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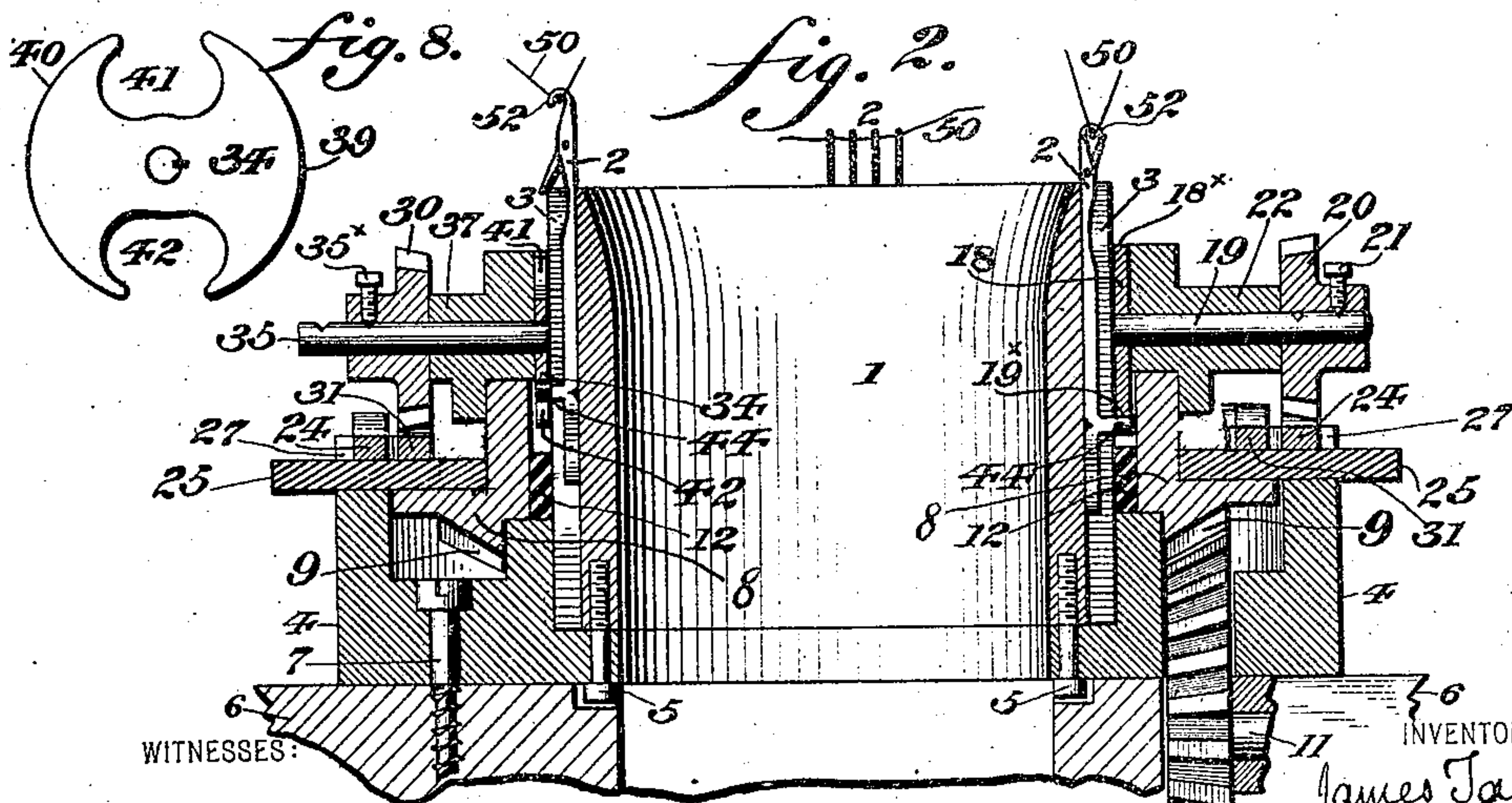
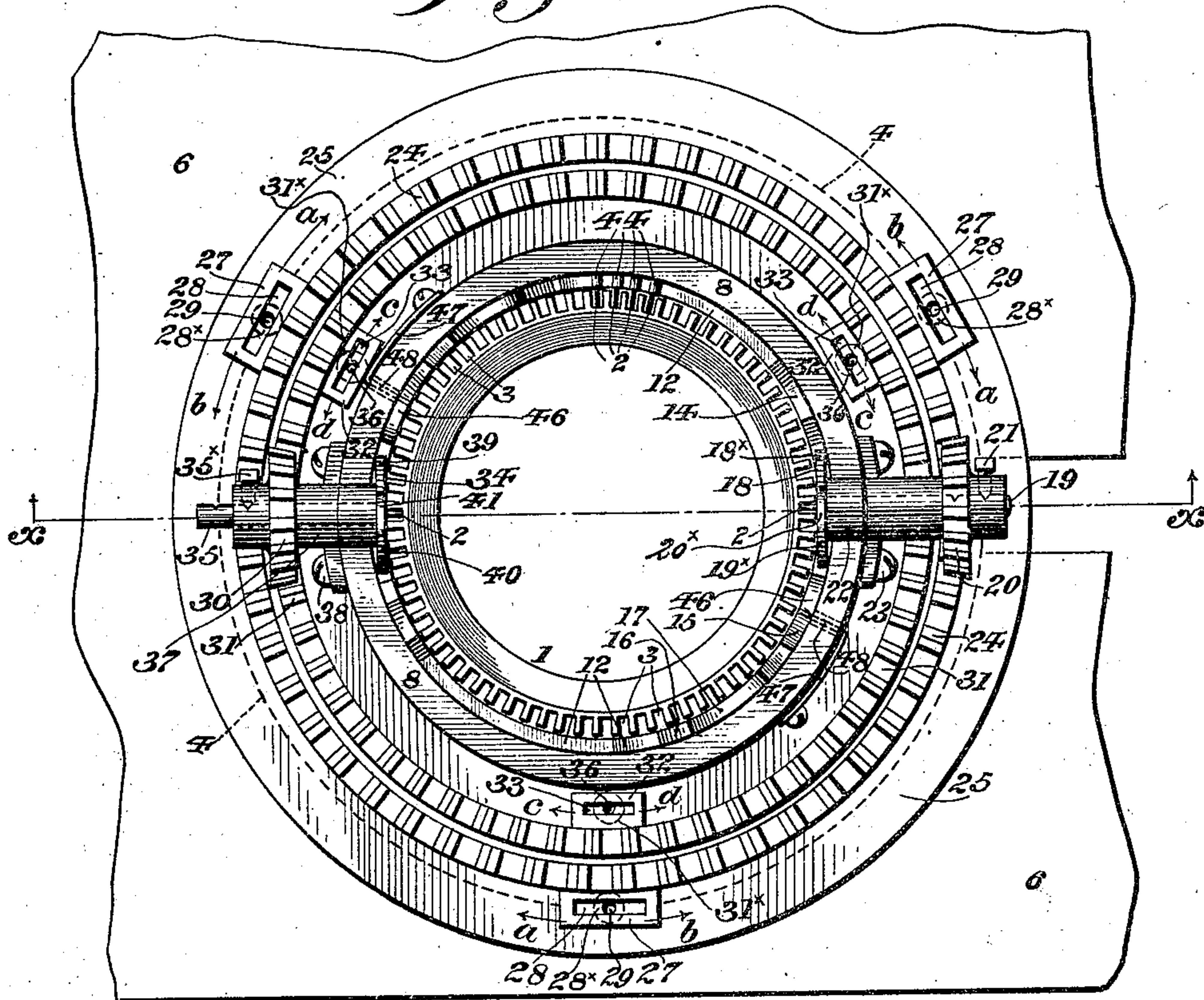
J. TAYLOR & J. F. FLAD.
ATTACHMENT FOR KNITTING MACHINES.

(Application filed Jan. 8, 1897.)

(No Model.)

2 Sheets—Sheet 1.

fig. 1.



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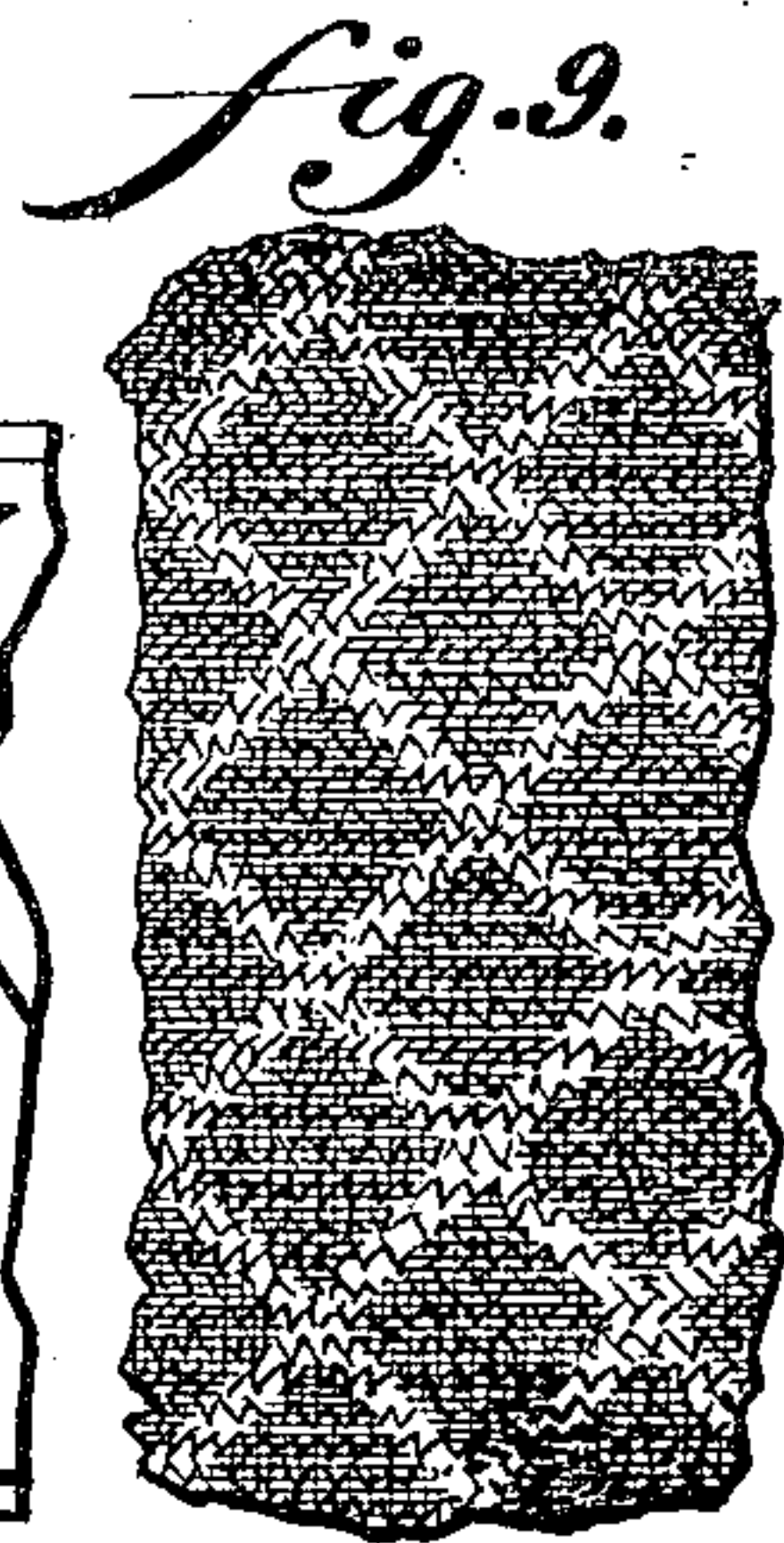
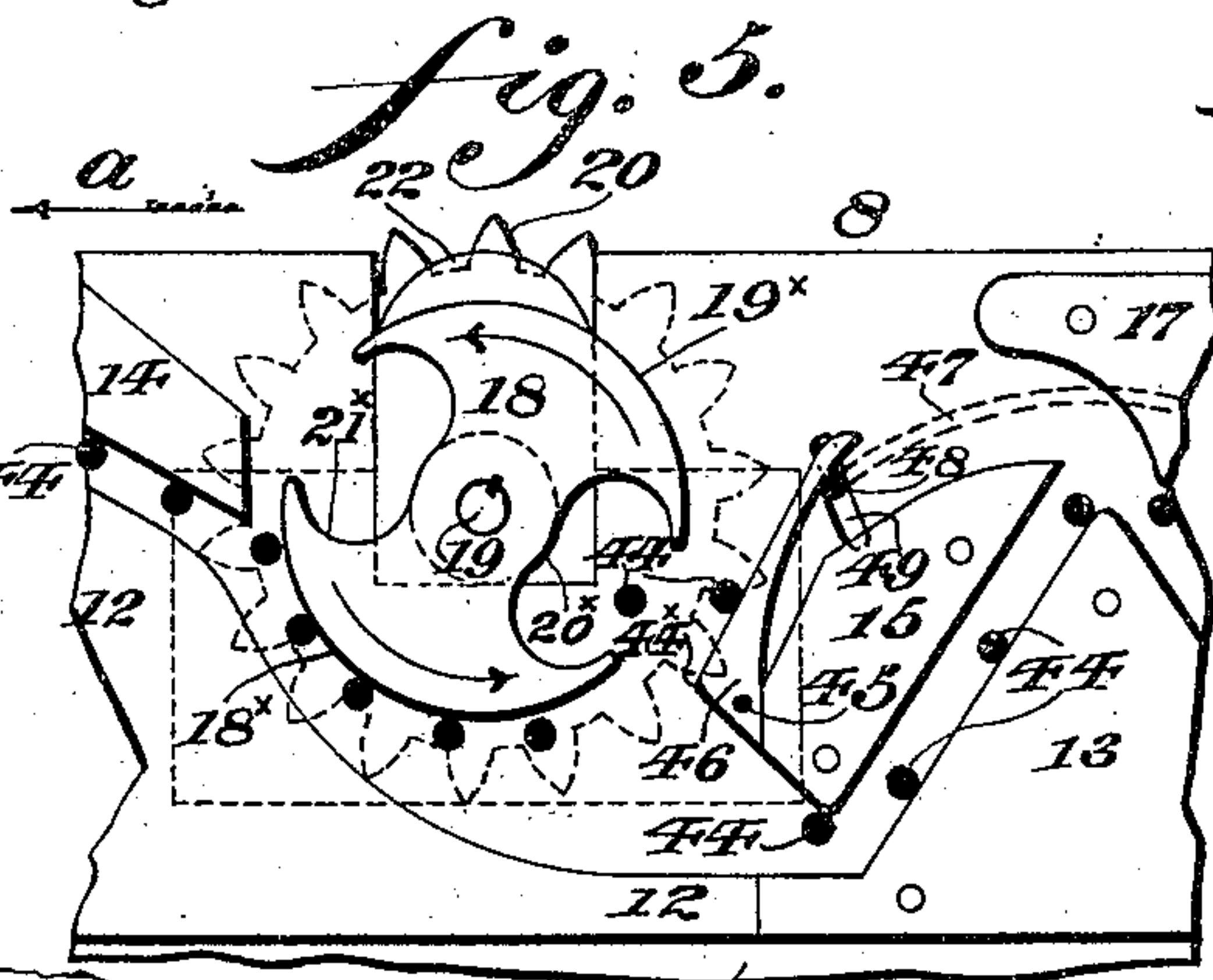
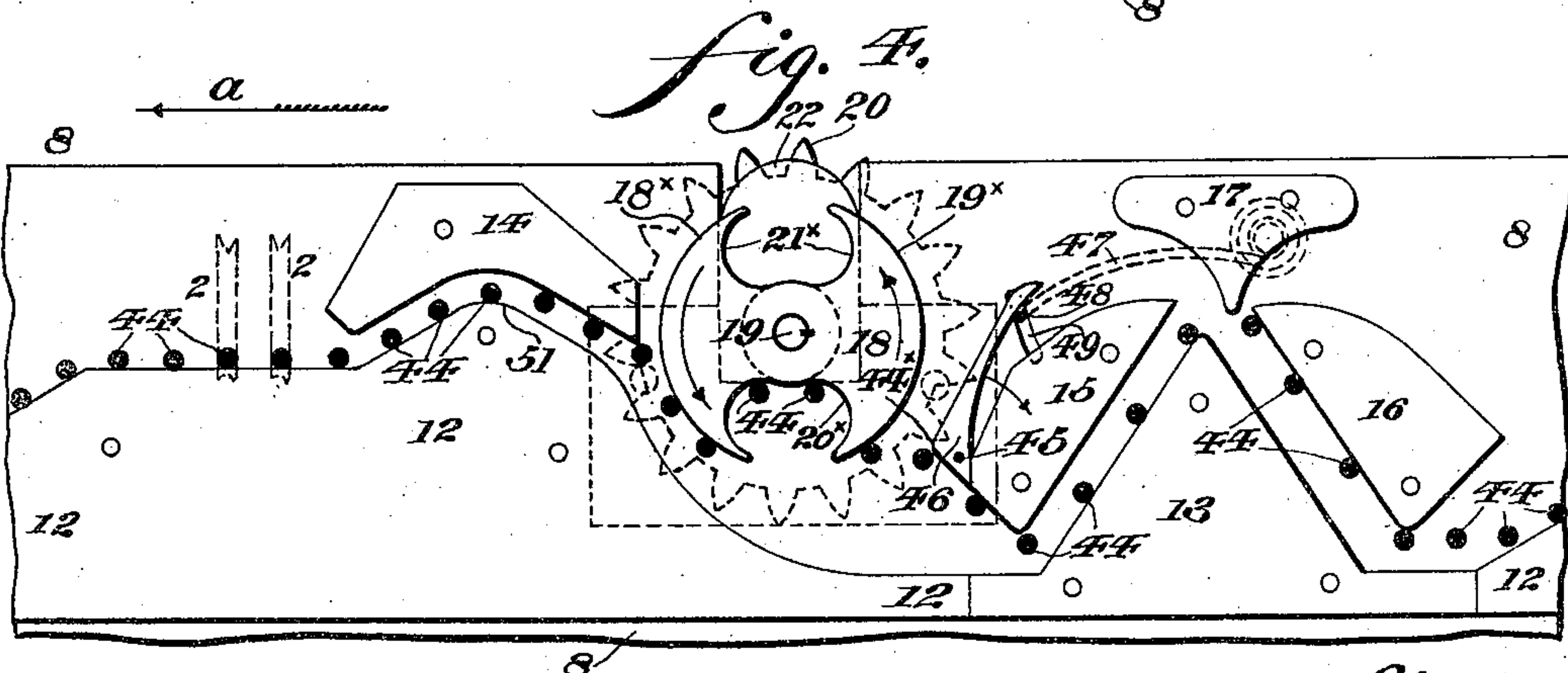
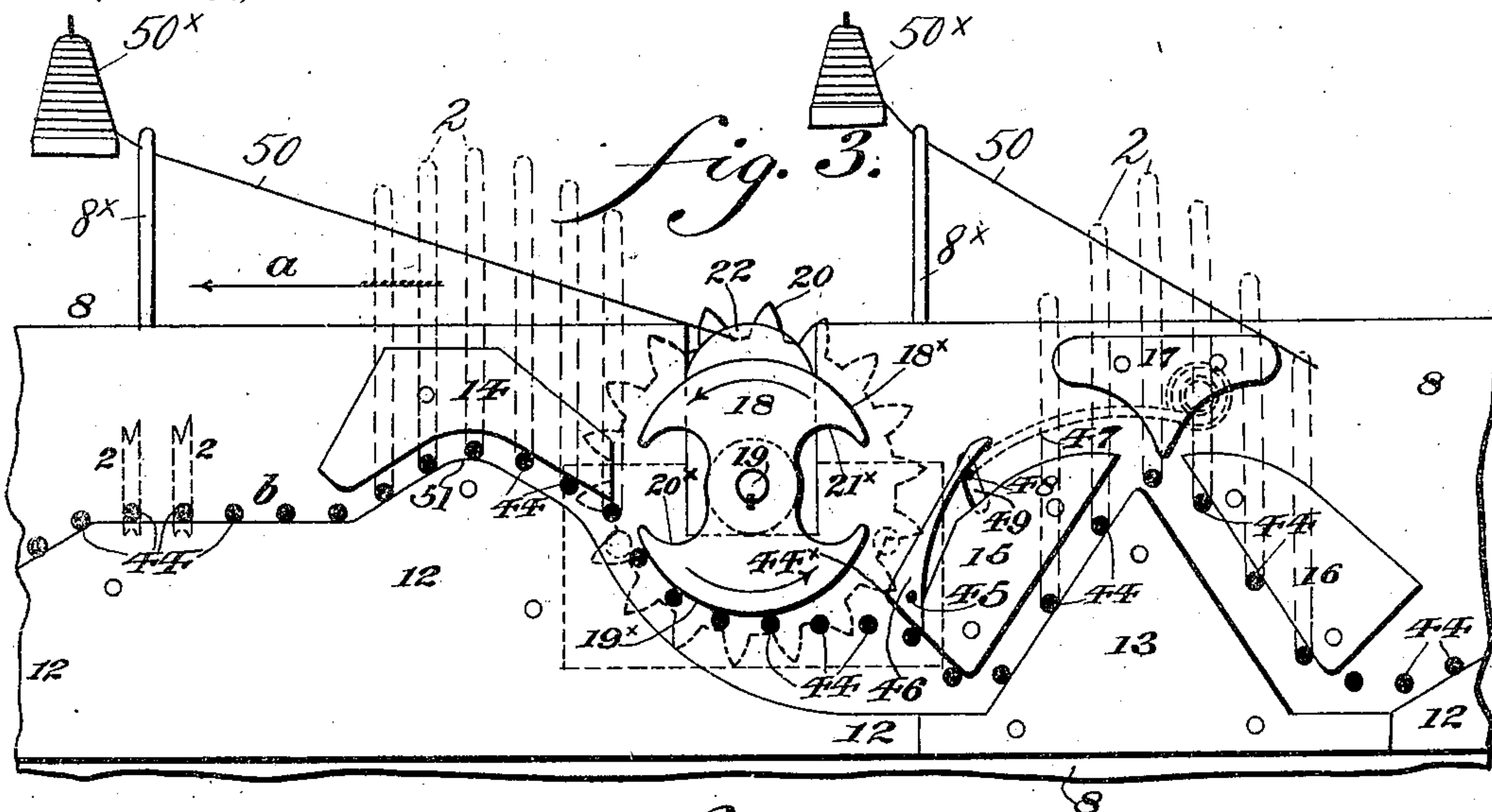
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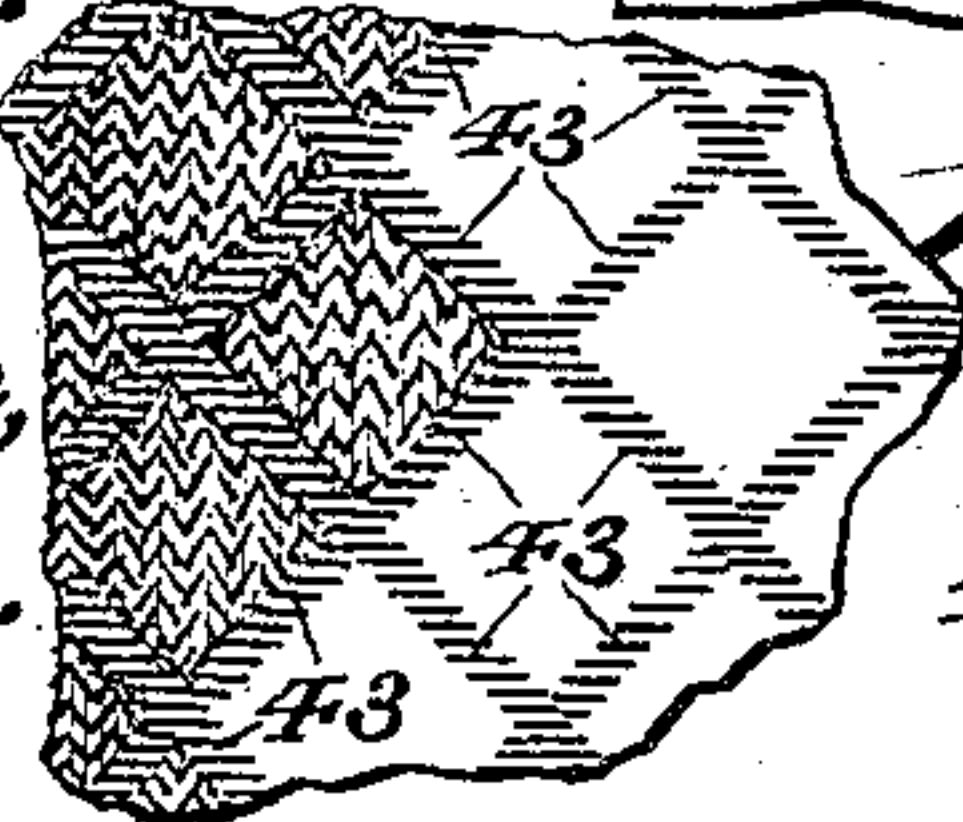
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2 Sheets—Sheet 2.

(No Model.)



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ATTACHMENT FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 611,951, dated October 4, 1898.

Application filed January 8, 1897. Serial No. 618,452. (No model.)

To all whom it may concern:

Be it known that we, JAMES TAYLOR and JOHN F. FLAD, citizens of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Improvement in Attachments for Knitting-Machines, which improvement is fully set forth in the following specification and accompanying drawings.

Our invention consists of an improved construction of attachments to knitting-machines whereby we are enabled to produce a fabric having a diamond pattern, the machine being also adapted for making other patterns with diagonal stripes or blocks, the especial novelty consisting in equipping a circular machine provided with latch-needles for this work; and to this end our invention consists, first, of an improved attachment whereby the needles, in addition to being raised and depressed by the ordinary cams attached to a cam-cylinder, are also depressed by rotatable disk-cams which are partially cut away on suitable portions of their peripheries, thereby forming recesses which enable one or more needles, as desired, not to be lowered as far down as those that come in contact with the outer edge of said disk-cam, the latter being caused to rotate in substantially a vertical plane and operative on the butts of the cylinder-needles, while the cam-cylinder revolves in a substantially horizontal plane around the needle-cylinder.

It further consists of two stationary toothed rings or racks suitably supported, one of which contains more teeth in number than the needle-cylinder has slots or needles, while the other of said racks contains less teeth than the needle-cylinder has slots or needles, said racks being mounted stationary outside the cam-cylinder, while the latter revolves inside the same, said cam-disks being rotated by suitable intervening mechanism.

It further consists of novel details of construction, all as will be hereinafter set forth and specifically pointed out in the claims.

Figure 1 represents a plan view of a portion of a knitting-machine having applied thereto the attachments embodying our invention. Fig. 2 represents a vertical section on line *xx*, Fig. 1, certain parts in Fig. 2

corresponding to those shown in Fig. 1, but being in different positions from those seen in said Fig. 1. Fig. 3 represents a view, on an enlarged scale, of the interior of a portion of the cam-cylinder developed and attachments applied thereto, the course taken by the needles at certain times being also illustrated. Fig. 4 represents a view of the parts shown in Fig. 3, but in different positions from those in said figure. Fig. 5 represents a view of some of the parts shown in Figs. 3 and 4, but in different positions from those in said figures. Fig. 6 represents a view of some of the parts shown in Figs. 3, 4, and 5, but in different positions from those in said figures. Fig. 7 represents a perspective view of certain detached parts of the machine. Fig. 8 represents a side elevation of a cam employed. Figs. 9 and 10 represent, respectively, views of the face and back of fabric as produced by our machine.

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

Referring to the drawings, 1 designates a needle-cylinder in which are placed the needles 2, the latter occupying the grooves 3 in said cylinder in the usual manner. Only a portion of the needles employed are shown in Figs. 1 and 2, the others being omitted for the sake of clearness of illustration of said figures, it being understood, however, that in practice all the grooves 3 have a needle 2 placed therein.

The needle-cylinder 1 is secured to the bed 4 of the machine by screws 5, which firmly retain said parts in position, so that when the bed 4 is secured to a bench or table 6, as in the present instance, by screws 7, only one of the latter being visible, as shown in Fig. 2, all of said parts will be held firmly in juxtaposition, excepting, however, the needles 2, which are raised and lowered by means to be hereinafter described.

8 designates a cam-cylinder which is guided on the bed 4 of the machine in such manner as to permit said cylinder to rotate, and has on its under side the bevel-gear or rack 9, with which meshes the bevel gear-wheel 10 on the driving-shaft 11. It will be apparent that when the bevel-wheel 10 is rotated it will cause the cam-cylinder 8, with which it

meshes, to likewise rotate, and thereby move the needles 2 up and down, so as to form the loops of the fabric.

Secured to the interior of the cam-cylinder 8 are the cams 12, 13, 14, 15, 16, and 17, the object of which will be hereinafter described.

18 designates a rotary cam whose working faces 18^x and 19^x are adapted to depress some of the needles 2 at certain times and for a purpose to be hereinafter described and which may be secured in any suitable manner to a shaft 19, which latter carries a gear-wheel 20, which is firmly secured thereto by a set-screw 21. The cam 18 is provided with recesses 20^x and 21^x, the object of which will be hereinafter described.

The shaft 19 is journaled in an ear 22, which is secured to the cam-cylinder 8 by means of screws 23, as seen in Fig. 1; it being evident that said ear 22 and its adjuncts will be carried around by the cam-cylinder when the latter rotates.

The gear-wheel 20 meshes with a toothed ring 24, which is secured to an annulus 25, which latter is secured to the bed 4 of the machine, it being noticed that the toothed ring 24 remains at all times stationary and that the gear-wheel 20, which meshes with the same, is carried around said ring by the cam-cylinder 8, so as to cause the shaft 19, and consequently the rotary cam 18, secured thereto, to rotate, for a purpose to be hereinafter described.

The toothed ring 24 is provided with ears 27, in each of which is a slot 28, through which is passed a screw 28^x, (shown in dotted lines in Fig. 1,) which enters a threaded opening 29 in the annulus 25, so as to retain said ring 24 in position on said annulus. The slots 28 permit the ring 24 to be moved slightly in the direction indicated by the arrows *a* and *b* in Fig. 1 in order to adjust said ring relatively to the needles 2, and thereby properly time the cam 18 with respect to said needles.

30 designates a gear-wheel secured to a shaft 35 by a set-screw 35^x and which meshes with a toothed ring 31, the latter being secured to the annulus 25 by screws 31^x (shown in dotted lines in Fig. 1) and whose threaded portions enter threaded openings 36 in the annulus 25. The object of the gear-wheel 30 and toothed ring 31 is to impart motion to a rotary cam 34, secured in any suitable manner to the shaft 35 of the gear-wheel 30, for a purpose to be hereinafter described.

The ring 31 is provided with ears 32, in each of which is a slot 33, through which is passed one of the screws 31^x, which secures said ring 31 to the annulus 25. The object of the slots 33 is to permit the ring 31 to be adjusted relatively to the needles 2 and which may be done by slightly moving said ring in the directions indicated by the arrows *c* and *d* in Fig. 1. The adjustment of the ring 31 relatively to the needles 2 is necessary, so as to properly time the cam 34 with said needles.

The shaft 35 is journaled in an ear 37, which

is secured to the cam-cylinder 8 by screws 38 and is carried around by said cylinder 8, so as to cause the shaft 35 and the cam 34 thereon to rotate, for a purpose to be hereinafter described.

The cam 34 (best seen in Figs. 1 and 8) is formed with the working faces 39 and 40 and recesses 41 and 42, the object of all of which will be hereinafter described.

The butts 44 of the needles 2 are preferably formed of cylindrical shape, so as to strengthen the same. (See Figs. 1 to 6, inclusive.)

Pivoted, as at 45, to the cam-cylinder 8 (see Figs. 3 to 6, inclusive) is a cam 46, which latter is adjacent to the cam 15 and is adapted to act in connection with the latter, for a purpose to be hereinafter described. The cam 46 is held in its normal position by a spring 47, whose bent portion 48 bears upwardly against the under side of the same. (See Figs. 3 to 7, inclusive.) The spring 47 is secured in any suitable manner to the outer face of the wall of the cam-cylinder 8 and its bent portion 48 is passed through a slot 49 in the wall of said cylinder and projects beyond the inner face of the wall of the latter, so as to contact with the under side of the cam 46, for a purpose to be hereinafter referred to.

The cam-cylinder 8 is provided with yarn-guides 8^x, through the eyes of which passes the yarn 50 as delivered from cops or bobbins 50^x. (See Fig. 3.) The yarn 50 after leaving the eyes of the yarn-guides 8^x is brought under the latches of the needles 2 in the usual manner, said needles taking the yarn at points over the cams 51 and 13.

The operation is as follows: The yarn 50, (see Fig. 2,) from which the fabric shown in Figs. 9 and 10 is produced, may be obtained from any desired number of bobbins or cops and is fed to the needles 2 in the usual manner. It will be evident that the fabric as produced by this machine may consist of yarns which are all of the same color, or it may contain yarns of different colors, according to the design. The cam-cylinder 8 in rotating will cause the needles 2 to be raised and lowered, so as to form loops which interlock with each other and produce a knitted fabric. When the butt 44 of a needle 2 is on the apex 51 of the cam 12, (see Figs. 3 and 4,) that needle is then at its maximum height and in a position to receive the yarn which is to be drawn by the beard or hook 52 of said needle through a loop on the latter in the usual manner. A loop through which the yarn 50 is drawn in the process of knitting and which forms part of the fabric shown in Figs. 9 and 10 is not shown in the drawings, as this is deemed unnecessary, since this feature of the operation is old and common in all knitting-machines. The cam-cylinder 8 is rotated by the mechanism hereinbefore described and moves in the direction indicated by the arrows *a* in Figs. 3 to 6, inclusive. The cam-cylinder 8 in rotating will cause the

butts 44, and consequently the needles 2, to be raised by the portion 51 of the cam 12, so that said needles may receive the yarn from a cop and form the same into loops in the process of knitting. The butts 44 of the needles 2, which were raised by the portion 51 of the cam 12, are next caused to contact with the under side of the cam 14, which depresses said butts, and consequently the needles 2, so as to bring the butts 44 in the path of the rotary cam 18. The working face 19^x then contacts with the butts 44 and depresses the same, and consequently the needles 2, as shown in Fig. 3, and brings said butts 44 in the path of the cam 15, which depresses the butts 44 to their full extent, and thereby causes the needles 2 to draw the yarn 50 in their hooks 52 through a loop on each of said needles in the usual manner in the process of knitting. The needles 2 are next raised, due to their butts 44 contacting with the working faces of the cams 13, so as to again place said needles in a position to have the yarn 50 passed under their hooks 52, so that said yarn may be drawn through the loops on said needles and form additional loops in the process of knitting. After the cam 13 has left the butts 44 of the needles 2, which were raised by the same, said butts contact with the under side of the cam 16, which depresses said butts 44, and consequently the needles 2, to their full extent, so as to again form loops in the fabric. When the cam 16 has left the butts 44, the latter next contact with the working face of the cam 12 and are raised by the same, and thus brought in a position similar to that shown at *b*, (see left-hand portion of Fig. 3,) but in another portion of the cylinder 8. The butts 44 of the needles 2, which are to be acted upon by the recesses 20^x and 21^x, are so timed relatively to said recesses that when said butts 44 leave the cam 14 they are caused to enter said recesses, due to the rotation of the cam-cylinder 8. The butts 44, which enter the recess 20^x, will be brought into the position shown in Fig. 4 when the cam 18 has been rotated ninety degrees, it being noticed that said butts 44, and consequently the needles 2, have not been depressed sufficiently to form loops in the fabric. A further rotation of ninety degrees of the cam 18 will bring the butts 44 from their positions seen in Fig. 4 to that shown in Fig. 5, so as to place said butts in the path of the cam 46, so that said butts 44, and consequently the needles 2, may be raised to their full extent by said cams in order that said needles may be brought in position to have the yarn 50 enter their hooks 52 and be drawn by the same through loops on said needles in the usual manner in the process of knitting. It will be seen that the needles 2, which enter the recess 20^x, form tuck-stitches, but no loops, from the time they leave the cam 14 until depressed to their full extent by the cam 16, this omission of loops in the fabric producing the floats 43. (Shown

in Fig. 10.) The butts 44 after leaving the cam 46 and the upper portion of the cam 15 contact with the working face of the cam 17 and are thereby brought in the path of the cam 16 and from this point travel in the same course described in connection with the needles 2, operated upon by the working face 19^x of the cam 18. The cam 34 works in conjunction with cams similar in every respect to those bearing the numerals 12 to 17, inclusive, and as their functions are precisely the same a detailed description of said cams is not deemed necessary.

It will be evident that the working face 18^x and recess 21^x of the cam 18 produce results in the knitted fabric similar to those described in connection with the working face 19^x and recess 20^x, and the same may be said of the cam 34.

The needle-cylinder 1 may contain any desired number of needles 2; but it is essential, however, that the number of teeth in the ring 24 shall be less than the number of needles in said cylinder, so that in every revolution of the cam-cylinder 8 the needles 2, which enter the recesses 20^x and 21^x, shall form floats 43 a slight distance to one side of and above the floats formed by the previous revolution of said cylinder and in the row of loops immediately beneath them, and thereby cause said floats 43 to lie in diagonal lines, as clearly shown in Fig. 10. It is also essential that the teeth in the inner ring 31 shall exceed the number of needles 2 in the cylinder 1, so that the floats 43 produced by the recesses 41 and 42 of the cam 34 shall be made to occupy a position a little to one side of and just above the floats 43 previously produced by the revolution of the cam-cylinder 8 and in the row of loops immediately beneath it, and thereby cause said floats 43 to lie in diagonal lines which cross those formed by the recesses 20^x and 21^x.

It will be evident that the number of recesses in the cams 18 and 34 may be increased or diminished, according to the design of the fabric.

Should any of the butts 44 of the needles 2 strike the corner 44^x of the cam 46, which may sometimes occur, instead of striking said cam at a point below said corner, no injury to the needles or machine can result therefrom, as the spring 47 will yield and permit said cam to assume the position shown in Fig. 6, and thereby bring the corner 44^x above the butt 44, which latter will then be deflected by the lower portion of the cam 46, so as to cause said butt 44 to pass under the cam 15, for the purpose hereinbefore described.

The working faces and recesses in the cam 18 are so timed relatively to similar parts in the cam 34 that when a working face on the cam 18 depresses the butts 44 of the needles 2 a working face on the cam 34 will likewise depress the butts 44 in its path, and the effect produced on the butts 44 by said working faces will occur at the same moment. Each recess

in the cam 18 is so timed relatively to similar parts in the cam 34 that they operate in unison on the butts 44 of the needles 2, for the purpose hereinbefore described.

5 As hereinbefore stated, the working faces of the cams 18 and 34 act in unison, as do also the recesses therein; but to more clearly illustrate the effect of said working faces and recesses upon the butts 44 a working face of
10 the cam 18 in Fig. 2 is represented as depressing a butt 44 of a needle 2, while the cam 34 in said Fig. 2 is represented as having one of its recesses acting upon a butt 44. This position of the working face in the cam 18 rela-
15 tively to the recess in the cam 34 would not exist in practice; but this has been shown so in Fig. 2 for the purpose hereinbefore stated.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a knitting-machine, cam-disks rotatably supported, said disks having recesses in the periphery thereof, a plurality of stationary racks and gearing common to said racks and
25 cam-disks.

2. In a knitting-machine, a plurality of rotatable recessed cam-disks oppositely supported, a plurality of stationary racks, and gearing intermediate said racks and cam-
30 disks.

3. In a knitting-machine, a cam-cylinder, cams fixedly attached thereto, a cam-disk having recesses in opposite portions of its periphery and rotatably supported, means for actuating said cam-cylinder, a stationary rack and
35 gearing meshing with said rack and adapted to operate said cam-disk.

4. In a knitting-machine, a needle-cylinder adapted to contain a plurality of needles, a
40 plurality of concentric stationary racks, one

of which contains more teeth than the needle-cylinder has slots or needles, and the other rack containing less teeth than said needle-cylinder has slots or needles, a pair of recessed cam-disks rotatably mounted oppositely to
45 each other, shafts on which said cam-disks are supported, and pinions mounted on said shafts and adapted to engage the inner and outer of said racks respectively.

5. In a knitting-machine, a cam-cylinder, 50 cams attached thereto, a cam-disk rotatably supported, recesses in the periphery thereof, means for actuating said cam-cylinder, a stationary rack and gearing meshing with said rack and adapted to operate said cam-disk. 55

6. In a knitting-machine, a needle-cylinder, a cam-cylinder rotatably supported, said cam-cylinder being provided with the fixed cams 12, 13, 14, 15, 16, and 17, arranged substantially as shown, the cam 46 pivotally support-
60 ed adjacent to said cam 15, a resilient arm adapted to contact with said cam 46, and disk-cams provided with oppositely-located recesses, in combination with means for rotating said disk-cams: 65

7. In a knitting-machine, a needle-cylinder, a cam-cylinder suitably supported, a plurality of stationary racks, one of which contains more teeth than the needle-cylinder has slots or needles, the other of said racks containing
70 less teeth than the said cylinder has slots or needles, recessed cam-disks suitably mounted, shafts on which said cam-disks are supported, and pinions on said shafts which are adapted to engage with said racks.

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