

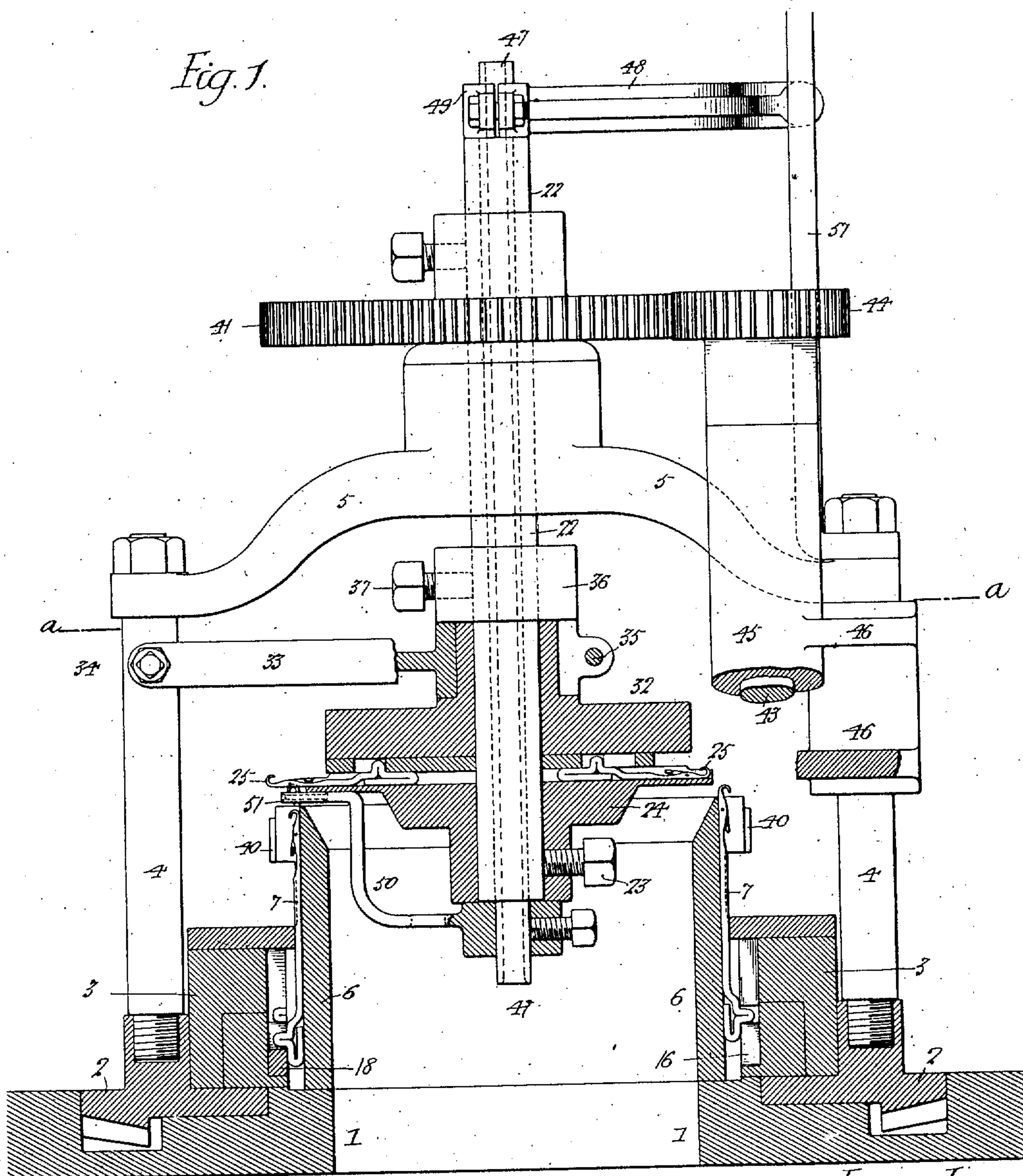
No. 849,701.

PATENTED APR. 9, 1907.

R. W. SCOTT.
FLEECE RIB KNITTING MACHINE.

APPLICATION FILED MAR. 8, 1906.

6 SHEETS—SHEET 1.



Witnesses:
Hamilton D. Turner
Augustus B. Oppen

Inventor:
Robert W. Scott.
By his Attorneys,
Hewitt & Hewitt

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6 SHEETS—SHEET 2.

Fig. 3.

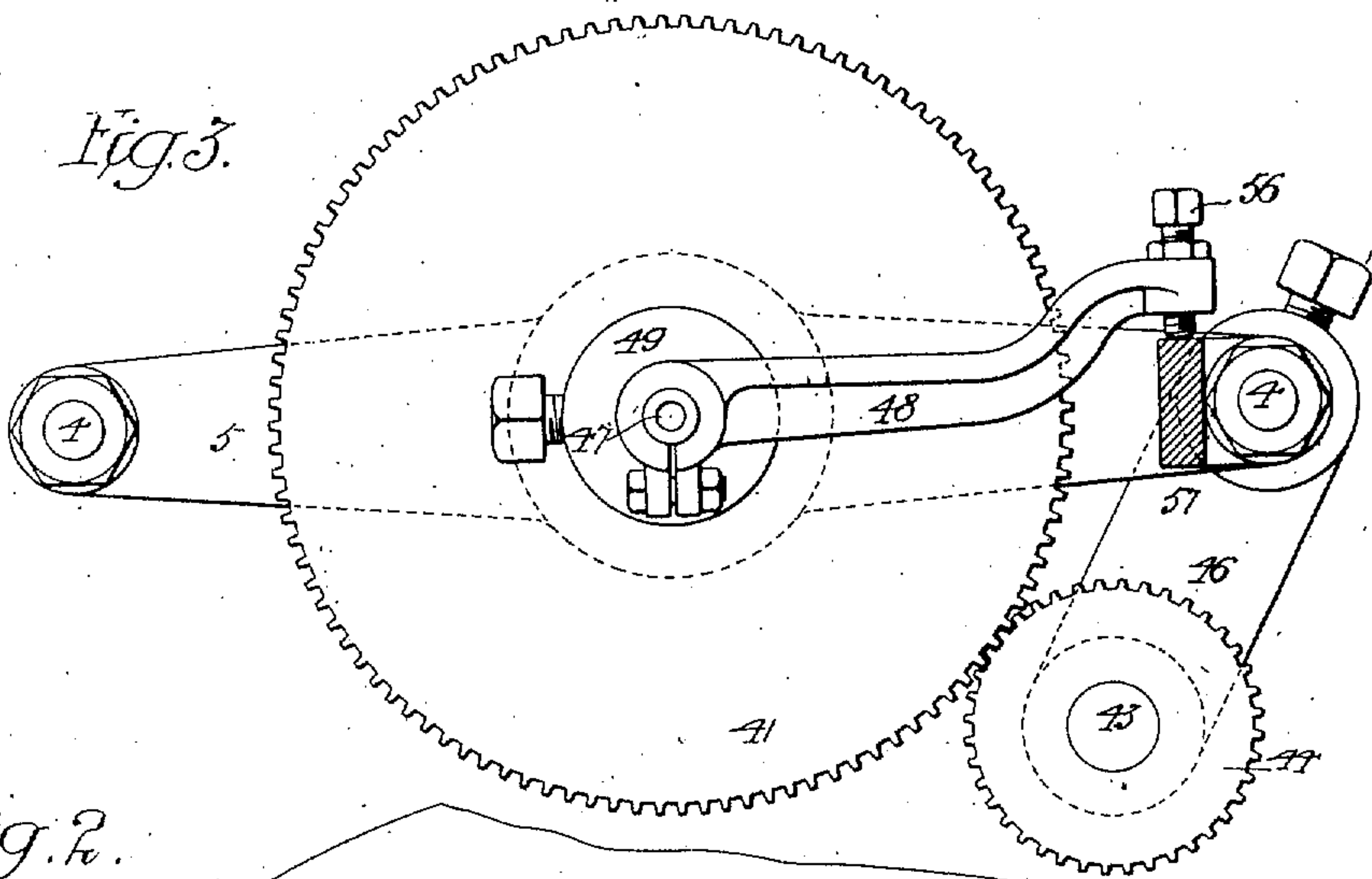
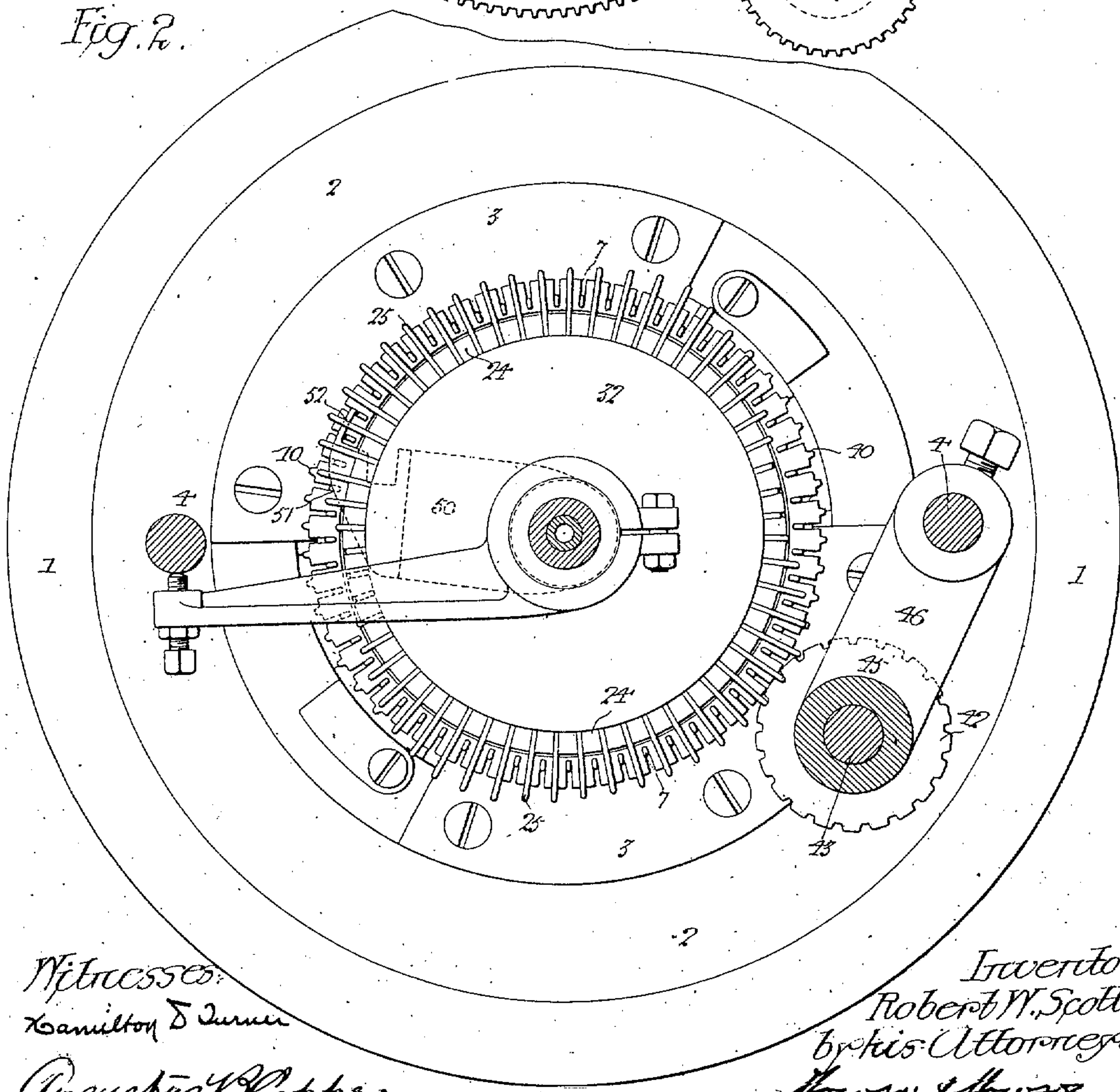


Fig. 2.



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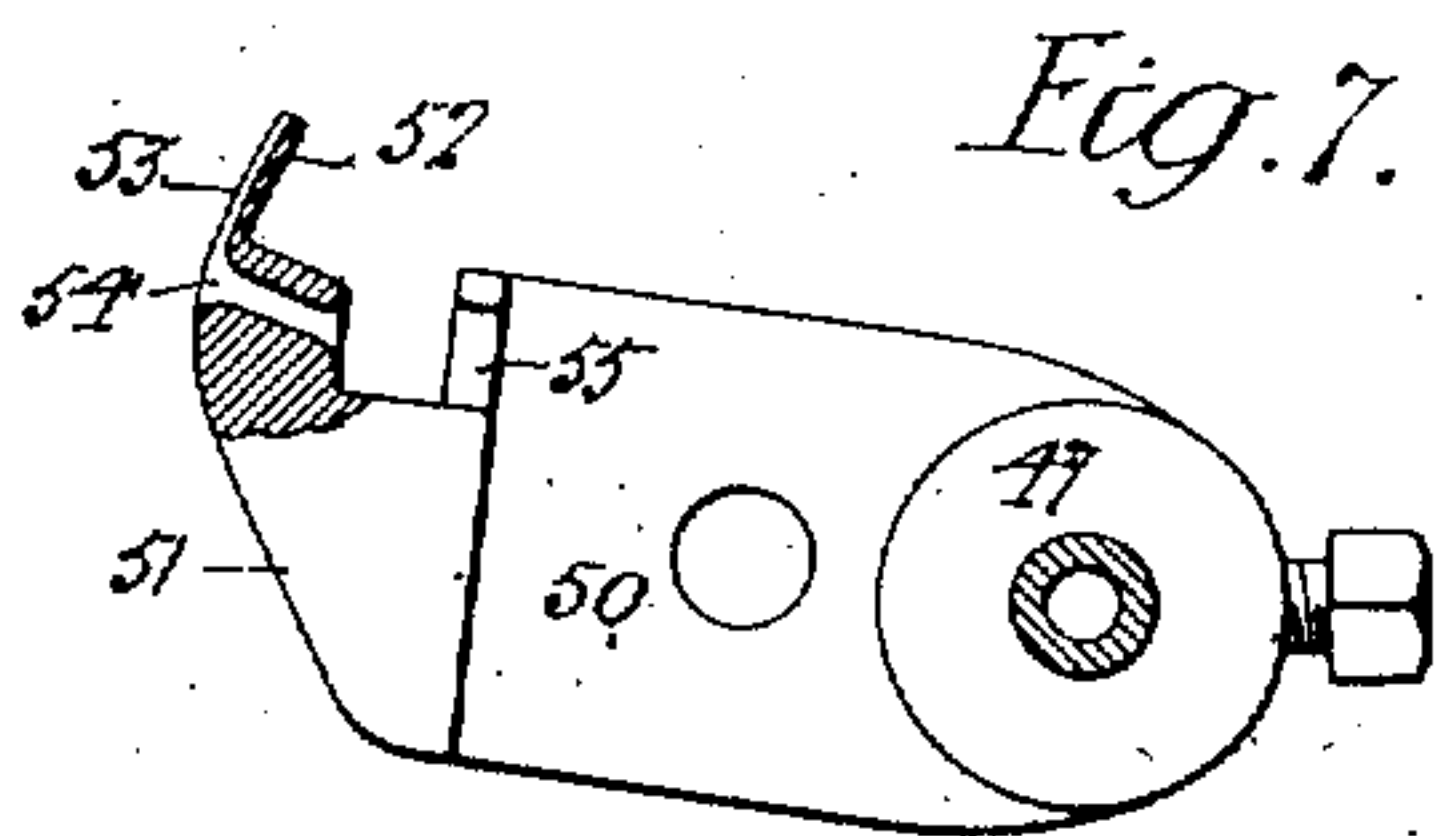
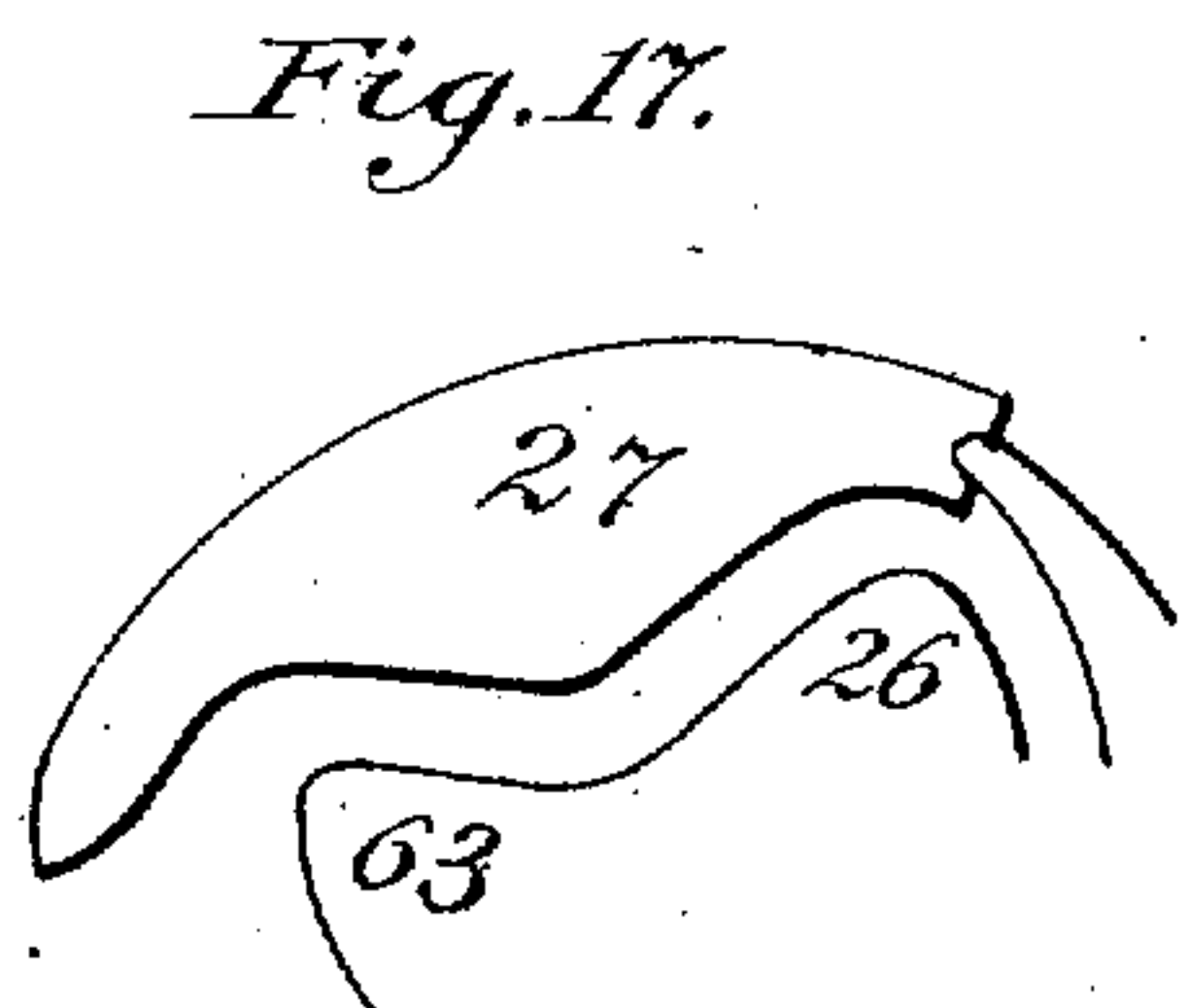
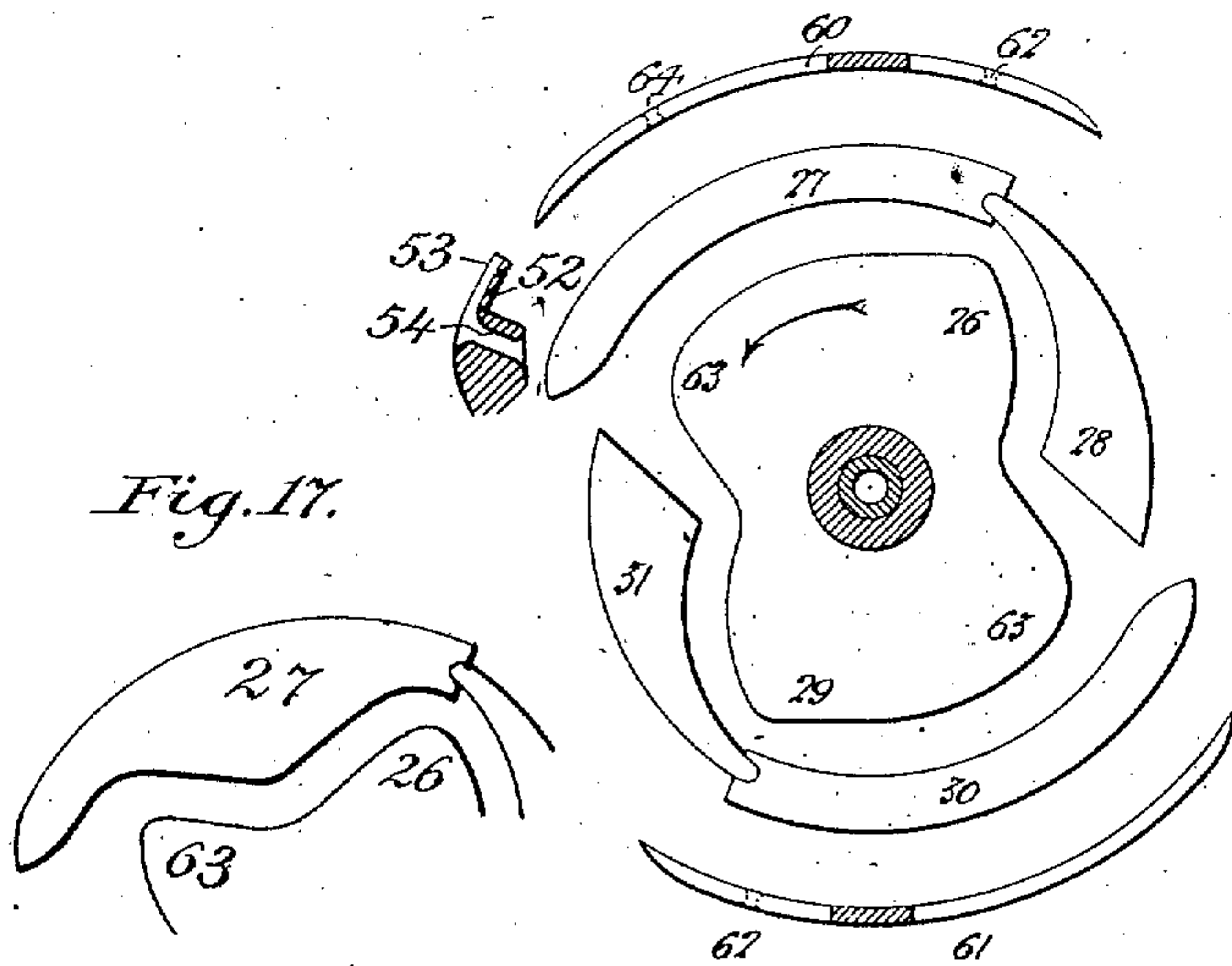
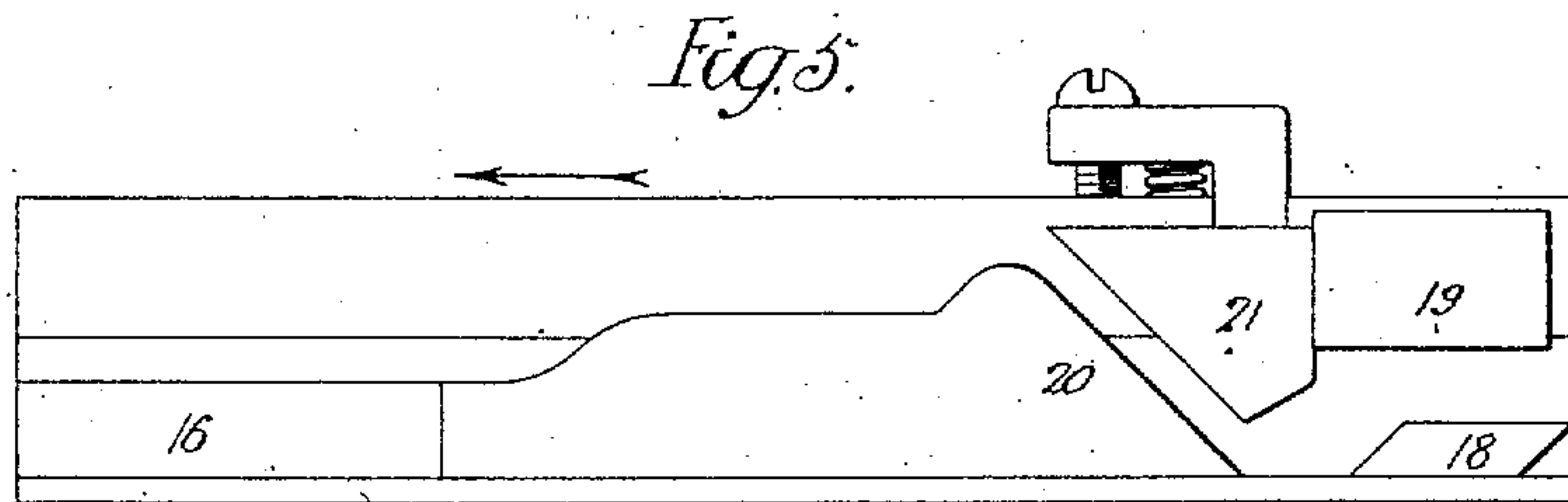
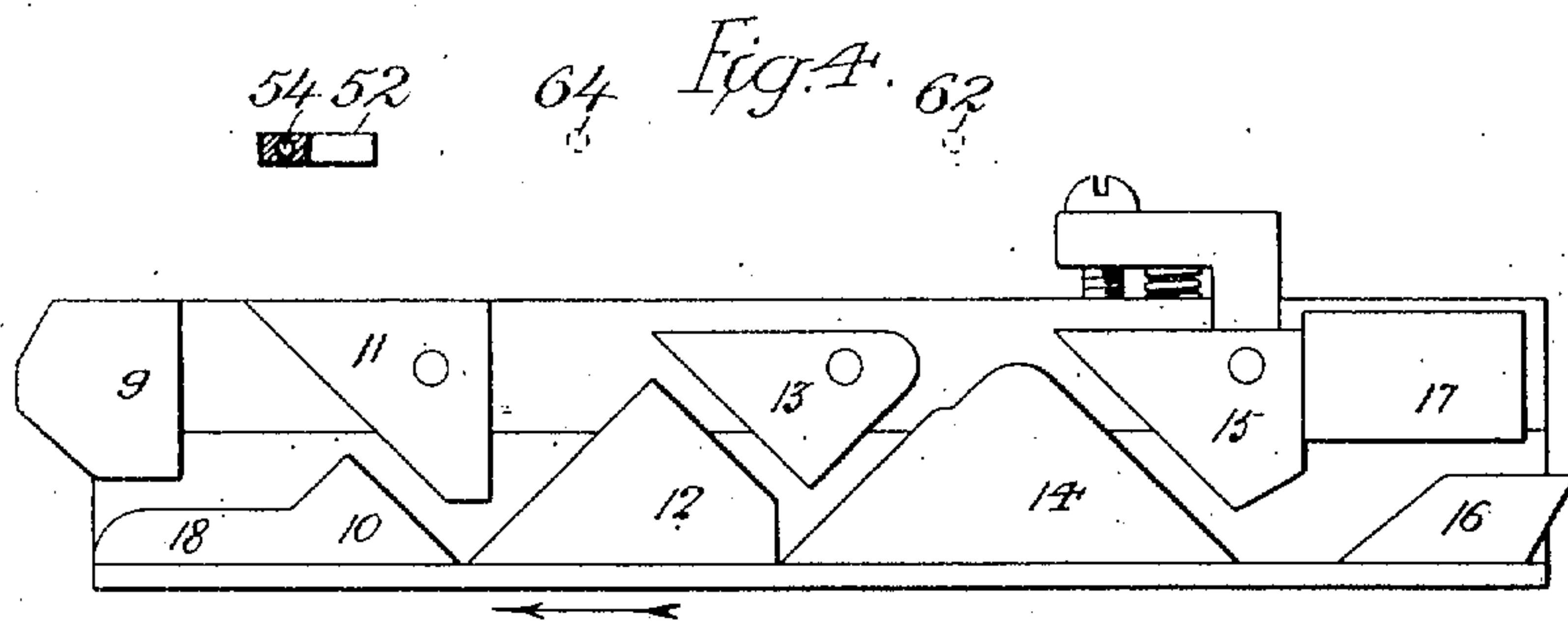
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6 SHEETS—SHEET 3.



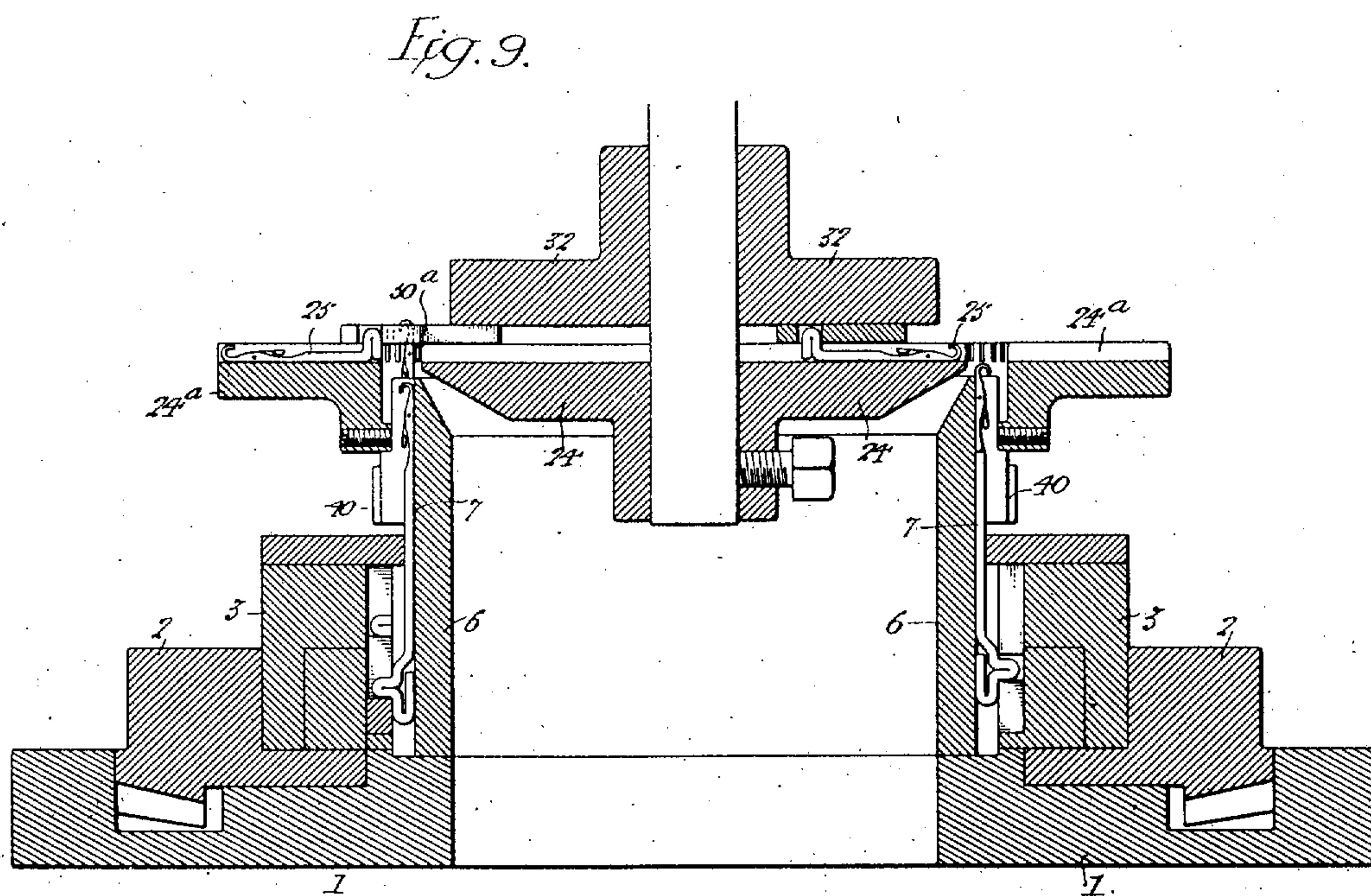
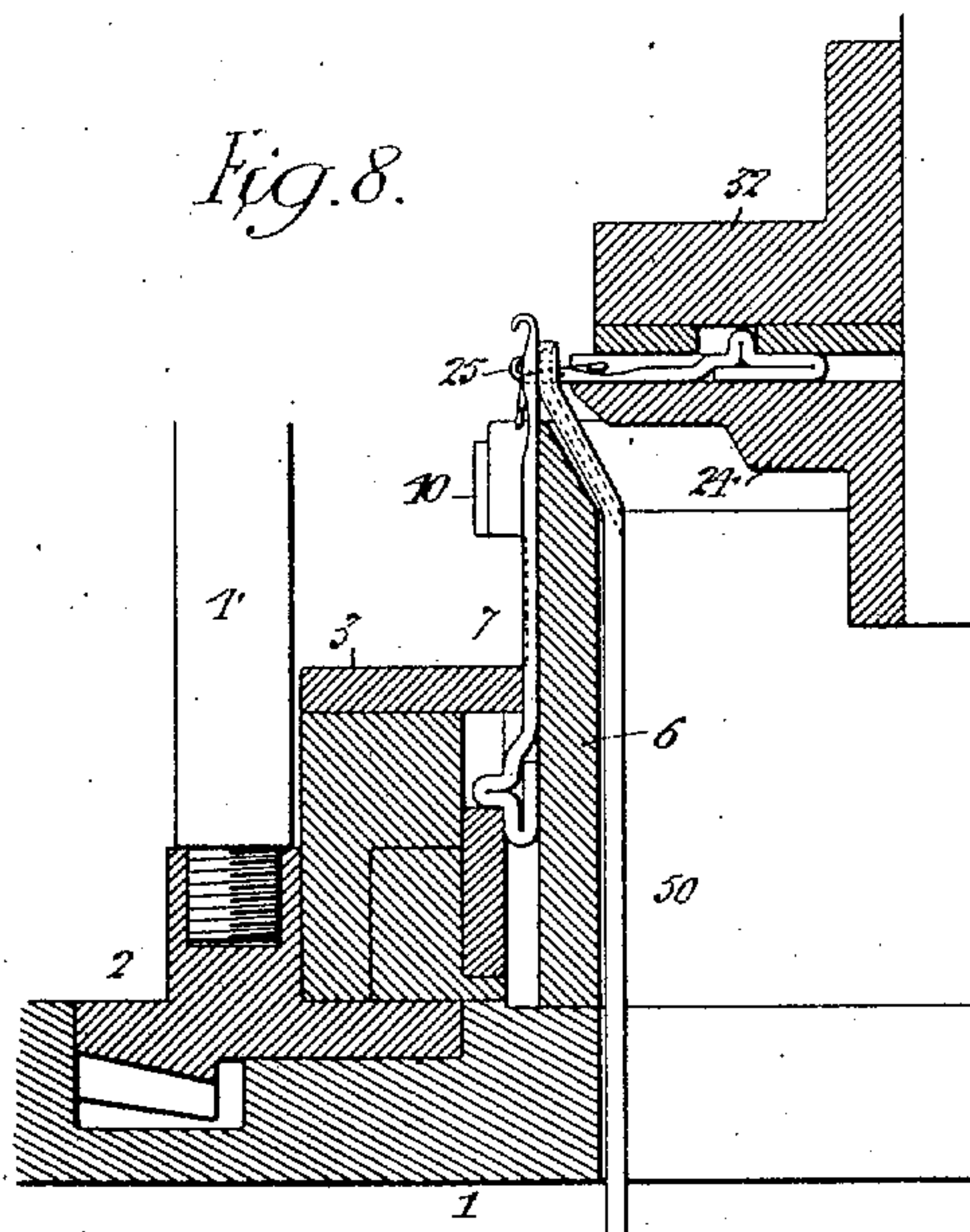
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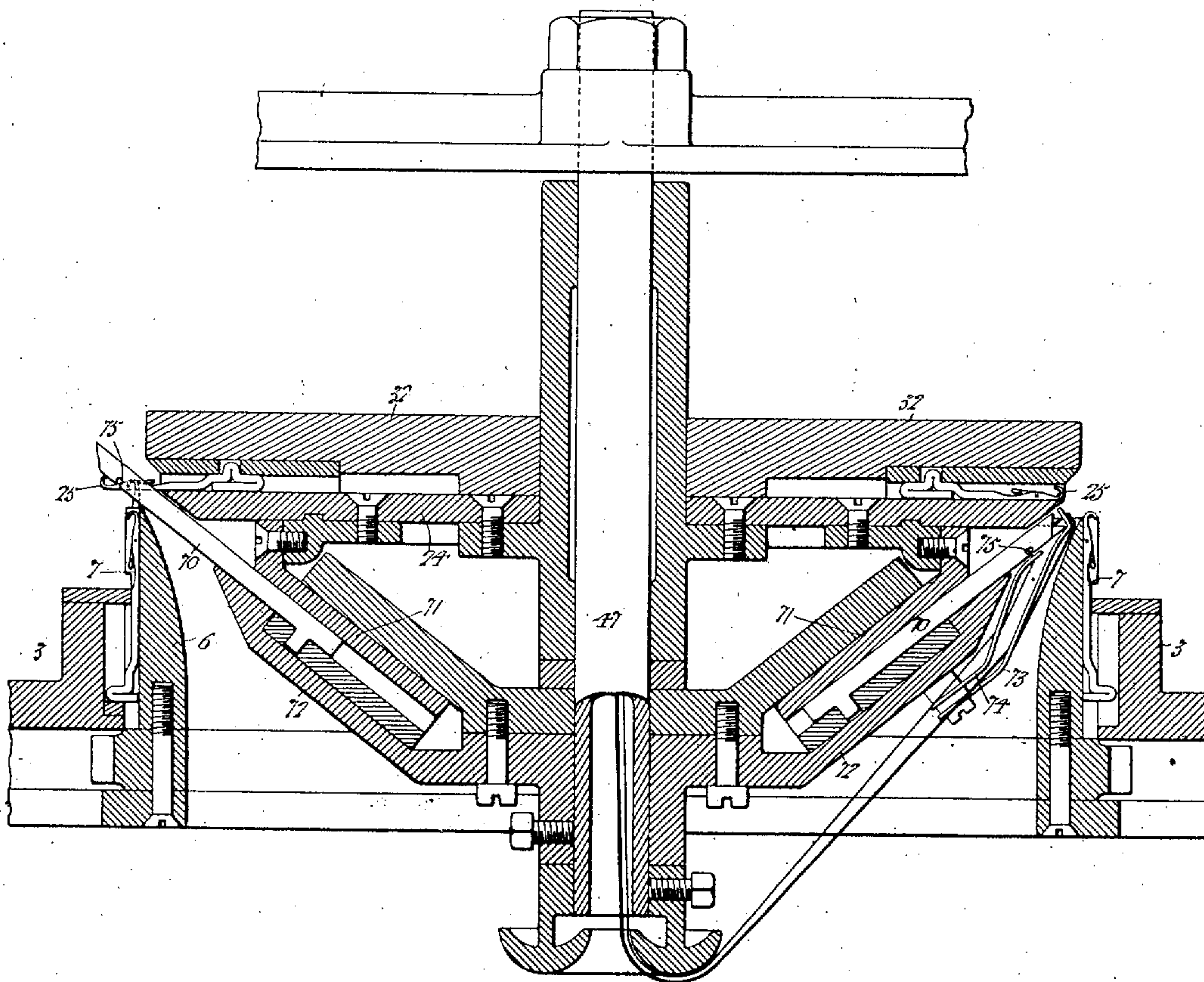
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6 SHEETS—SHEET 5.

Fig. 10.



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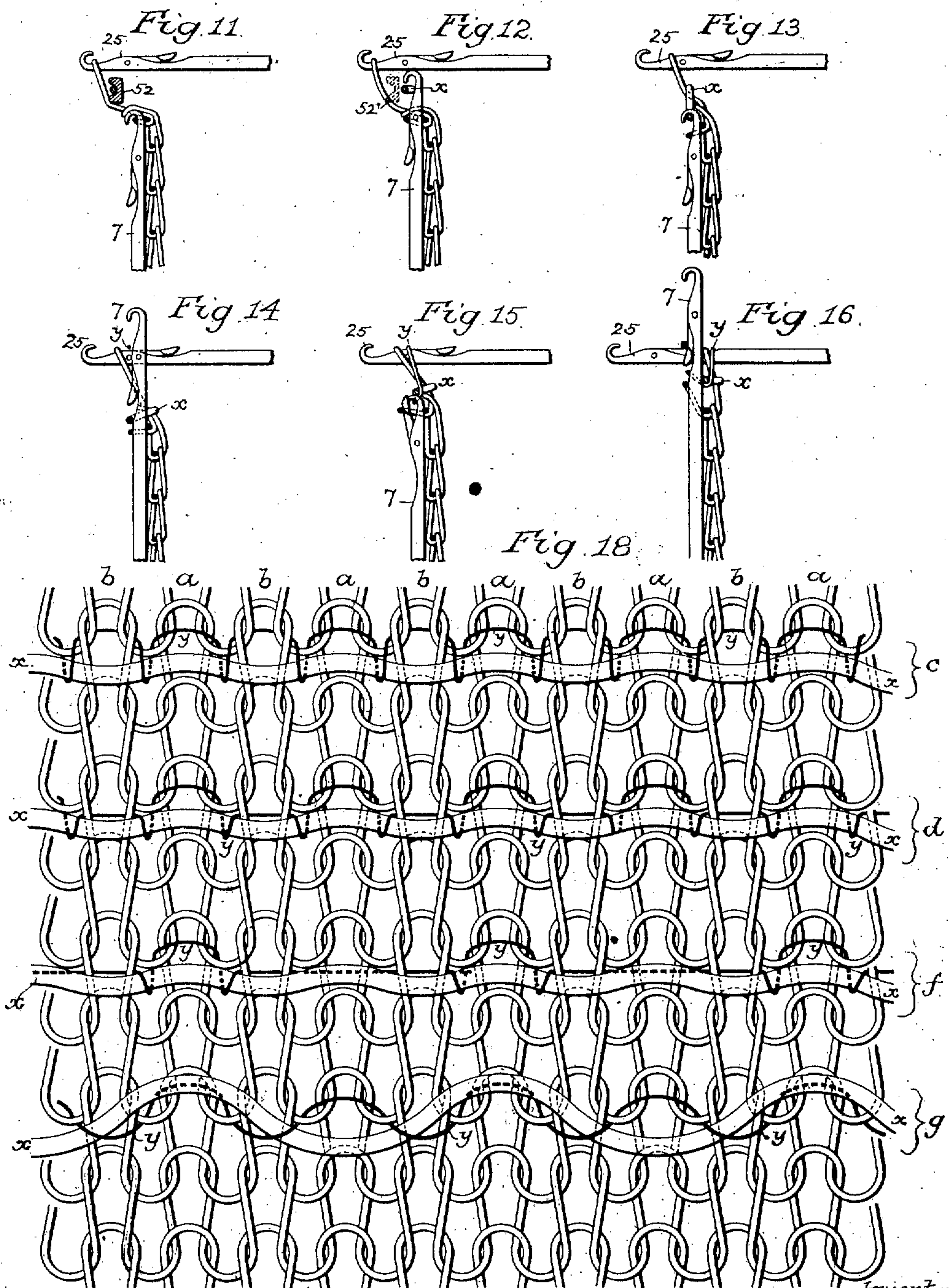
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APPLICATION FILED MAR. 8, 1905.

6 SHEETS—SHEET 6.



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UNITED STATES PATENT OFFICE.

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

FLEECED-RIB-KNITTING MACHINE.

No. 849,701.

Specification of Letters Patent.

Patented April 9, 1907.

Application filed March 8, 1905. Serial No. 249,033.

To all whom it may concern:

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

The main object of my invention is to so construct a rib-knitting machine that a fleecing yarn can be secured to the ribbed fabric by means of a tying-yarn independent of the knitting yarn or yarns of which the fabric is composed.

In the accompanying drawings, Figure 1 is a view, partly in side elevation and partly in section, of a rib-knitting machine constructed in accordance with my present invention. Fig. 2 is a sectional plan view of the machine on the line *a a*, Fig. 1. Fig. 3 is a plan or top view of a portion of the machine. Fig. 4 is a view showing one half of the cylinder-cam box of the machine developed in a flat plane. Fig. 5 is a similar view of the other half of the cam-box. Fig. 6 is a plan view of the yarn-guides of the machine and of the cams of the dial-cam plate. Fig. 7 is a plan view of the fleecing-yarn guide of the machine. Fig. 8 is a sectional view illustrating a modification of the invention. Figs. 9 and 10 are sectional views of other types of knitting-machines embodying my invention. Figs. 11 to 16, inclusive, are diagrams illustrating the operation of the machine. Fig. 17 is a view illustrating a modified construction of certain of the dial-cams; and Fig. 18 is an exaggerated view of a piece of rib-knitted fabric, showing various ways of combining a fleecing-yarn therewith in accordance with my invention.

Referring first to the machine shown in Figs. 1 to 7, it will be noted that so far as concerns the general construction of the rib-knitting machine my invention involves no material departure from ordinary practice except in the means employed for maintaining the needle-dial in stationary position and for imparting rotating movement to the dial-cam plate, the invention comprising mainly the combination with the elements of a rib-knitting machine, of a fleecing-yarn guide, a tying-yarn guide, and means for causing the tying-yarn to engage with the fleecing-yarn and with the wales of the ribbed fabric as the latter is being knit.

In Fig. 1 of the drawings, 1 represents part of the fixed table or bed of the machine, which constitutes a bearing for a rotating gear-wheel 2, the latter carrying the cylinder-cam box 3 and having also mounted upon it by means of posts 4 the arch 5, as is usual in machines of this type. Secured to the fixed bed-plate is the needle-cylinder 6, which has vertical grooves for the guidance of the cylinder-needles 7, the latter being caused to reciprocate vertically by means of cams 9 to 21, inclusive, (shown in Figs. 4 and 5,) and operating in the manner hereinafter set forth. Mounted in the hub of the arch 5 is a tubular vertical spindle 22, to the lower end of which is secured, by means of a set-screw 23, the needle-carrying dial 24, the upper face of the latter being grooved, as shown, for the reception of the radially-reciprocating dial-needles 25, which are caused to reciprocate by means of cams 26 to 31 and 63, inclusive, (shown in Fig. 6,) these cams being carried by the under side of a dial-cam plate 32, which is free to rotate around the spindle 22 and is provided with a projecting arm 33, having at its outer end an adjusting-screw 34, which bears against one of the posts 4 of the arch, so that as the latter rotates with the drive-wheel 2 corresponding rotation will be imparted to the dial-cam plate 32. Adjustment of the dial-cam plate and its cams around the axis of the spindle 22 is permitted or effected by turning the screw 34 in one direction or the other, the hub of the arm 33 being split and provided with a clamping-bolt 35, whereby it is secured to the hub of the cam-plate, as shown in Figs. 1 and 2, rise of the dial-cam plate on the spindle 22 being prevented by means of a collar 36, located above the hub of the arm 33 and secured to the spindle by means of a set-screw 37.

Owing to the use of the rotating internal yarn-guide and stitch-deflector hereinafter referred to, I cannot lock the needle-dial 24 to the needle-cylinder 5 by means of engaging lugs on the inner side of the cylinder and under side of the dial, as usual. Hence I am compelled to resort to other means for preventing rotation of the dial. Various means for accomplishing this result may be employed; but in the present instance I have provided annular racks on the needle-cylinder and on the spindle 22, these racks engaging with spur-wheels carried by a shaft which is

mounted in a bearing secured to and rotating with the arch structure of the machine. The annular rack on the needle-cylinder is represented at 40, and the annular rack carried by the spindle 22 is represented at 41, a spur-wheel 42 at the lower end of a vertical shaft 43 engaging with the rack 40 and a similar spur-wheel 44 at the upper end of said shaft 43 engaging with the rack 41. The shaft 43 is carried by a bearing 45 on a bracket 46, which is secured to one of the posts 4, as shown in Figs. 1, 2, and 3. Hence as said bracket is carried around by the rotating arch structure the pinions 42 and 44 are caused to rotate uniformly, and there can be no movement of the rack 41 independently of the rack 40 on the needle-cylinder, and as the latter is stationary it follows that the rack 41 and the dial 24 controlled thereby must also remain stationary.

Passing through the tubular spindle 22 is a tubular yarn-guide 47, provided at its upper end with a projecting arm 48, which has a split hub 49, with suitable clamp-screw and nut, whereby it is secured to the yarn-guide, this hub resting upon the upper end of the spindle 22, and thus serving for the proper support of the yarn-guide in respect to said spindle. Secured to the projecting lower end of the yarn-guide 47 is a bent arm 50, whose outer end constitutes a combined yarn-guide and stitch-deflector, said outer end having a cam-surface 51, Fig. 7, and at the rear of the same a projecting finger 52, the outer face of which is grooved, as at 53, to form a yarn-guiding channel which communicates at its forward end with a yarn-passage 54, extending through the guide, said yarn-passage being in line with a notch 55 in the vertical portion of the arm 50, so that a yarn passing through the tubular yarn-guide 47 can be threaded through the notch 55, passage 54, and grooved channel 53, so as to be delivered from the end of the projecting finger 52 of the guide.

The yarn-guide 50 operates on the inside of the knitted tube, depending from the cylinder and dial-needles of the machine, and the cam-face 51 of said guide is located close to the under side of the dial 24 and projects so far beyond the periphery of said dial and so far also beyond the cylinder-needles 7 that if said guide is caused to rotate with the dial-cam plate it will deflect the stitches carried by the dial-needles to such an extent that the yarn fed by it can be delivered behind said stitches and in front of the cylinder-needles 7 the latter rising behind the projecting finger 52 of the guide, so that said yarn can be properly laid in their hooks.

Rotative movement of the tubular yarn-guide 47 in consonance with the dial-cam plate 32 and cylinder 3 is effected by contact of a screw 56 at the outer end of the arm 48 with a post 57, which is secured to and pro-

jects upwardly from one of the posts 4 of the machine or from some other portion of the rotating arch structure, adjustment of said screw 56 providing for back-and-forth adjustment of the guide 50, so that it may bear the proper relation to the cams of the cam-box and dial-cam plate.

The machine which I have shown in the drawings is what is termed a "two-feed" machine—that is to say, the cylinder-cam box and dial-cam plate have two sets of knitting-cams which coöperate with two knitting-yarn guides, so as to form two courses of stitches on each rotation of the machine, although it should be understood that my invention is equally applicable to a single-feed machine or to a machine having more than two feeds with their accompanying sets of cams.

In Fig. 6 the two yarn-guides are represented, respectively, at 60 and 61, said yarn-guides being suitably mounted upon the dial-cam plate and rotating therewith in the direction of the arrow, Fig. 6, the knitting-yarn being fed through an eye 62, in each yarn-guide. At 26, 27, and 28 are represented, respectively, the projecting-cam, the guard-cam, and the retracting-cam of the dial-cam plate, which coöperate with the knitting-yarn guide 60, and 29, 30, and 31 represent, respectively, the projecting-cam, the guard-cam, and the retracting-cam of the dial-cam plate, which coöperate with the knitting-yarn guide 61. The projecting-cam structure, however, is formed so as to present a cam 63 considerably in advance of the cam 26, so as to provide for a projection of the dial-needles so far in advance of the knitting-point as to provide for the proper action of the yarn-guide and stitch-deflector 50, whereby the stitches are pushed outward upon the dial-needles in order to permit of the laying of the fleecing-yarn behind them by said guide. The cam 63, however, is not essential, as the guide 50 may, if desired, push out the dial-needles as well as the stitches.

One half of the cylinder-cam box has the usual knitting-cams, comprising a projecting-cam 14 and an adjustable depressor-cam 15 for operating the cylinder-needles to receive the knitting-yarn from the guide 60, and the other half of the cylinder has knitting-cams comprising a lift-cam 20 and an adjustable depressor-cam 21 for operating the cylinder-needles to receive the knitting-yarn from the guide 61, a lift and rest cam 16 and a guard-cam 17 following the cams 14 and 15, and a lift and rest cam 18 and a guard-cam 19 following the cams 20 and 21. In addition to these two sets of knitting-cams there are on the cylinder-cam box a leveling-cam 9 and two sets of cams 10, 11, 12, and 13, the cams 10 and 12 being lift-cams and the cams 11 and 13 being depressor-cams.

The lateral relation of the yarn-guides 54, 64, and 62 in respect to the cams of the cam-

cylinder is shown by dotted lines in Fig. 4, although this does not properly show their vertical relation, as in the machine the said guides are farther above the cylinder-cams. The relation of the guides 54, 64, and 62 to the dial-cams is shown in Fig. 6.

The internal yarn-guide 50 of the machine is intended for the control of the fleecing-yarn x , which is fed through the tubular yarn-guide 47, and the cam 10 of the cylinder-cam box raises the cylinder-needles behind and close to the end of the finger 52 of said internal yarn-guide 50, so as to permit of the placing of the fleecing-yarn in the hooks of said needles after it has been placed behind the dial-needle stitches, which have been projected by the action of the cam-face 51 of said guide, the draft upon the fabric preventing the cylinder-stitches preceding those in the hooks of the cylinder-needles from being pulled over said hooks when the dial-stitches are thus projected. (See Fig. 11.)

The lift of the cam 10 is not sufficient to slip the stitches on the cylinder-needles back of their latches, (see Fig. 12,) and after the fleecing-yarn has been laid in the hooks of these needles the latter are depressed by the action of the cam 11, (see Fig. 13,) so as to draw loops of fleecing-yarn of the required length, which rest between adjoining cylinder-needles against the inside of the sinker-wales between said cylinder-needles and the intervening dial-needle, after which the cylinder-needles are raised to the clearing-point by the cam 12—that is to say, they are raised to such a point that both the knitting-stitch and the loop of fleecing-yarn will be slipped back of the latches of the needles. (See Fig. 14.)

When the needles are raised by the cam 12, they receive a fine tying-yarn y , which is fed to them through an eye 64 of the yarn-guide 60, and the needles are then depressed by the action of the cam 13. (See Fig. 15.) This cam, however, is shorter than the normal depressing-cams 11 and 15, so that it will not cast from the cylinder-needles the knitting-stitches thereon; but the loops of fleecing-yarn occupy a higher position upon the shanks of the needles than do the knitting-stitches, because said fleecing-yarn is engaged by the dial-needle stitches. The partial depression of the cylinder-needles by the cam 13 therefore is sufficient to clear from said needles the loops of fleecing-yarn which are caught and retained by the fine binding-yarn loops, which are drawn by the cylinder-needles as they descend. (See Fig. 15.) Each cylinder-needle now contains a stitch of knitting-yarn and a loop of tying-yarn, and when said needles are raised in front of the fleecing-loops by the lift-cam 14, so as to receive the knitting-yarn from the eye 62 of the guide 60, both the knitting-stitch and the tying-loop will be slipped back

of the latches, as shown in Fig. 16, and when the needles are depressed by the cam 15 will be cast from the needles over the new loop of knitting-yarn.

When the dial-cams are constructed in the manner shown in Fig. 6, the tying-yarn y will also be fed to the dial-needles, since the latter remain in the projected position to which they have been adjusted by the cam 63 in order to permit of the pushing out of the stitches by the deflector 51. Hence loops of the tying-yarn will be drawn in both the cylinder-needle wales and in the dial-needle wales of the fabric, which is produced upon the machine, as shown at c in Fig. 18, in which a represents the cylinder-needle wales and b the dial-needle wales; but if this is not desired the dial-needles can by a proper conformation of the cams of the dial-cam plate—as shown, for instance, in Fig. 17—be retracted at the point where the tying-yarn is being fed to the cylinder-needles, the result in this case being as shown at d in Fig. 18.

As shown, I have provided for the introduction of the fleecing-yarn and of the tying-yarn for engaging the same in alternate courses only of the knitted web, the cam 63, shown in advance of the cam 29 in Fig. 6, serving merely to effect a preliminary but unnecessary partial projection of the dial-needles; but it will be evident that the fleecing and tying yarns may be used in connection with each course, if desired, by providing a proper equipment of cams 9 to 13, inclusive, in advance of the knitting-cams 20 and 21 and by duplicating the guide 50 and providing the yarn-guide 61 with a tying-yarn eye 64, and it will also be evident that by separating the cylinder-needles, either in the plane of their reciprocation or in a plane transverse thereto, the fleecing-yarn can be fed in front of some of said needles and behind the others, so that it will not be tied into each cylinder-needle wale of the fabric—as shown, for instance, at f in Fig. 18.

Although convenient, it is not essential that the stitch-deflector and fleecing-yarn guide shall form part of the same element of the machine, and said fleecing-yarn guide and stitch-deflector may be arranged adjacent to the inner side of the needle-cylinder 6 instead of to the under side of the needle-dial, there being a corresponding transposition in the movements of the cylinder and dial needles, so that the fleecing-yarn will be laid underneath the cylinder-needle stitches and on top of the dial-needles, as shown in Fig. 8. In this case the central tubular yarn-guide 47 will not be necessary, since although the fleecing-yarn guide is inside of the cylinder of the machine and inside of the needle-angle it is not inside of the tubular web depending from the needles.

In the machine shown in Fig. 1 the dial-cylinder and dial are stationary and the cyl-

inder-cam box and dial-cam plate rotate; but my invention is of course equally applicable to a machine in which the reverse is true.

It is not always necessary in carrying out my invention to employ an internal fleecing-yarn guide and stitch-deflector. For instance, I may, as shown in Fig. 9, employ an external fleecing-yarn guide 50^a of a character somewhat similar to that shown and described in my Letters Patent No. 577,789, dated February 23, 1897, this yarn-guide acting upon the butts of the dial-needles 25 and serving to project them into an annular needle-dial 24^a, located outside of the main needle-dial 24 and suitably mounted upon the needle-cylinder 6. The fleecing-yarn guide 50^a will, however, be modified as compared with that of the machine of the previous patent, so as to project the dial-needles to a greater extent than before in order to permit said fleecing-yarn guide to lay its yarn in the hooks of the cylinder-needles, the machine being also equipped with a tying-yarn guide and the cylinder-cam box being provided with cams 9 to 13, as described; for operating the cylinder-needles to receive and draw loops of the fleecing and tying yarns. My invention may even be embodied in a machine in which reciprocating jacks are employed in connection with an internal fleecing-yarn guide and a tying-yarn guide. Such a machine is illustrated in Fig. 10, in which 70 represents a series of jacks mounted in a diagonal jack-bed 71, which is secured to the under side of the dial 24, these jacks being reciprocated by cams carried by a rotating and diagonally-disposed cam-ring 72, which is secured to the lower portion of the tubular yarn-guide 47 and rotates with the same. Mounted upon and rotating with the cam-ring 72 are a pair of yarn-guides 73 and 74, the guide 73 controlling a fleecing-yarn and the guide 74 controlling the tying-yarn, both of which yarns are fed into the machine through the tubular yarn-guide 47. For convenience I have shown these yarn-guides in the drawings as located at a point diametrically opposite to the point at which the jacks 70 are projected; but in practice the guides will be located close to the point of projection of the jacks. Each jack has in its under side a notch 75 for engaging the tying-yarn, so that when the jack is projected a loop of said tying-yarn will be applied to the cylinder-needle of the machine alongside of which the jack works, the jacks being operated in connection with each cylinder-needle, if desired, or only with every second, third, or other alternate needle, or some of the jacks being operated in connection with some of the needles in knitting one course and the alternate jacks being operative in connection with the alternate cylinder-needles in knitting the next course, as in the patent of D. C. Bellis, No. 561,559, June

9, 1896. Each jack has a beveled outer end, and the fleecing-yarn guide 73 is so disposed as to lay the fleecing-yarn in front of said beveled ends of the jacks when the latter are in the retracted position, as shown at the right-hand side of Fig. 10. The ends of a certain number of jacks—say one-half of the same—are beveled in one direction, while the ends of the alternating jacks are beveled in the opposite direction. Hence when the jacks are projected the fleecing-yarn will be directed on top of certain of the jacks and beneath the others, so as to lie alternately above and below the tying-yarn, the effect of the operating of the machine being therefore to interlace the fleecing-yarn with the tying-yarn in the manner shown at *g* in Fig. 18.

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

1. The combination of the two sets of needles, knitting-cams and knitting-yarn guide or guides of a rib-knitting machine, with a fleecing-yarn guide, a tying-yarn guide, and means for causing said tying-yarn to engage with said fleecing-yarn, and with wales of the ribbed fabric, substantially as specified.

2. The combination of the two sets of needles, knitting-cams and knitting-yarn guide or guides of a rib-knitting machine, with means for laying a fleecing-yarn behind the stitches carried by one set of needles, and delivering said yarn to needles of the other set, a tying-yarn guide, and means for causing said tying-yarn to engage with said fleecing-yarn, and with wales of the ribbed fabric, substantially as specified.

3. The combination of the two sets of needles, knitting-cams, and knitting-yarn guide or guides of a rib-knitting machine, with means operating on the inside of the machine for laying a fleecing-yarn behind the stitches carried by one set of needles and delivering said fleecing-yarn to needles of the other set, a tying-yarn guide and means for causing said tying-yarn to engage with said fleecing-yarn and also with wales of the ribbed fabric, substantially as specified.

4. The combination of the two sets of needles, knitting-cams and knitting-yarn guide or guides of a rib-knitting machine, with means for displacing from their normal position the stitches carried by one set of needles, a guide for laying a fleecing-yarn behind said stitches and delivering it to needles of the other set, a tying-yarn guide and means for causing said tying-yarn to engage with said fleecing-yarn and also with wales of the ribbed fabric, substantially as specified.

5. The combination of the two sets of needles, knitting-cams, and knitting-yarn guide or guides of a rib-knitting machine, with means acting directly upon the stitches

upon one set of needles to displace them from their normal position, a guide for laying a fleecing-yarn behind said deflected stitches and delivering it to needles of the other set, a tying-yarn guide and means for causing said tying-yarn to engage with said fleecing-yarn and also with wales of the ribbed fabric, substantially as specified.

6. The combination of the two sets of needles, knitting-cams, and knitting-yarn guide or guides of a rib-knitting machine, with a deflector operating on the inside of the machine and serving to displace from their normal position the stitches carried by one set of needles, a guide for laying a fleecing-yarn behind said deflected stitches and delivering it to needles of the other set, a tying-yarn guide and means for causing said tying-yarn to engage with said fleecing-yarn and also with wales of the ribbed fabric, substantially as specified.

7. The combination of the two sets of needles, knitting-cams, and knitting-yarn guide or guides of a rib-knitting machine, with a stitch means for displacing from their normal position the stitches carried by one set of needles, a guide for laying a fleecing-yarn behind said deflected stitches and applying it to needles of the other set, means for operating the latter needles to engage the fleecing-yarn, a tying-yarn guide and means for operating the needles so as to cause them to engage and draw loops of the tying-yarn and cast the loops of fleecing-yarn onto the same without casting the knitting-stitches carried by them, substantially as specified.

8. The combination of the two sets of needles, knitting-cams and knitting-yarn guide or guides of a rib-knitting machine, with a combined fleecing-yarn guide and deflector operating to displace from their normal position the stitches carried by one set of needles, lay a fleecing-yarn behind said deflected stitches and deliver it to needles of the other set, a tying-yarn guide and means for causing said tying-yarn to engage with said fleecing-yarn and also with wales of the ribbed fabric, substantially as specified.

9. The combination of the two sets of needles, knitting-cams, and knitting-yarn

guide or guides of a rib-knitting machine, with a combined fleecing-yarn guide and deflector operating on the inside of the machine and serving to displace from their normal position the stitches carried by one set of needles, lay a fleecing-yarn behind said deflected stitches and deliver it to needles of the other set, a tying-yarn guide and means for causing said tying-yarn to engage with said fleecing-yarn and also with wales of the ribbed fabric, substantially as specified.

10. The combination of the two sets of needles, knitting-cams, and knitting-yarn guide or guides of a rib-knitting machine, with a combined fleecing-yarn guide and deflector operating to displace from their normal position the stitches carried by one set of needles, lay a fleecing-yarn behind said deflected stitches and apply it to needles of the other set, means for operating the latter needles to engage the fleecing-yarn, a tying-yarn guide and means for operating the needles so as to cause them to engage said tying-yarn and cast the loops of fleecing-yarn onto the same without casting the knitting-stitches, substantially as specified.

11. The combination of the two sets of needles, knitting-cams, and knitting-yarn guide or guides of a rib-knitting machine, with a combined fleecing-yarn guide and deflector located on the inside of the machine and acting directly upon the stitches carried by one set of needles to displace the same from their normal position, lay a fleecing-yarn behind said deflected stitches and apply it to needles of the other set, means for operating the latter needles to engage the fleecing-yarn, a tying-yarn guide and means for operating the needles so as to cause them to engage said tying-yarn and cast the loops of fleecing-yarn onto the same without casting the knitting-stitches, 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:

WM. E. SHUPE,
JOS. H. KLEIN.