

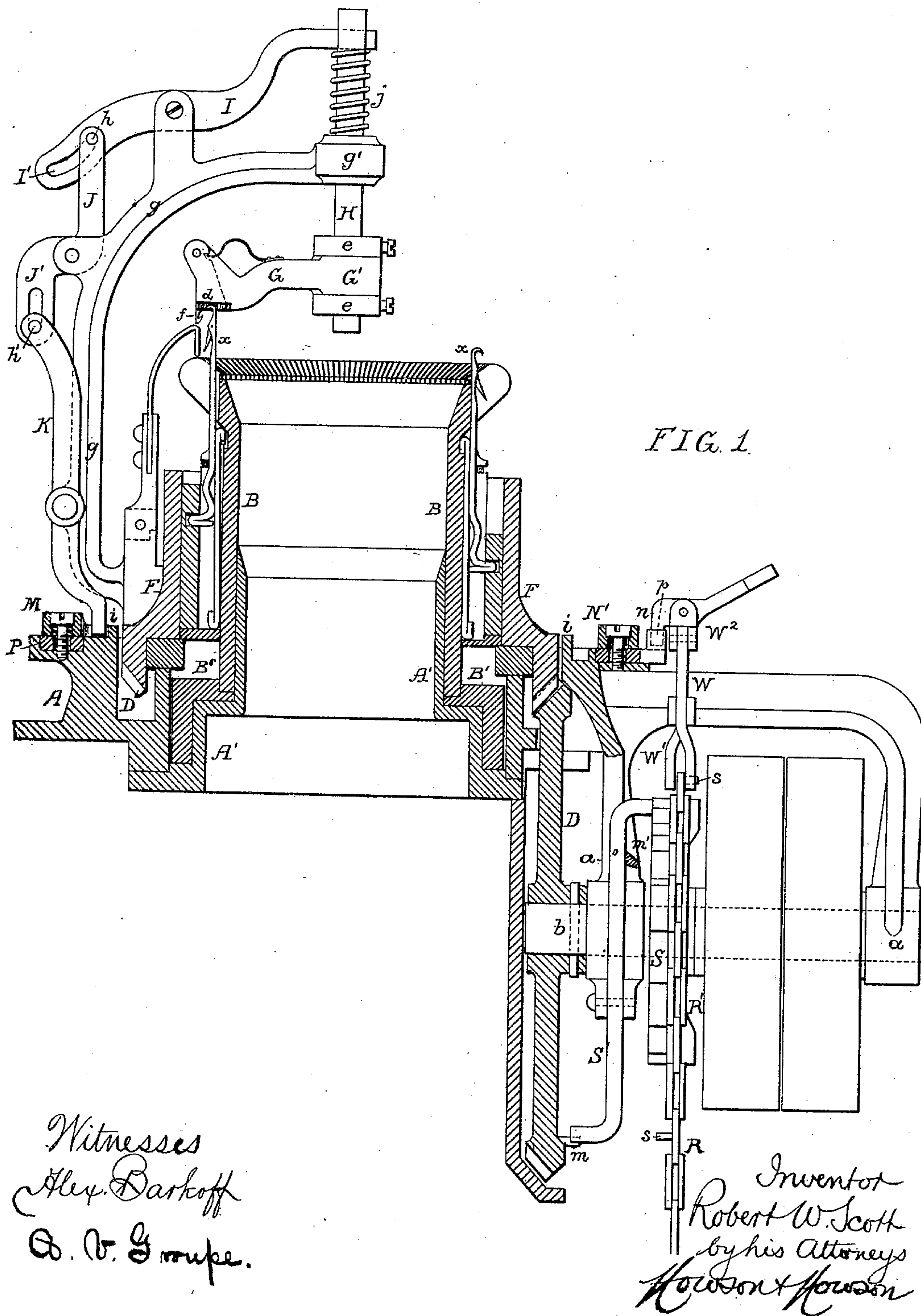
(No Model.)

3 Sheets—Sheet 1.

R. W. SCOTT.
KNITTING MACHINE.

No. 410,859.

Patented Sept. 10, 1889.



(No Model.)

3 Sheets—Sheet 2.

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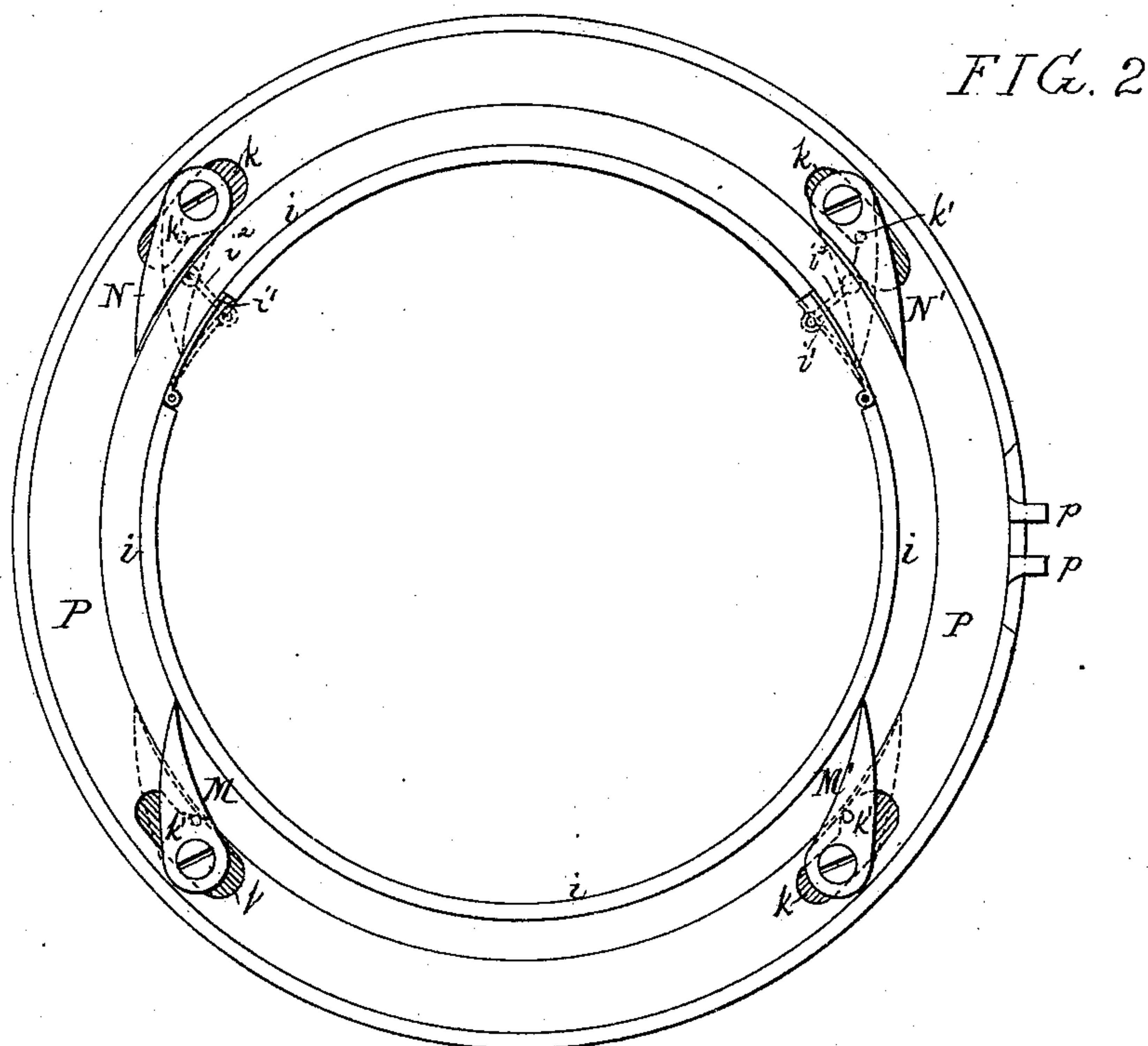


FIG. 3.

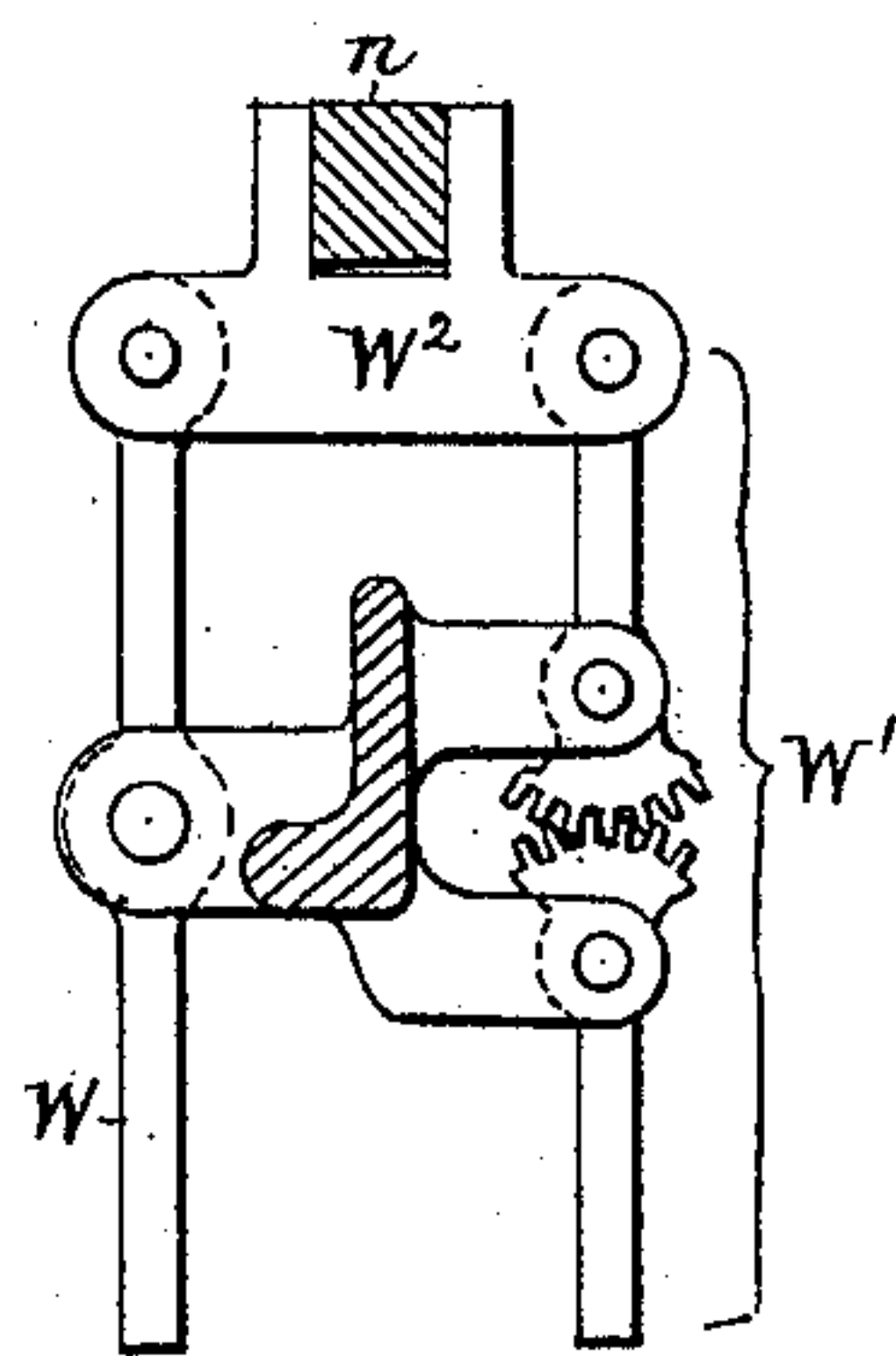


FIG. 4.

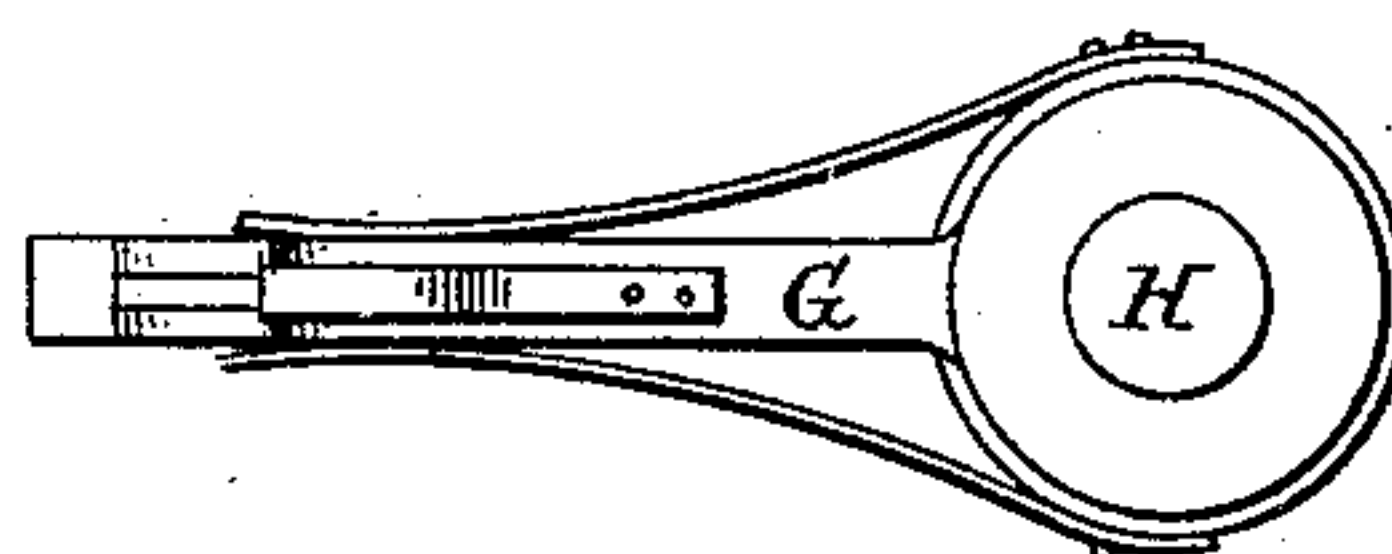
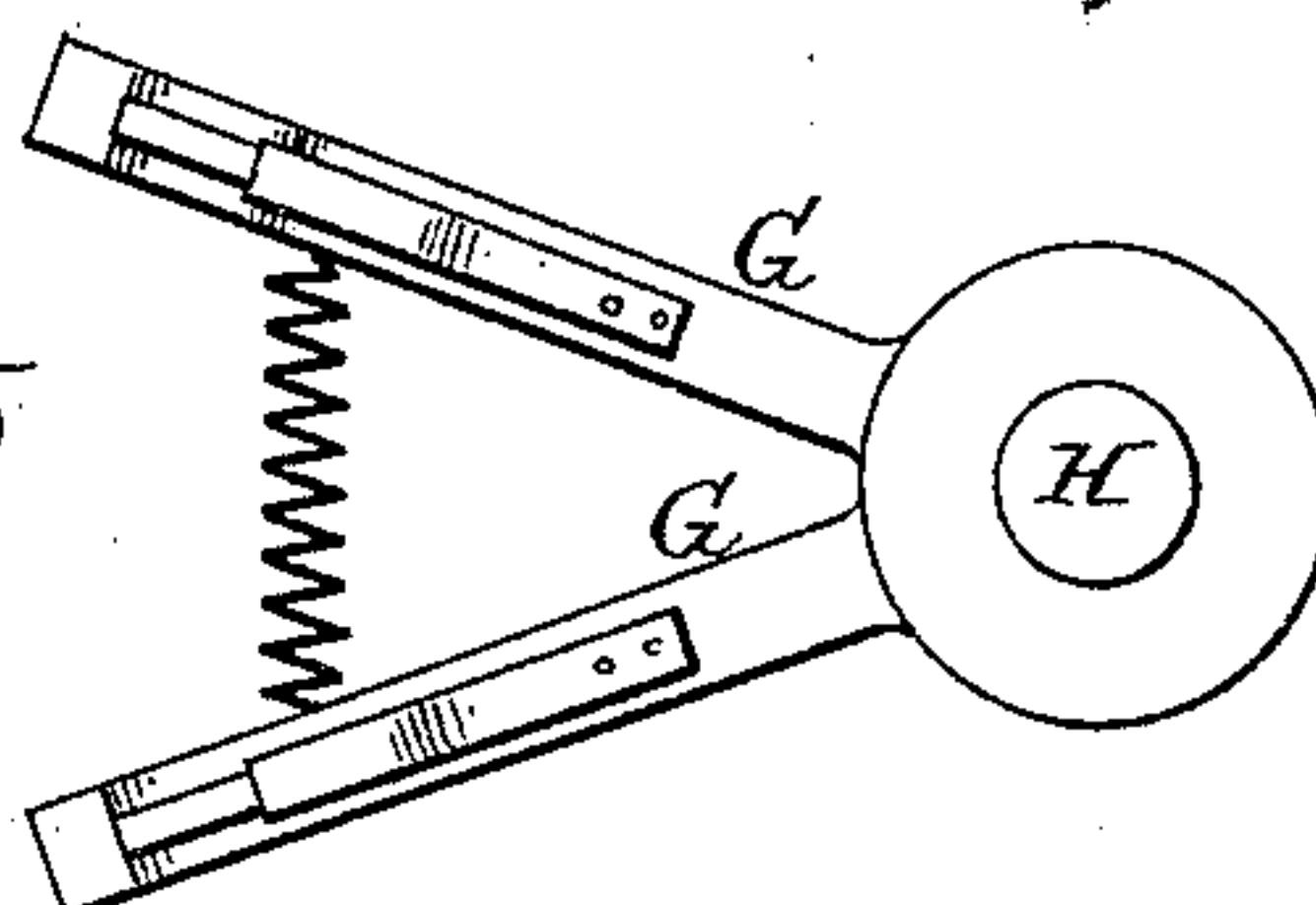


FIG. 5



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by his Attorneys
Howson & Howson

(No Model.)

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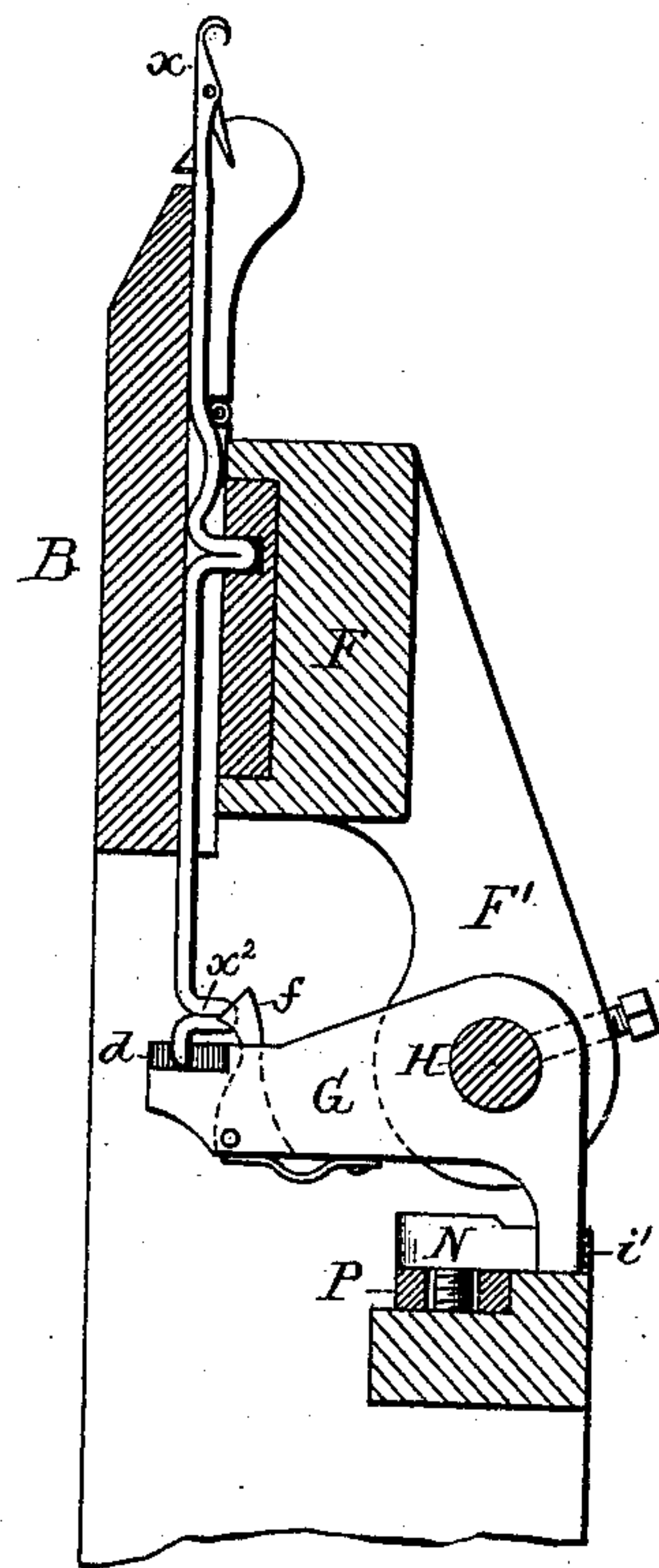


FIG. 6.

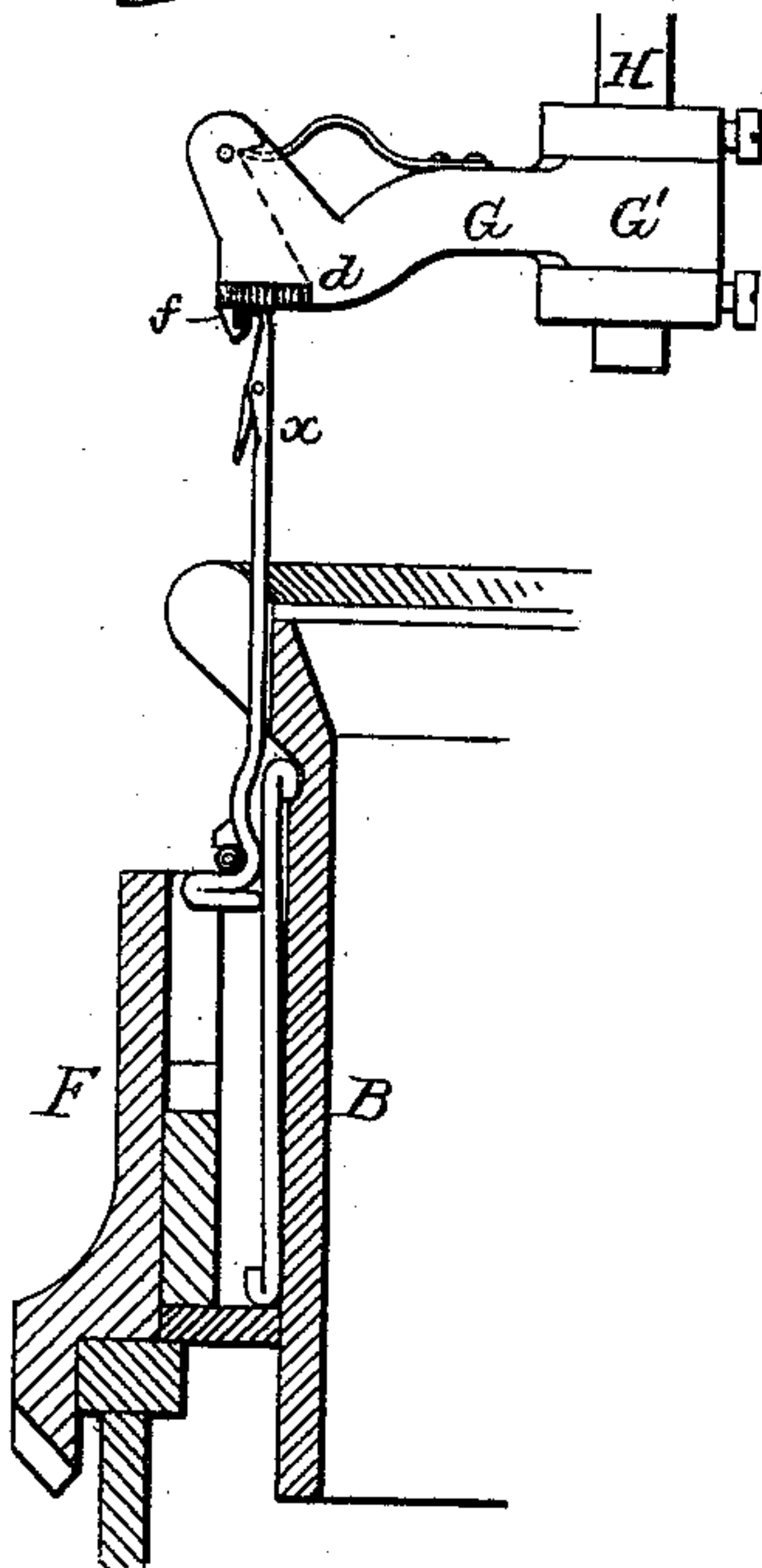


FIG. 1 1/2

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Ally. Barkoff

Inventor:
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UNITED STATES PATENT OFFICE.

ROBERT W. SCOTT, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO LOUIS N. D. WILLIAMS, OF SAME PLACE.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 410,859, dated September 10, 1889.

Application filed July 8, 1889. Serial No. 316,836. (No model.)

To all whom it may concern:

Be it known that I, ROBERT W. SCOTT, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Knitting-Machines, of which the following is a specification.

My invention relates especially to that class of knitting-machines known as "seamless machines," which are intended for forming pockets or bulges on knitted webs by first throwing a number of needles out of action simultaneously, but permitting them to retain their stitches, then gradually reducing the number of needles remaining in action by throwing needles out of action alternately at opposite ends of the acting set, but permitting them to retain their stitches, and then bringing these needles successively into action again preparatory to throwing into action simultaneously the needles first rendered inactive.

The main object of my invention is to provide simpler mechanism than usual for effecting the automatic picking of the needles first out of and then into action again for the formation of the narrowed and widened web constituting the pocket or bulge on the fabric. The mechanism may be used in part, however, for effecting but one of these objects—that is to say, it may be used for throwing needles into action for widening or out of action for narrowing when but one of these duties is to be performed.

In the accompanying drawings, Figure 1 is a view, partly in elevation and partly in longitudinal section, of a circular-knitting machine constructed in accordance with my invention. Fig. 1½ is a sectional view of part of the same, showing the needle-picker, needle, and cam-cylinder in a different position. Fig. 2 is a plan view of part of the machine shown in Fig. 1. Fig. 3 is a detached view of part of the machine; and Figs. 4, 5, and 6 are views illustrating modifications.

A is the fixed frame or bed of the machine; B, the needle-cylinder mounted in an internal rim or flange A' of the bed and supported upon a cam-ring B', so that it can be raised and lowered to govern the slackness or stiffness of the work.

To suitable bearings *a*, depending from the

fixed frame A of the machine, is adapted the driving-shaft *b*, to which is secured a bevel-wheel D, gearing into a bevel-pinion D', formed on the base of the cam-cylinder F, the latter being mounted on the fixed frame of the machine, so as to be free either to rotate or to reciprocate thereon.

The operating-cams of the cylinder F are, as usual in machines of this class, so constructed that when the needles *x* are depressed in the needle-cylinder they will be under the influence of the cams and will be operated so as to knit; but when raised in the needle-cylinder they will be free from the influence of said cams, and will consequently remain out of action.

In operating a machine of this character all of the needles are in action in making plain tubular work, and when it becomes necessary to form a heel or toe pocket upon said tube a number of the needles—usually about one half—are lifted out of action simultaneously by suitable means—for instance, by means of a special cam on the cam-cylinder, as shown in the patent of D. C. Bellis, No. 385,163, dated June 26, 1888. The end needles of the set remaining in action are then lifted successively, first at one end of the set and then at the opposite end of the same, so as to be out of the path of the operating-cams, the needles so raised retaining their stitches and the operation being continued until the web which is being produced has been narrowed to the desired extent, whereupon the end needles are successively depressed or brought into action, first at one end and then at the other end of the acting set, until all of the needles formerly raised in narrowing the web have been depressed and brought into action again, whereupon the needles around the other half of the head are likewise depressed and the formation of tubular fabric is resumed, it being understood that during the formation of such tubular fabric the cam-cylinder is rotated, while during the formation of the pocket or bulge the cam-cylinder is reciprocated so as to carry the thread first in one direction around the acting set of needles and then in the opposite direction around the same.

The essential feature of novelty in the

present machine is the means employed for effecting the automatic moving of needles out of action at the ends of the set and the automatic bringing of these needles again into
5 action, and this mechanism I will now proceed to describe.

The needle-picker is substantially similar to that set forth and claimed in my patent, No. 407,126, dated July 16, 1889, and consists
10 of a bar *G*, recessed on the opposite sides at the outer end, so as to form shoulders *d*, the outer end of the bar being also provided with a pivoted hook *f*. The inner end of the bar *G* has a hub *G'*, which is confined between
15 collars *e* on a spindle *H*, the latter being adapted to a bearing *g'* in an arm *g*, extending upward from one side of the cam-cylinder *F* of the machine. The upper end of the spindle *H* is acted upon by one arm of a lever
20 *I*, hung to a bracket on the arm *g*, and having in its other arm a slot *I'*, which receives a pin *h* on one arm of a lever *J*, likewise hung to a bracket on the arm *g*, the other arm of this lever having a slot *J'*, which receives a pin *h'*
25 on a lever *K*, hung to the arm *g*, the other arm of this lever bearing against a flange *i*, formed on the fixed frame *A* of the machine, as shown in Figs. 1 and 2, and a spring *j*, acting upon the lever *I* so as to move the same
30 and the intermediate levers *J* and *K* in such manner as to press the lower arm of the latter lever against the flange *i*.

Hung to the fixed frame *A* of the machine, adjacent to the flange *i*, are a series of spring-cams *M M'* and *N N'*, one set of these cams
35 being held out of action while the other set is in action, and this operation being effected by means of a cam-ring *P*, turning in a suitable bearing in the fixed frame *A*, and having cam-slots *k*, which act upon pins *k'*, depending from the cams *M M' N N'*, so that by moving the cam-ring in one direction the
40 cams *M M'* will be permitted to drop into action, as shown by full lines in Fig. 2, while the cams *N N'* will be held out of action, as also shown by full lines in said figure, a reversal in the direction of movement of the ring causing a corresponding reversal in the
45 relative position of the cams, as shown by dotted lines in Fig. 2.

The operation of the cam-ring *P* at the appropriate intervals is effected by means of a pattern-chain *R*, adapted to a chain-drum *R'*,
55 secured to or forming part of a ratchet-wheel *S*, which is mounted so as to be free to turn on the shaft *b*, and is actuated by means of a pawl-lever *S'*, the latter being under the influence of a projecting lug *m* on the bevel-wheel *D* and of a suitable retracting-spring *m'*.

Hung to the frame *A* of the machine is a single lever *W* and a compound lever *W'*, as shown in Fig. 3, the upper ends of the levers being connected by a link *W²*, which carries
60 a catch *n*, engaging with lugs *p* on the cam-ring *P*, and on the pattern-chain *R* are oppositely-projecting lugs or pins *s*, one of which is adapted to strike the lever *W*, the other pin

striking and operating the lower member of the compound lever *W'*, the pins being arranged at such a distance apart on the chain that the
70 cam-ring *P* will be operated at the appropriate intervals, contact of a pin with the lever *W* moving the link *W²* in one direction and contact of a pin with the lower member of the lever *W'* moving the link in the oppo-
75 site direction.

The operation of the machine is as follows: During the production of continuous tubular fabric the picker rotates above the tops of the needles *x* and is out of the way of the
80 same, and when the machine is stopped preparatory to the formation of the pocket on the tube the picker is on that side of the machine in which the needles are to remain in action. When the needles are lifted around
85 the other half of the machine, their upper ends are in such position that they will be in the path of the outer end of the picker as the latter moves with the cam-cylinder in its reciprocations. On the first reciprocating
90 movement of the cam-cylinder, therefore, the picker will strike the first raised or inoperative needle at one end of the acting set, the vertical position of the picker being such that that portion of it above the shoulders *d*
95 comes into contact with the needle, the lateral dimensions of the picker being such that under these circumstances the hook *f* is directly in line with the next needle of the head—that is to say, the first depressed or acting needle
100 of the acting set. During the first part of the reciprocating movement of the cam-cylinder the cams *M M'* are in operative position, as shown by full lines in Fig. 2, and just before the cam-cylinder has reached the limit of
105 its reciprocating movement the lower end of the lever *K* comes under the influence of one of these cams—say the cam *M*—the said arm of the lever consequently traveling up the outer face of the cam and then dropping back onto
110 the guide-flange *i*. The consequence of this is a vibrating movement is imparted to the lever *K*, and thence through the lever *J* to the lever *I*, so that the spindle *H* and the needle-picking tool carried thereby are first
115 depressed and then raised again, with the result that the hook *f* catches the hook of the first depressed needle, and on the rise of the picking-tool lifts said needle to the inoperative position, as fully set forth in my patent
120 above referred to. On the reciprocation of the cam-cylinder in the opposite direction the picking-tool is brought to bear against the raised or inoperative needle at the opposite end of the acting set, and the
125 levers are again actuated, this time by the cam *M'*, so as to pull into inoperative position the first needle at that end of the acting set, and these operations are thus repeated, so that needle after needle, first at one end and
130 then at the other end of the acting set, is pulled up into inoperative position, the frictional driving device for the needle-picking tool permitting the arrest of the latter at any

desired point without stopping the continued movement of reciprocation of the cam-cylinder. When the desired number of needles have been thus lifted out of action and it is desired to reverse the operation and bring these needles into action again, movement of the cam-ring P is effected by means of the automatic mechanism described, so as to throw the cams M M' out of action and allow the cams N N' to drop into action, as shown by dotted lines in Fig. 2, so that on the first reciprocation of the cam-cylinder after this movement the lever K will be actuated by one of the cams N N'—say by the cam N. It will be observed on reference to Fig. 2, however, that that portion *i'* of the flange *i* adjacent to each of the cams N N' is pivoted and connected to said cam by means of a link *i*², as shown by dotted lines, so that it will be depressed when the cam is permitted to drop into acting position, as in dotted lines; hence before the lever K reaches the cam N it will pass into the recess thus formed, and the movement thereby imparted to it will be transmitted to the needle-picking tool so as to lift the same to such an extent as to bring the recessed lower portion of the bar G to bear on the raised needle, which serves as a stop for said bar. The consequence of this is that one of the shoulders of the bar is caused to project over the top of said needle, and the hook *f* is brought into line with the space between that needle and the needle adjacent to it, so that when the needle-picking tool is depressed it will carry down into operative position the needle overlapped by its shoulder, and will rise without causing the hook to engage with a needle. On the reverse reciprocation the same operation is effected at the opposite end of the set, and so on until all of the needles previously thrown out of action have been pressed into action again, whereupon the needles around the other half of the head are likewise depressed into operative position, preparatory to the resumption of the knitting of the tubular web. The cams M M' and N N' are so located on the bed of the machine, as shown in Fig. 2, that the cams M M' will act when the thread-guide has passed beyond the end needle of the acting set, while the cams N N' act before the thread-guide reaches said end needle—in other words, the end needle of the acting set is raised out of action after the completion of a course of stitches and before the thread-guide commences to return to form the next course, while the needles are pushed down into action at the ends of the set while the thread-guide is approaching and before it reaches said end, the operation of the needles being in effect precisely the same as in the ordinary hand-machines of this character.

It will be evident that the essential feature of my improved machine is the utilization of the needles themselves as stops for the needle-picking tool, and this feature may be embodied in machines differing from that shown as

regards the mere mechanism for operating the picking-tool, and the latter itself is also susceptible of modification, as indicated in my patent above referred to, and although I have shown my invention as applied to a circular machine, it will be evident that it can be applied to straight machines as well; hence in some of my claims I have alluded to the needle-carrier as covering both a cylinder or straight frame. In Fig. 6, for instance, I have shown an instance of the application of the invention to a straight machine, of which B is the needle-bar, and F the reciprocating cam-box, the latter having bearings F' for a rod H, which is thus carried by and reciprocated with the cam-box, the bar G of the needle-picking tool being frictionally mounted upon said rod H so as to travel with the cam-box until stopped by the needles. In this case the cams M M' and N N' are of course arranged in a straight line, and the cam-operating bar P is straight instead of circular; but the parts are otherwise constructed as in the circular machine.

It will also be evident that my invention may be used in part for effecting but one operation—that is to say, it may effect either the moving of the needles into operative position, or their movement into inoperative position—and in some classes of machines the operation may be in a measure the reverse of that formerly described—that is to say, the operative needles may be the raised needles and the inoperative needles may be the depressed ones, so that the picking-tool will be stopped by contact with the operative needles, or the jacks of the needles may serve as stops instead of the needles themselves—for instance, the picking-tool may be at the base of the cylinder, and may act upon jacks projecting below the same, the tool being stopped by contact with the jacks of either the acting or inoperative needles. This construction is also shown in Fig. 6, in which the downwardly-projecting stems of the needles constitute jacks, the lower ends of which are acted upon by the recessed end of the picker in order to raise the needles, bits *x*² on the jacks being acted upon by the hook of the picker in order to draw down the needles. By the use of the term "needle" in the claims, therefore, is intended not only the needle itself, but the jack or other equivalent device, which is practically part of the needle.

A spring-controlled picker is also available as a substitute for the frictionally-operated picker—for instance, as shown in Fig. 4, the picker-arm may be pivoted loosely and held between spring-arms on the carrier, tending to maintain it constantly in mid-position, or two pickers acted upon by an interposed spring may be used, as shown in Fig. 5.

Although I have described cams as a means of operating the needles, it will be evident that my invention is not limited to the use of cams for this purpose, as in many cases it may be advisable to use a substitute for the cam for advancing the needles, or for both ad-

vancing and retracting the same—such, for instance, as set forth in a separate application filed by myself and L. N. D. Williams, and bearing date June 22, 1889, Serial No. 315,288.

5 My invention is also applicable to those machines in which the needle-bed is horizontal and either straight or annular, the needles being guided either laterally or radially in said horizontal bed.

10 It will be evident, furthermore, that my invention can be readily applied to a machine in which the needle-cylinder is rotated and vibrated in place of the cam-box.

Both in Figs. 1 and 6 I have shown the bits of
15 the needles under control of the cams of the cam-box; but it should be understood that when the needle is to be raised or lowered the cam-box has been so moved prior to such operation that the cams are beyond the bit of the
20 needle which is to be acted upon, the latter being thus free to be moved either up or down, as shown, for instance, in Fig. 1½, which represents a needle raised into inoperative position by the picker.

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

1. The combination of the needle-carrier and its needles, means for operating the latter, and a needle-picking tool projecting into
30 the line of the needles, whereby its movement may be arrested by contact with a projecting needle of the carrier, and the picker thus brought into position for acting on said needle, substantially as specified.

35 2. The combination of the needle-carrier and its needles, the needle-picking tool arranged to be stopped by a projecting needle, and a tool-carrier having a yielding connection with the picking-tool, whereby one may
40 have movement independently of the other, substantially as specified.

3. The combination of the needle-carrier and its needles, the needle-picking tool occupying such relation to the needles as to be
45 stopped by a projecting needle of the set, and a tool-carrier having a frictional connection with the picking-tool, substantially as specified.

4. The combination of the needle-carrier

and its needles, a needle-picking tool projecting into the line of the needles, whereby
50 its movement may be arrested by contact with a projecting needle of the carrier, means for moving the picking-tool so as to cause such contact of the same with the needles, and
55 means for moving the picking-tool in line with the movement of the needles, so as to move the engaged needle into operative or inoperative position, substantially as specified.

5. The combination of the needle-carrier and its needles, the cam-box and its needle-operating cams, a needle-picking tool occupying such relation to the needles as to be
60 stopped by a projecting needle of the set, and a tool-carrier having a yielding connection with the picking-tool and connected to the cam-box so as to be moved therewith, substantially as specified.

6. The combination of the needle-carrier
70 and its needles, a needle-picking tool occupying such relation to the needles as to be stopped by a projecting needle of the set, means for moving the picking-tool across the
75 set of needles, and cams and intervening devices whereby the picking-tool is moved in a direction in line with the needles after reaching the limit of its transverse movement, substantially as specified.

7. The combination of the needle-carrier
80 and its needles, a needle-picking tool occupying such relation to the needles as to be stopped by a projecting needle of the set, means for moving the picking-tool across the
85 set of needles, two sets of cams and intervening devices whereby the picking-tool is moved in a direction in line with the needles after reaching the limit of its transverse movement, and means for throwing said sets of cams into
90 operation alternately, substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ROBERT W. SCOTT.

Witnesses:

WILLIAM D. CONNER,
HARRY SMITH.