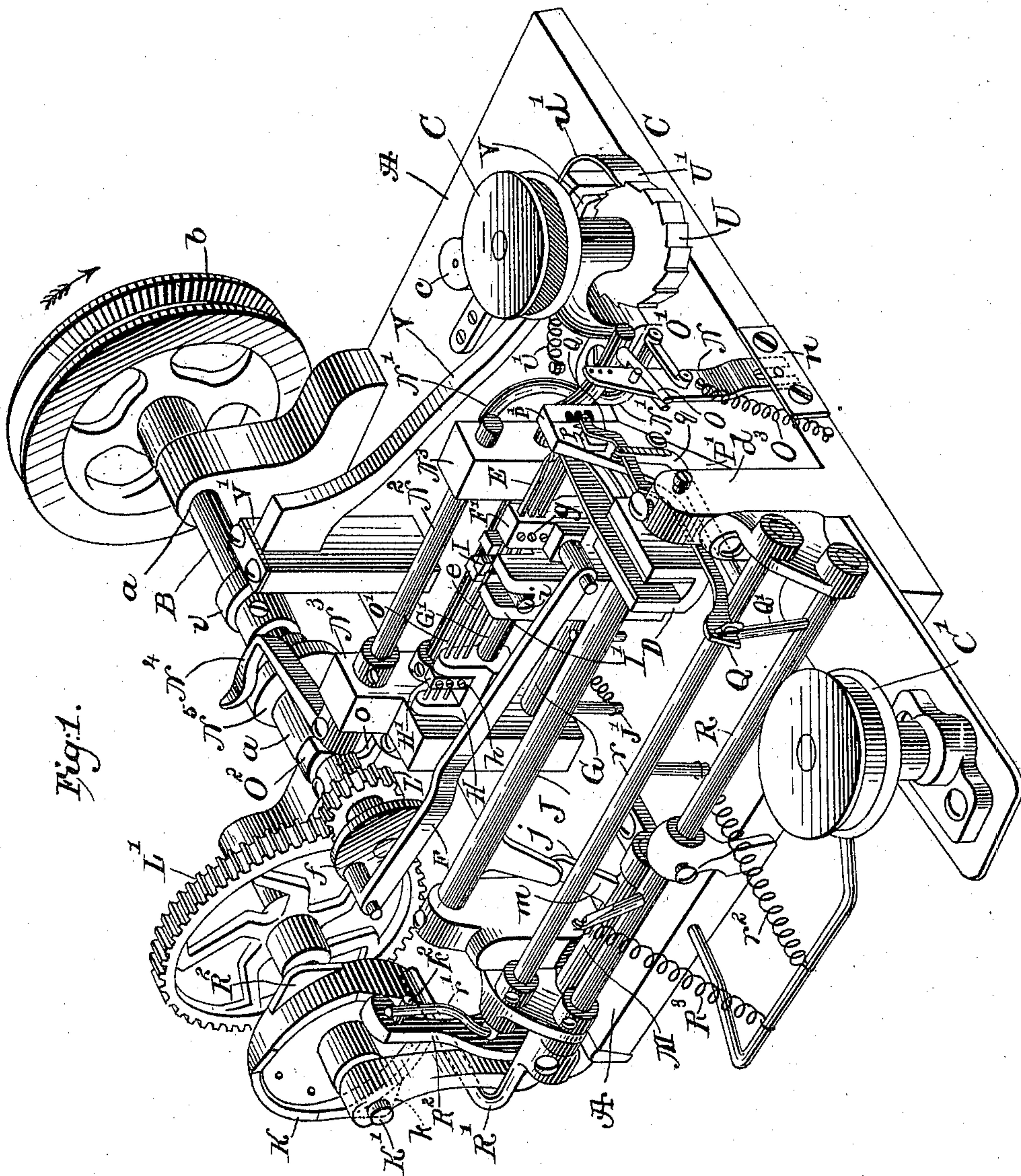
(No Model.)

4 Sheets—Sheet 1.

**J. ASHWORTH.
CROCHET MACHINE.**

No. 579,102.

Patented Mar. 16, 1897.



Witnesses.
 Geo. A. M. M. M.
 Matthew M. Blunt.

In Witness,
 John Ashworth
 by A. N. Pierce,
 attorney.

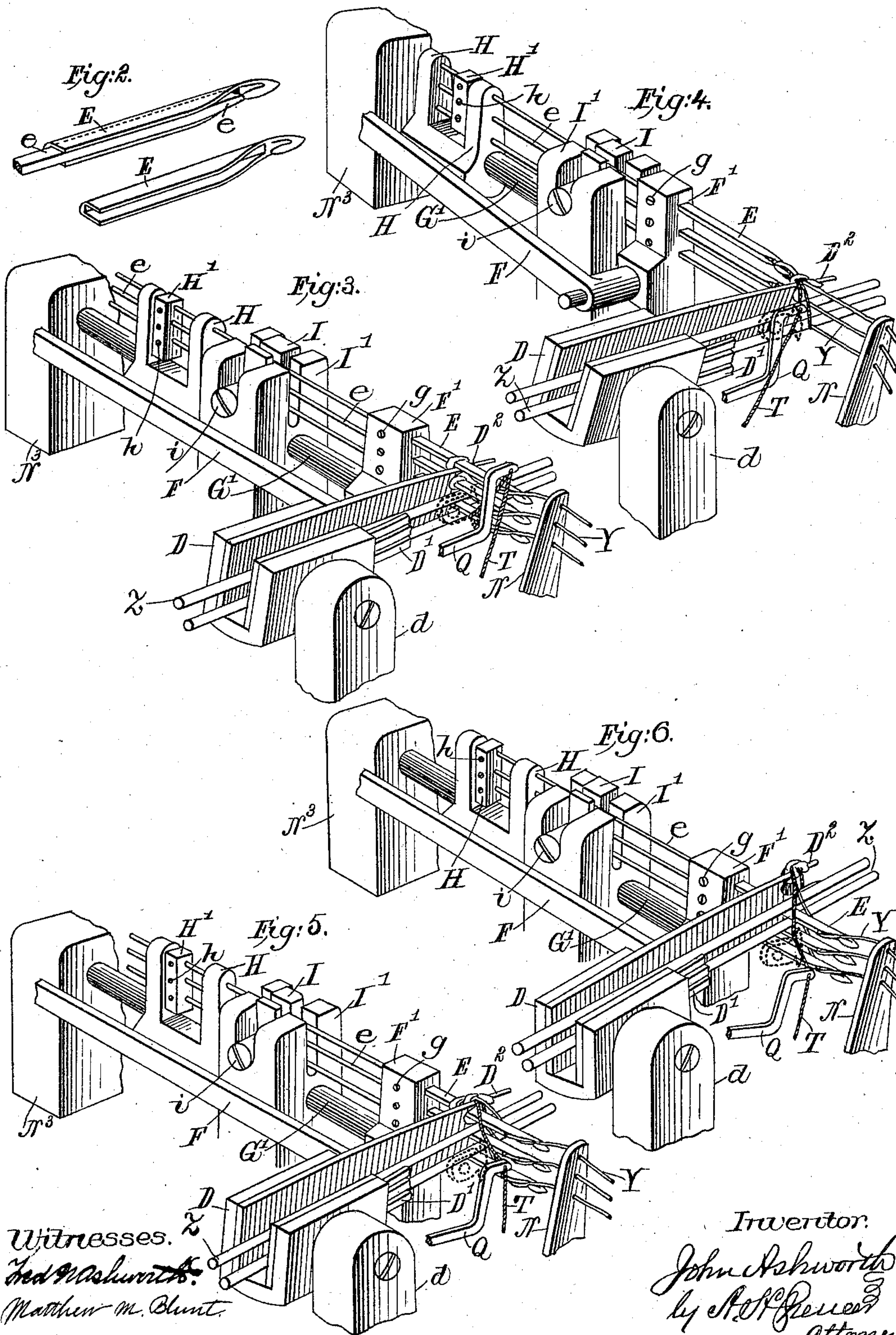
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CROCHET MACHINE.

No. 579,102.

Patented Mar. 16, 1897.



Witnesses.
Jed Ashworth.
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Inventor.
John Ashworth
by A. S. Green
Attorney

(No Model.)

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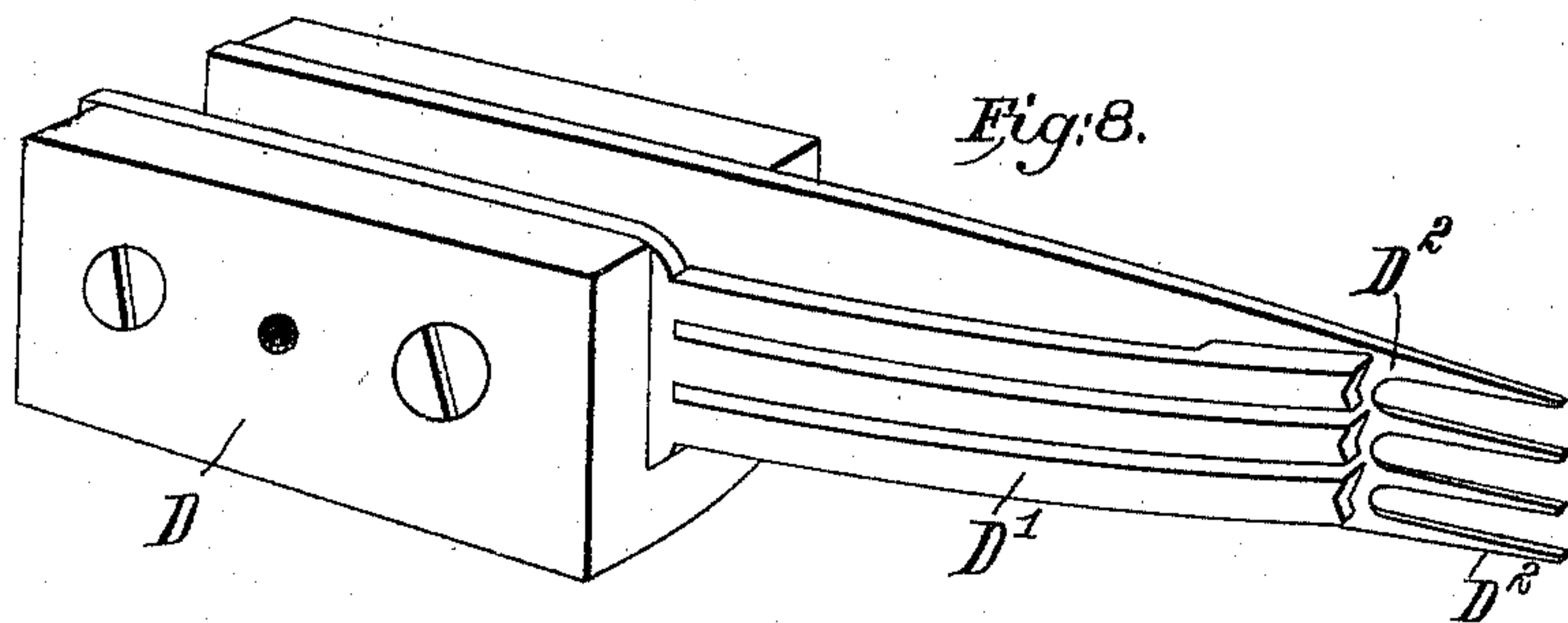
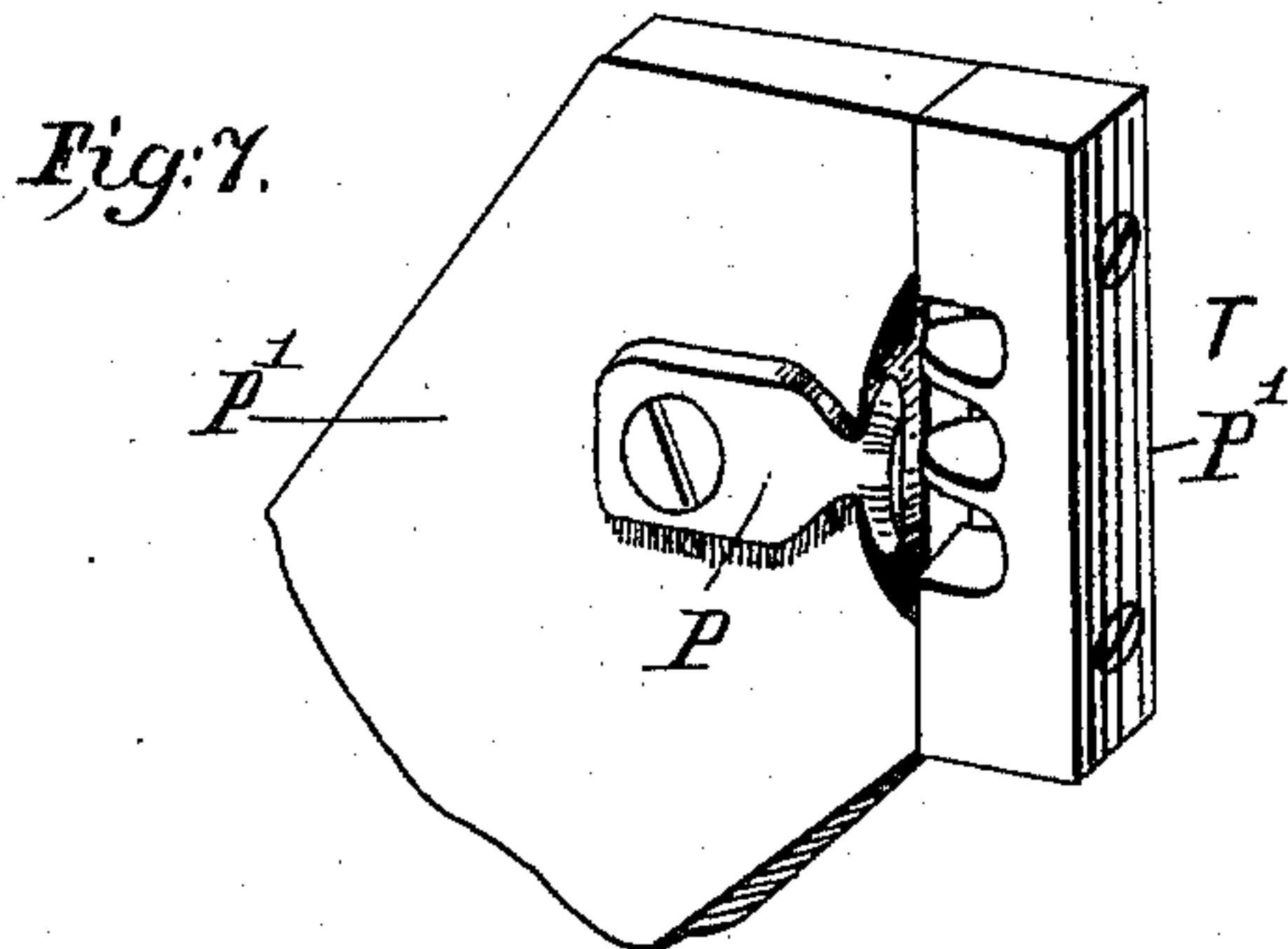
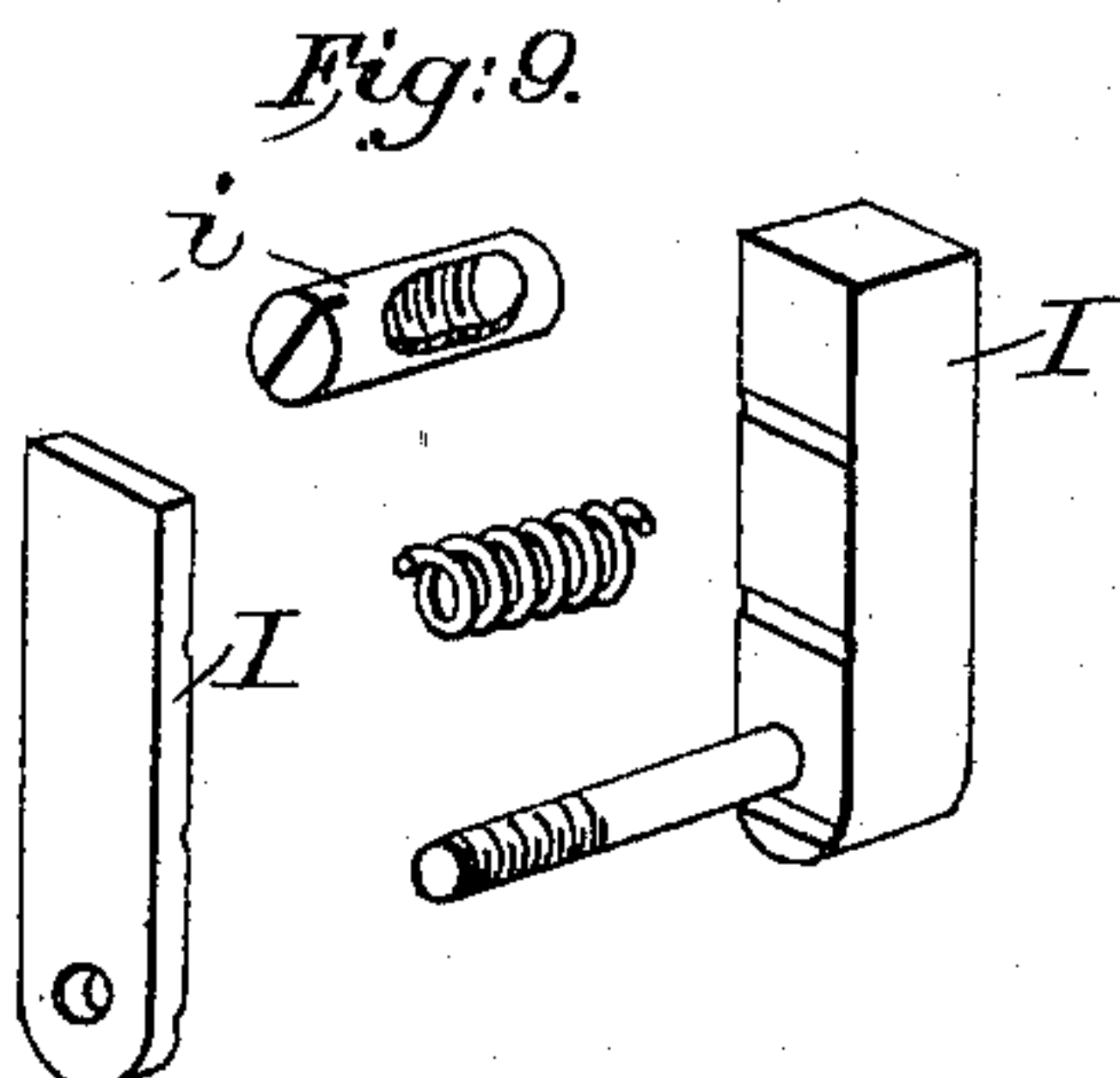
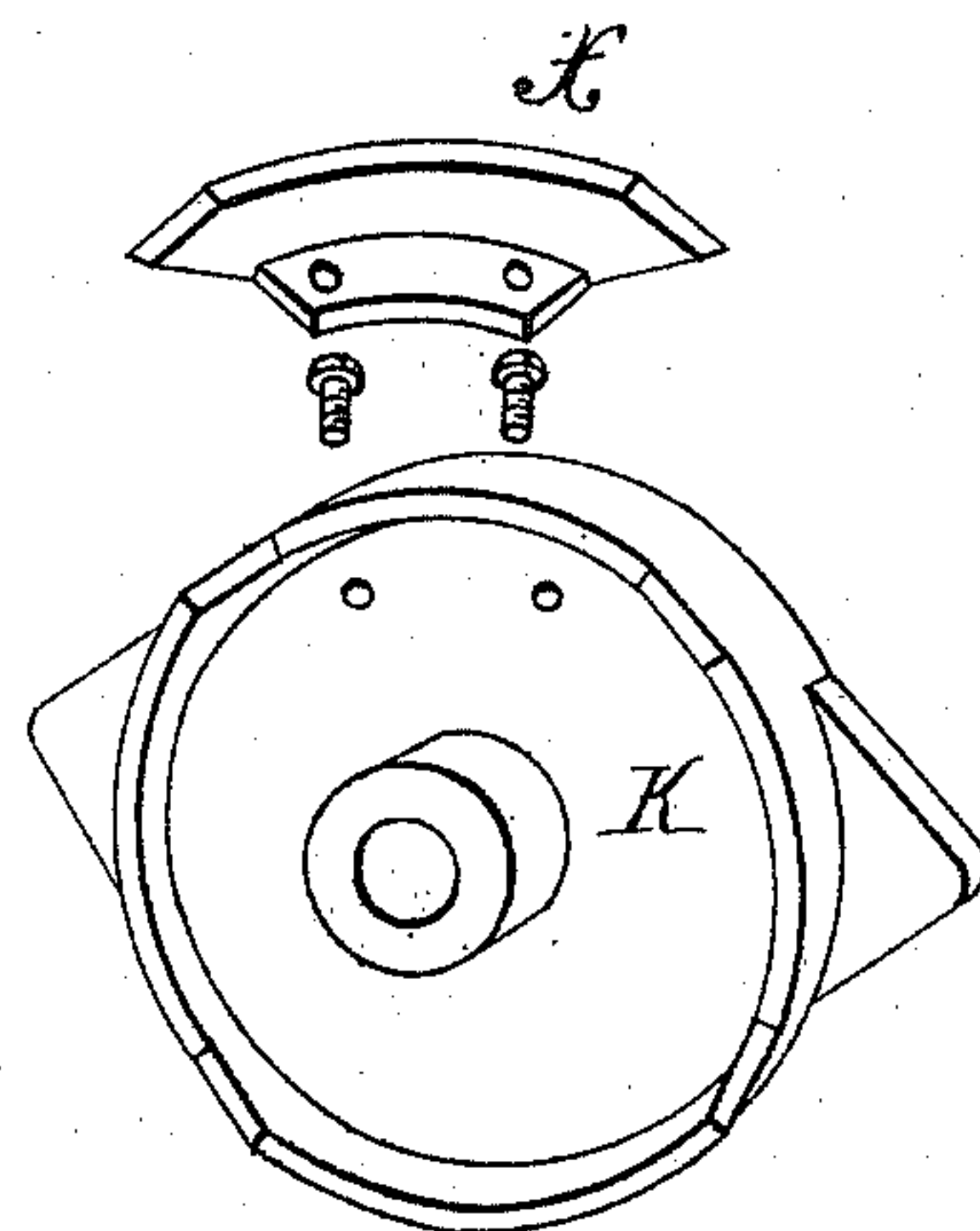


Fig. 10.



Witnesses.
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Matthew M. Blunt,

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(No Model.)

4 Sheets—Sheet 4.

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Fig. 11.



Fig. 12.

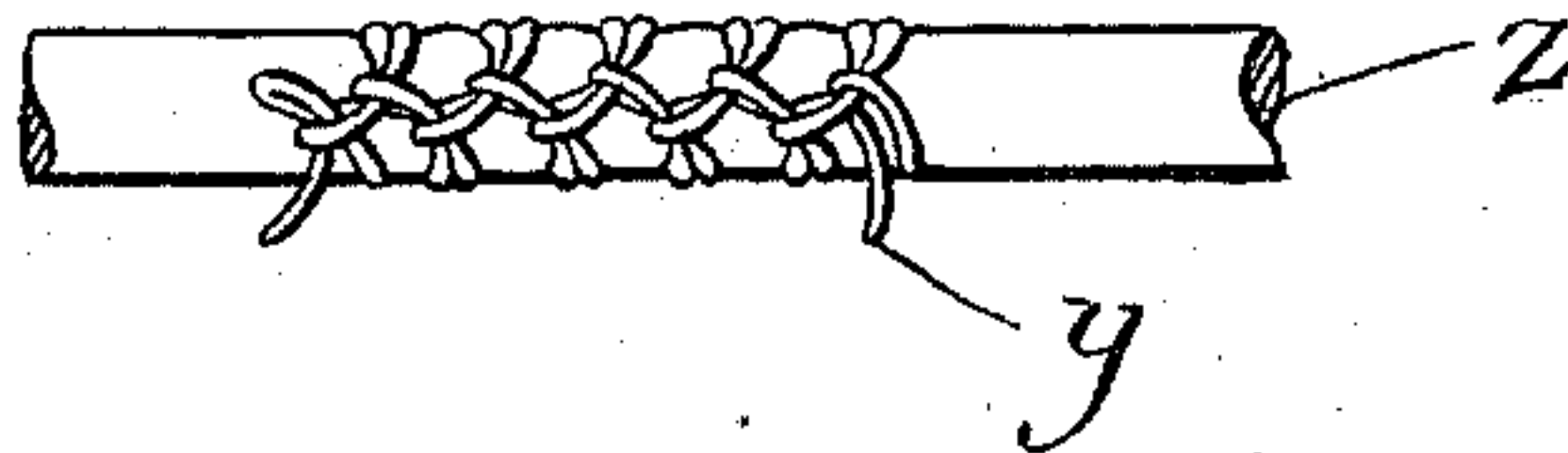


Fig. 13.

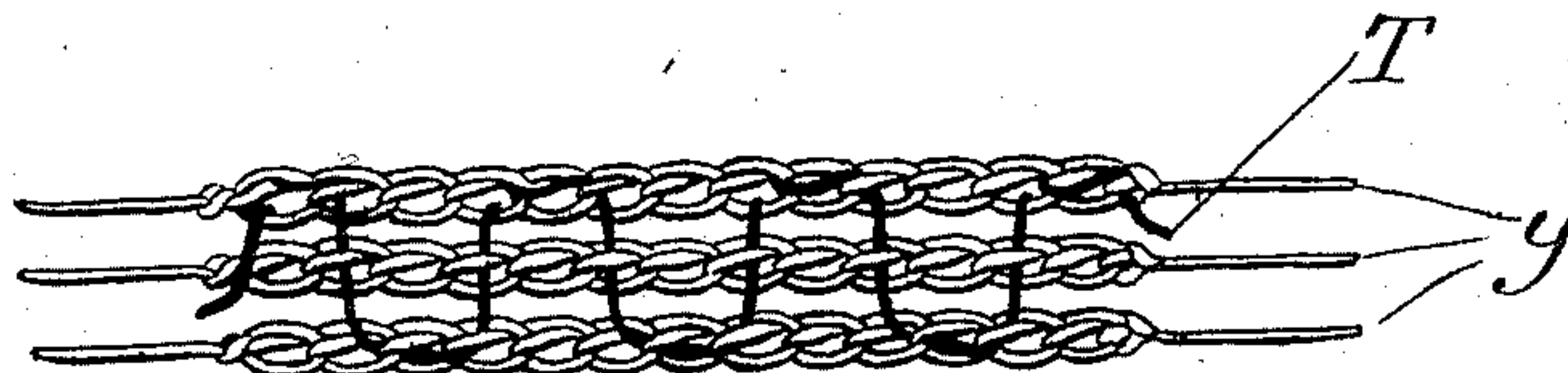


Fig. 14.

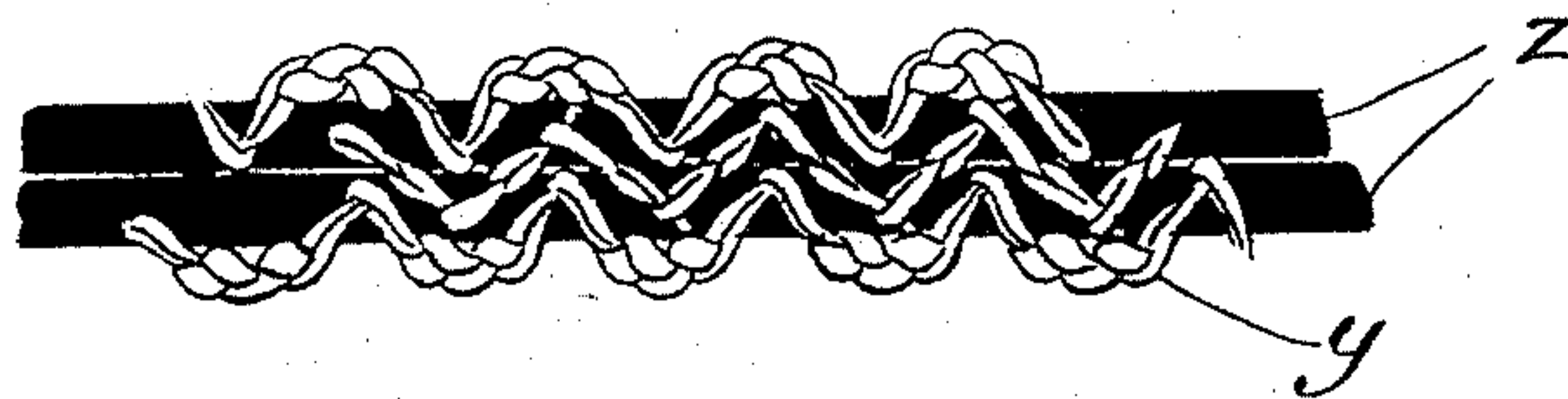
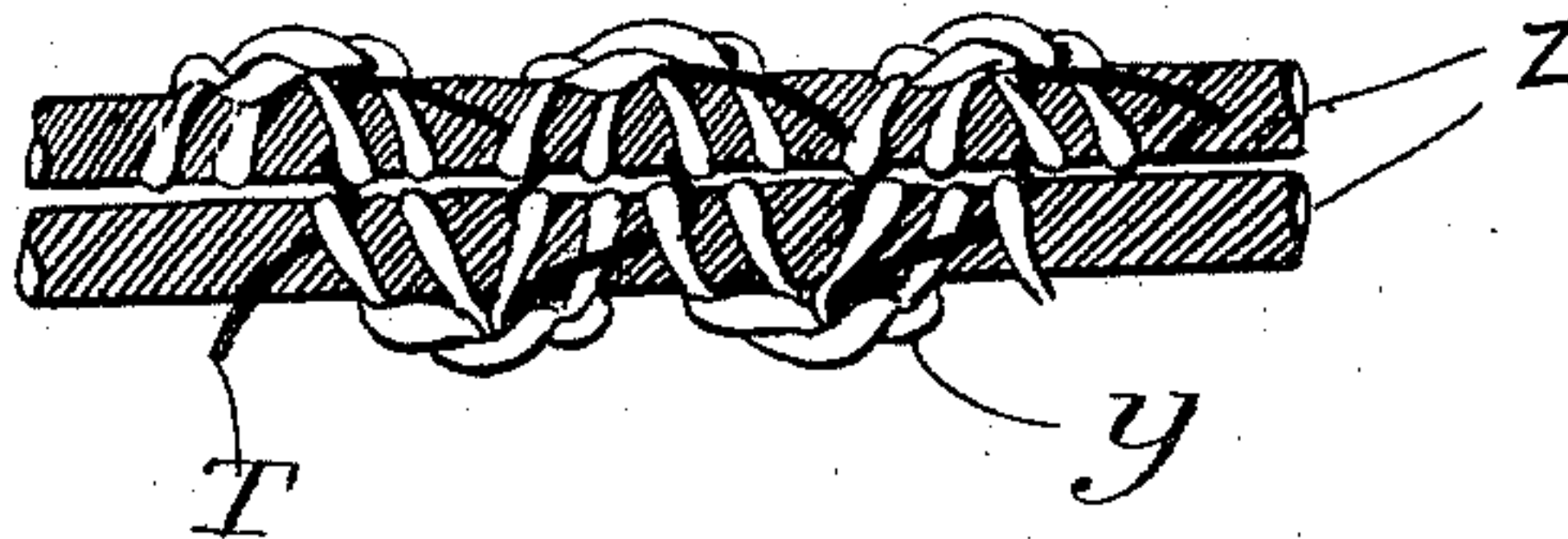


Fig. 15.



Witnesses.

N. F. Baker—
Sed M. Ashworth.

Inventor.

John Ashworth,
by A. H. Bence,
Attorney.

UNITED STATES PATENT OFFICE.

JOHN ASHWORTH, OF SOMERVILLE, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO ELLEN ASHWORTH, OF SAME PLACE.

CROCHET-MACHINE.

SPECIFICATION forming part of Letters Patent No. 579,102, dated March 16, 1897.

Application filed February 11, 1895. Serial No. 537,888. (No model.)

To all whom it may concern:

Be it known that I, JOHN ASHWORTH, of Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Crochet-Machines, of which the following, taken in connection with the accompanying drawings, is a specification.

This invention includes various improvements in machines for braiding, crocheting, or knitting bands of textile material and coverings for elastic or flexible cords whether endless or otherwise. Slight changes in the apparatus adapt it for variations in style or character of the work produced, as will be explained.

Prominent among the features of novelty may be mentioned needles and guards combined with spring-templates or lateral strand-guides between the fingers of which the needle-points pass; also, such needles and lateral guides combined with means for raising and lowering the temple and strands held thereby at predetermined times; also, such needles and temple combined with a movable perforated thread-guide which carries the several threads at the proper instant to the hooks or barbs of the several needles. A peculiar feature, also, is a tying-thread guide which carries from the upper to the lower edge of the band and obliquely across its back a tying-thread engaging alternately with laterally-projecting loops on the two edges. Combined with this tying-thread guide and its actuating devices is a peculiar stationary hook which holds the tying-thread until the proper moment and then allows it to be pulled off just when it is to be taken up by the retreating needle and merged in the edgewise stitch only. The band or strand being formed or covered is suitably stretched and is carried forward by automatic feed mechanism. Levers operated by cams and springs effect many of the peculiar movements of my devices, and by making certain parts capable of being readily removed and replaced I may vary the action, so that the same machine will produce widely-different results. By omitting the foundation-strands the machine is operative to form a continuous knitted cord or crocheted braid.

In the drawings, Figure 1 is a perspective view of my improved machine, showing the several parts in their working positions. Fig. 2 is a perspective view of the needle and part of its barb-protector or thread-guard. Figs. 3, 4, 5, and 6 are enlarged perspective details of the temple, needles, and adjacent parts, showing the successive positions in the formation of a stitch. Fig. 7 is an enlarged perspective detail of the tying-thread hook and the upper portion of the support on which it is fixed. Fig. 8 is a like view of the temple through which pass the strands to be covered, this figure showing clearly the fingers on which the loops or stitches are formed and from which they are drawn. Fig. 9 shows, detached, the parts of the friction-clutch for the needle-barb protectors. Fig. 10 shows the cam-wheel and an additional cam for actuating the temple. Figs. 11 to 15 illustrate on an enlarged scale some forms of the work of the machine under varying circumstances, Fig. 11 showing a single braid made on the temple-prongs with one thread. Fig. 12 shows the same stitch inclosing a foundation-strand. Fig. 13 shows three braids united loosely by the dark tying-thread. Figs. 14 and 15 are front and back views of part of a two-strand band with crocheted cover and tying-thread, the stitch being much spread and somewhat exaggerated to show the several threads.

A is the base or bed of the machine, furnished with brackets or bearings *a*, in which the main shaft B revolves, driven by a crank or a driving-pulley *b*. All the movable parts are actuated directly or indirectly from this shaft, which is located over the rearward edge of the base. Near the front edge two flanged supporting and feed wheels C C', revolving on vertical axes, receive the stretched endless strands Z, upon which a crocheted covering is to be formed. If the band or braid is not endless, it is fed forward between the wheels C and *c*, and the wheel C' may be dormant.

In Fig. 1 the band is not shown, as it would conceal much of the mechanism, but it will be understood from the enlarged detail Figs. 3, 4, 5, and 6 that the two-strand band, which the machine as here illustrated is adapted to cover and to complete as one fin-

ished band, passes while uncovered through the trough of the temple D, advancing to the needles E, where the covering is applied. The needles have a reciprocating horizontal motion, derived from the pitman F, which is pivoted at its front end to the sliding head F', in which the three needles are fixed, and at its rear end is connected to the crank-pin of a disk *f*, mounted on the inner end of the main shaft B.

The devices which actuate my needles are of peculiar construction. The needle-body is hollow or of U-shape and barbed at the point, as best seen in Fig. 2, where the sides of the U are shown cut away obliquely near the barb. Inside of the flattened hollow body and projecting rearwardly beyond it is a long thread-guard or barb-protector *e*, movable with and independently of the needle, to open or expose the barb, so that the needle may engage its proper thread, and to close by a lengthwise movement against the barb, thereby preventing the premature disengagement of the thread and injury to the band. The portion of the guard *e* which reciprocates within the needle-body will be flattened or otherwise shaped to conform to its interior surface.

Three needles are shown in the drawings, but the number may be increased or diminished according to the product desired. The needles are secured in the head F' by small screws *g*, and this head slides along a stationary rod G, Fig. 1, when the pitman is reciprocated. A rod G', parallel to rod G, moves with the head F' and carries forward and back a saddle H, having between its front and rear lugs a block H', fixed by screws *h* to the rearward portion of the thread-guards *e*, which pass freely through perforations in the lugs. There is a space between the two lugs of the saddle H about three times the width of the block H', so that they can move a certain distance without imparting motion to said block and to the thread-guards to which it is secured. The needles E can therefore move forward on the first part of their advancing stroke without the guards, thus leaving the barbs uncovered and ready to engage the thread.

The most rearward position of the parts at the beginning of the stroke is indicated in Fig. 4, the needles having drawn the thread-loops through the preceding stitch, and the front lug of the saddle H having pressed back the block H', carrying the thread-guards *e* with it. When the pitman F advances, it moves the head F', the U-shaped needles held therein, the rod G', and the saddle H; but the block H' and the thread-guards *e* do not advance until the rearward lug strikes the block. (See Fig. 3.)

To insure the guards *e* against premature movement either way by friction of the lugs of the saddle, I provide a spring-clasp I, having an adjusting-screw *i* and mounted in a standard I', through which the guards pass.

By adjusting the clasp to give the slight pressure required and yet permit movement of the guards freely I provide for separately stopping them during part only of the reciprocating movement of the needle, as already explained.

The strands Z to be covered in forming the band pass lengthwise through the temple D. The rear wall of the temple terminates in four pointed fingers D², around which the stitches are formed and from the points of which they are drawn off as the band moves forward. Between these fingers the needles reciprocate, first through one space and next through the adjacent one, and as the needles are arranged to move in one uniform place the tip of the temple is slightly raised or lowered after each stitch, so that the needles will pass alternately on opposite sides of the strands to form the stitches around them successively. To give this up-and-down movement at the tip, the heel of the temple is pivoted on its supporting-standard *d*. The front of the temple has two or more spring-arms D', concaved longitudinally on the inner face of their forward ends to each receive one of the strands and move it into proper position with reference to the advancing needle. This slight intermittent movement of the temple may be effected in various ways. As combined with the other mechanism it is here shown with a rearwardly-extending shaft J, Fig. 1, oscillated through intervening mechanism by face-cams on the side of the wheel K at the rear of the machine and fixed on a shaft K', rotated slowly by the gears L L' from the main shaft B. Said cams act on an arm R², rising from a short shaft M, having an arm *m*, which in turn acts upon a like arm *j* on the shaft J, a spring attached to an arm J' giving the movement in the opposite direction.

The three threads of silk or yarn Y to be engaged by the needles and to form the covering of the foundation-strands come from spools (not shown) and under light tension and pass through holes in the upper part of an upright yarn-guide N, which has a peculiar movement to carry the three yarns at the proper time back of the barbs and into the eye of the needles. This movement may be variously effected. As illustrated in Fig. 1, the guide N is slotted at its foot to receive a stud, and is loosely held behind a plate *n* on the front edge of the base A, and is moved forward and back by a curved arm N', projecting from a shaft N², extending rearwardly through standards N³, and having at its rear end a crank-arm N⁴ of L form, bearing upon the face of a cam N⁵ on the main shaft. Upward-and-downward movement of the yarn-guide N is produced by a slotted arm O engaging with a stud on said guide and projecting from a shaft O', arranged beneath the shaft N², and similarly provided with an angular arm *o*, bearing on a cam O² on the main shaft B. A spring O³ at the front tends to draw the guide forward and downward. By

these or equivalent devices a composite upward lateral and downward motion is given to the yarn-guide N, which carries the yarns up to and against the respective needles, and the retreating needles each engage one of the covering-yarns and draw it through the preceding stitch.

A peculiarity of my machine is a tying-thread mechanism by which a tying-thread T is intermittently brought to and engaged with one marginal stitch and then carried obliquely across the back of the band to and engaged with a stitch in the opposite edge thereof, so as to keep the band flat and prevent the edges from curling or rolling over. An essential feature of this mechanism is a double-pointed hook P, mounted upon a standard P', through which the needles pass, and fixed in position adjacent to the barbs of the needles as they reciprocate. This device may be seen in Fig. 1, but is best shown in Fig. 7. The points of the hook extend upwardly and downwardly and are curved or beveled from the front toward the rear, so that the needle can pull the thread T off from them. Coöperating with this stationary part is the movable tying-thread guide Q, which has an eye at its tip for the tying-thread to pass through and is given a generally forward-and-back movement, as herein shown, by the vibration of an arm Q', to which its rear end is pivoted, and an upward-and-downward movement by the vibration of a slotted arm q, which projects from a horizontal shaft r and receives at its tip the guide Q, working forward and back through it. A composite motion to the tip and eye of the guide, alternating with a period of rest, results from the simultaneous or successive movements of these parts, and they are so timed as to carry the tying-thread over one of the prongs or points of the hook P, where it is held until the barb of the needle nearest to said point engages it, in addition to the yarn which is to form the edgewise stitch. The retreating movement of the needle pulls upon the thread T and at the proper moment the guide Q moves upwardly or downwardly enough to permit said thread to pull off of the hook.

The described movements of the parts Q and q may be variously effected. The means illustrated are preferred. The vibrating arm Q' projects from a shaft R, which oscillates in its bearings when an arm R' at its rear end is actuated by peripheral cams k on a cam-wheel K, revolving with the shaft K'. A spring R holds these arms up to their bearing against the cams. Similarly the arm q is vibrated (to raise and lower tying-thread guide) by the limited oscillation of a shaft r, which extends to the rear edge of the machine and has an arm r', actuated by face-cams on the side of the wheel K. The cams which are employed for this latter movement are the ones which cause the intermittent movement of the temple, and in order to move them simultaneously from the same cam and yet have them dis-

connected the extremity of the arm k is furnished with a lateral pin k², against which the extremity of the arm r' bears, pressed by the spring r². Now when the needles are advancing between the fingers D² of the temple and through the perforations of the standard P' the yarn-guide N is swinging upwardly in front of the needle-barbs to carry the yarns laterally into the needle-eyes, where they are engaged and drawn through the preceding stitch. At the same time the tying-thread guide brings the tying-thread forward and introduces it laterally into the eye of the upper or lower needle, where it is similarly engaged and is incorporated with the upper or lower stitch.

The tying-thread T is not engaged by the central needle at any time, since its thread is to be carried zigzag from edge to edge across the back of the band. Its mechanism therefore has an intermittent movement and lies dormant during the formation of each alternate stitch, at which time the peripheral cams k of the wheel K are not acting upon the arm R' of the shaft R, and the extremity of the arm R², which carries the pin k² on which the arm r rests, is bearing upon an intermediate step of the face-cam on said wheel between the highest and the lowest positions. In Fig. 1 the arm k is seen rising from this intermediate position onto the highest step of the face-cam, and the tying-thread guide is just rising to carry its thread up and forward where the uppermost needle will engage it. This guide next moves back and downward to a central position, where it lies dormant during the formation of one stitch. It then moves downwardly forward and back and upwardly to the central position, where it again rests during one stitch.

The feed movement is best effected by a ratchet U on the upright shaft of the feed-wheel C, with which the tip of a reciprocating bar V engages. This bar works through a standard V' and is actuated by a cam v on the main shaft B and is drawn back after each feed movement by a spring v'. A spring-clip or feed-lock U', secured at one end to the base A, bears at its tip against the teeth of the ratchet U to prevent any feed movement of more than one tooth at each stroke of the feed-bar V. The feed mechanism acts with the formation of each stitch, and the result as to the tying-thread is to carry it in a zigzag direction across the back of the band, since it is engaged only in the top and bottom stitches.

The machine and its parts herein represented are arranged to cover two elastic or other foundation strands for the band with an ornamental material applied thereon by crochet-stitches, with an edge stitch, and with a tying-thread engaging the edge stitches only and running zigzag across the back of the band. This tying-thread may be omitted and the covering made otherwise complete, the devices for presenting said thread to be prop-

erly taken up by the needles being in such case dormant. For covering three or more foundation-strands additional needles, cams, and actuating parts would be required, but the general operation would be the same as has been described.

When a single strand is to be covered, a single needle only is required. In such a case I may remove two of the three needles shown in Figs. 3 to 6 or simply omit two of the three threads of covering silk or yarn so shown, thereby rendering two needles dormant without removing them. The vibrating temple will carry the strand alternately above and below the plane of reciprocation of the remaining needle, which, engaging the single yarn at each forward movement, first above and then below the strand, produces a crocheted covering around it, as in Fig. 12. Where no foundation-strand is provided, the crochet-stitches are formed around the tapering fingers of the temple only, and the braid drawn endwise therefrom is such as is shown in Figs. 11 and 13, where one and three yarns are used, respectively.

In Fig. 10 I have represented the cam-wheel K of Fig. 1 with an additional cam portion X to be screwed to the lowest face of the side of said wheel, so as at that point to form a duplicate of the highest face of such wheel. The effect of this addition is to produce a double alternate motion of the temple, actuated by the wheel K at each revolution thereof, instead of a cam action in three steps, as hereinbefore described in connection with the movement of the temple.

I claim as my invention—

1. The needles E, pitman F and sliding head F' in which the needles are secured, and the reciprocating rod G' carrying said head and the saddle-piece H, in combination with the elongated barb-protectors e, the block H' fixed thereto between the front and rear lugs of said saddle, and with the friction-clasp I i, holding the parts e with a yielding pressure, substantially as set forth.

2. The vibrating temple D provided at its free end with fingers D² around which the stitches are formed and from which they are drawn, and with the arms D' serving to hold the strands in position with relation to said

fingers and the needles, substantially as set forth.

3. The temple D D' D² and means for giving to its free end a limited and intermittent vibratory movement, in combination with reciprocating needles adapted to enter the spaces between the fingers of the temple during the pauses in its movement, and with means for presenting the yarns or threads to be engaged by the barbs of the needles during such pauses, substantially as set forth.

4. The vibrating temple having tapering terminal fingers, the barbed reciprocating needles E, and the barb-protectors e working within said needles and having a more limited reciprocating movement, in combination with the thread-guide N perforated for the passage of the several threads, and with means for giving such guide a rising-and-falling and a forward-and-backward movement at the proper time, substantially as set forth.

5. The temple, the reciprocating needles and barb-protectors, and the yarn-guide N having a composite motion, in combination with tying-thread mechanism adapted to present a tying-thread to be engaged alternately by the upper and lower needle and incorporated first into the upper and afterward into the lower edge stitch, substantially as set forth.

6. The tying-thread mechanism consisting of the rigid double-pointed hook P having its prongs beveled rearwardly, and a support on which such hook is mounted adjacent to the barbs of the needles when advanced, in combination with a tying-thread guide Q having an eye at its tip for the thread T, and with means for moving said guide-tip upwardly, forward and back, and downwardly to a central position, then, after a period of rest, downwardly, forward and back, and upwardly to said position, substantially as set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 1st day of February, A. D. 1895.

JOHN ASHWORTH.

Witnesses:

A. H. SPENCER,
CHARLES G. KEYES.