

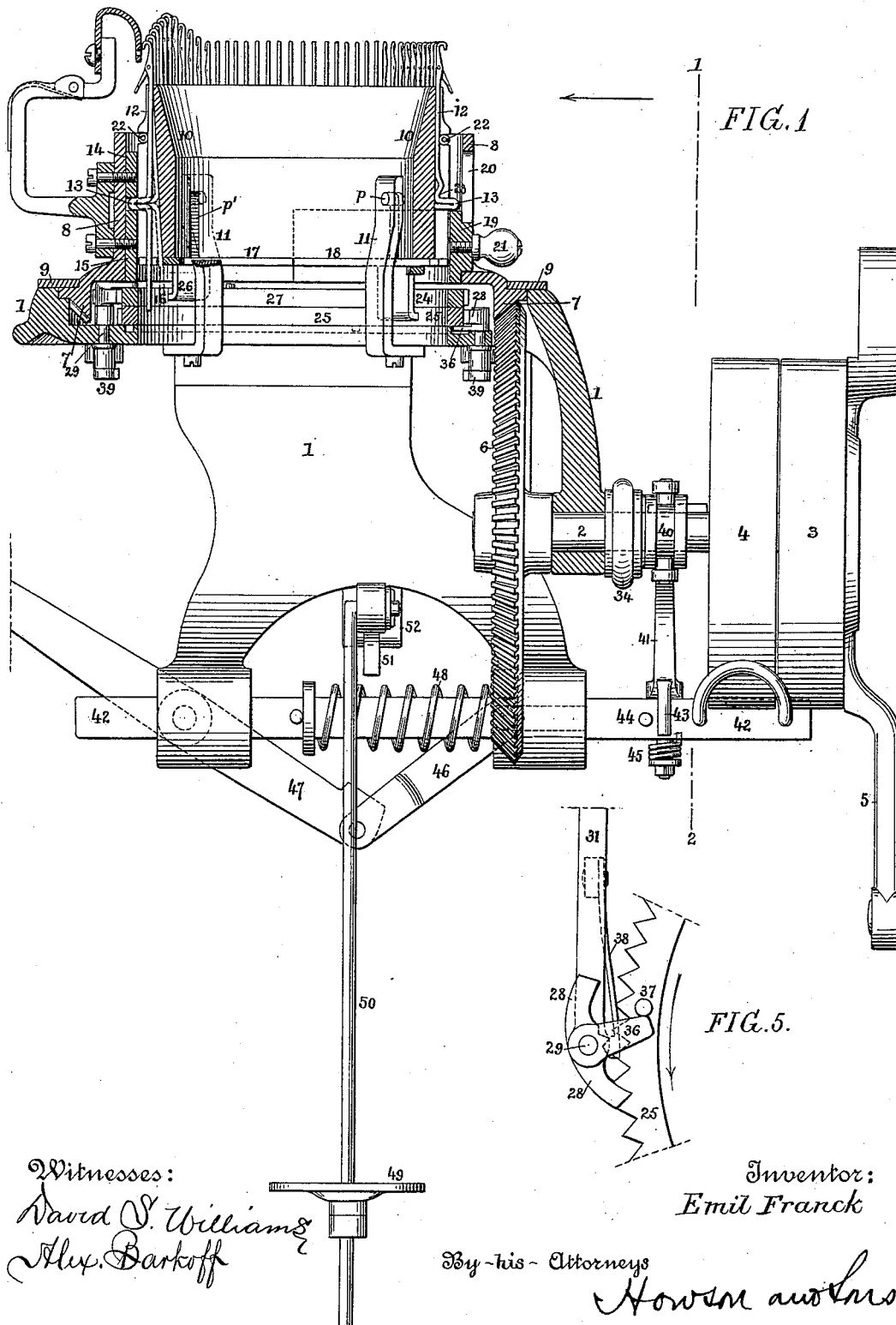
(No Model.)

3 Sheets—Sheet 1.

E. FRANCK.
KNITTING MACHINE.

No. 419,513.

Patented Jan. 14, 1890.



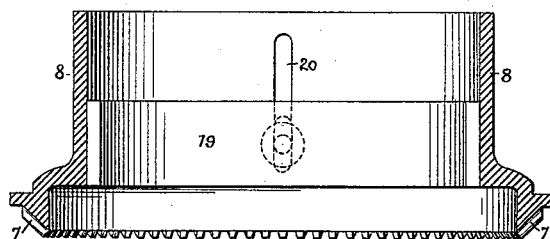
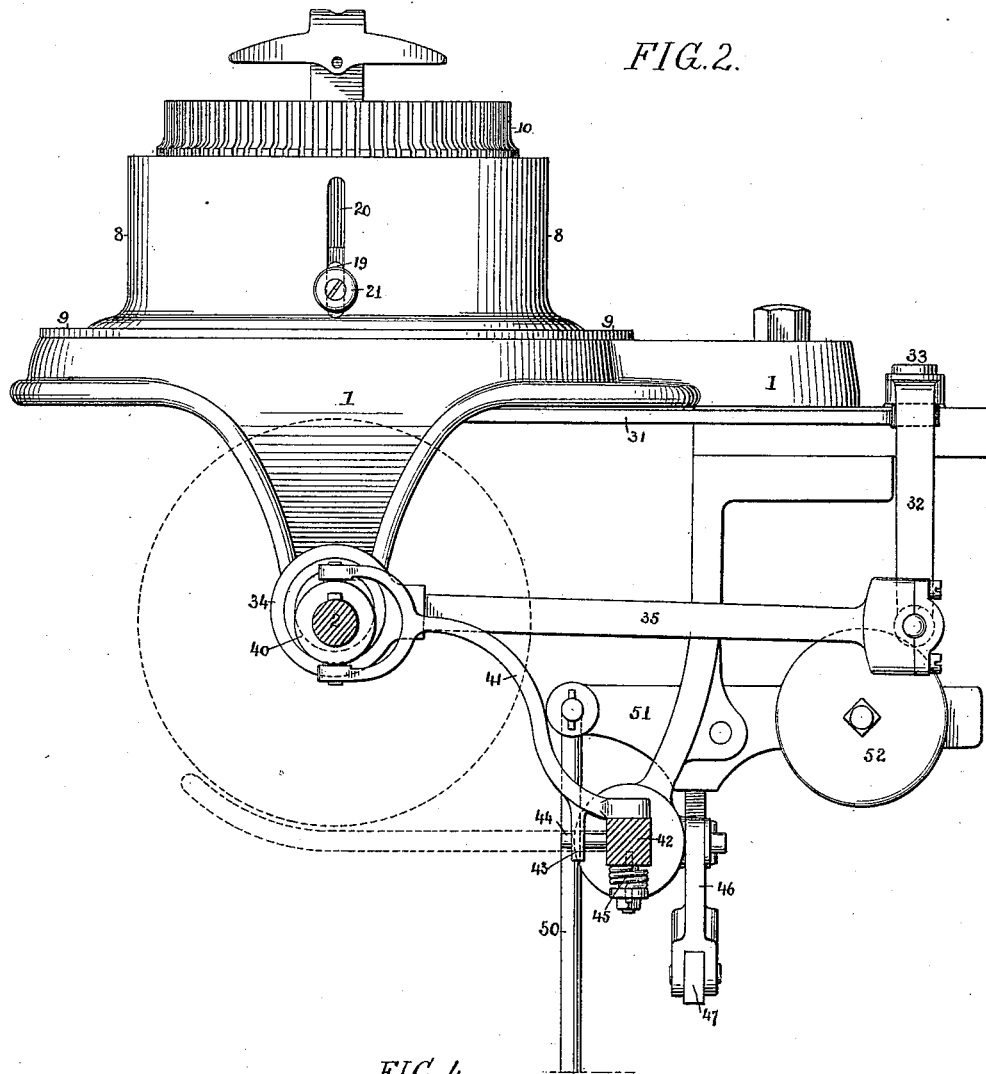
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Witnesses:
David Williams
Alex. Barkoff

Inventor:
Emil Franck

By - his - Attorneys
Horvath and Co.

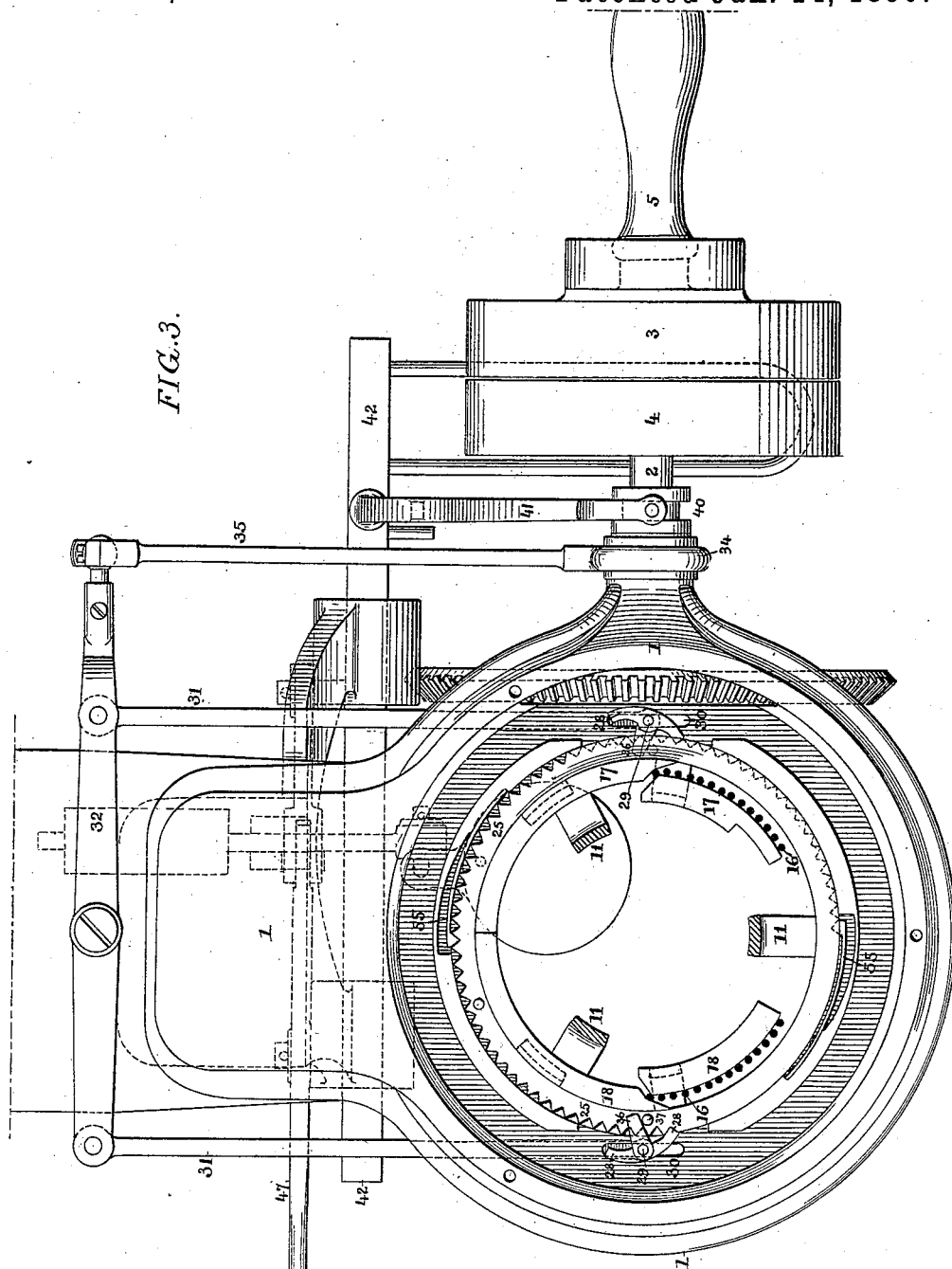
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Witnesses:
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UNITED STATES PATENT OFFICE.

EMIL FRANCK, OF PHILADELPHIA, ASSIGNOR TO WALTER P. McCLURE, OF NORRISTOWN, PENNSYLVANIA.

KNITTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 419,513, dated January 14, 1890.

Application filed August 24, 1887. Serial No. 247,709. (No model.)

To all whom it may concern:

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

The main object of my invention is to so construct a knitting-machine as to enable it to automatically effect the throwing into and
10 out of action of certain of the needles of the head to accomplish the operation of narrowing and widening to form a pocket at one side of the knitted tube; and this object I attain in the manner which I will now proceed
15 to describe, reference being had to the accompanying drawings, in which—

Figure 1 is a view, partly in section and partly in elevation, of sufficient of a circular-knitting machine to illustrate my invention.
20 Fig. 2 is a transverse section on the line 1 2, Fig. 1, looking in the direction of the arrow, the needles being omitted. Fig. 3 is a plan view of the machine with the needle-cylinder and the ring carrying the lifting-cams removed therefrom. Fig. 4 is a sectional view
25 of the cam-ring, showing the supporting-cam in elevation; and Fig. 5 is an enlarged view of part of the machine, illustrating a detail of construction.

1 represents the fixed frame of the machine, to suitable bearings in which is adapted the driving-shaft 2, having a fast pulley 3 and loose pulley 4, and provided with an operating crank or handle 5, said shaft having at
35 the inner end a bevel-wheel 6, which gears into a bevel-pinion 7 at the lower end of the ring 8, which carries the lifting-cams of the machine. This ring is suitably mounted on the fixed frame of the machine, so as to be
40 free to rotate thereon, and is retained in position vertically by means of a ring 9, secured to the fixed frame.

Within the cam-ring 8, and concentric therewith, is a needle-cylinder 10, which is
45 supported on the fixed frame by brackets 11, and is grooved externally for the reception of the needles 12. These brackets have pins *p*, adapted to notches or grooves *p'* in the lower edge of the needle-cylinder, Fig. 1, so that
50 the latter can be readily lifted out without

disturbing the other parts of the machine. Some of the needles are short, as shown at the right-hand side of Fig. 1, and have bits 13 at their lower ends, and the backs of the grooves in which these needles travel are ver-
55 tical; but those needles which have to be thrown into and out of action in effecting the widening and narrowing operations have stems extending below the bits 13, as shown at the left-hand side of Fig. 1, and the grooves
60 in which these needles slide are beveled—that is to say, they are deeper at the bottom than at the top—so that by pressing inward upon the downwardly-projecting stems of these needles their bits will be withdrawn
65 from engagement with the cam-blocks 14 and 15, whereby the operation of the needles to form the stitch is effected.

The projecting stems 16 of the needles 12 are acted upon by horizontally-sliding cam-
70 plates 17 and 18, and, supposing the needles of the head to be divided into two equal parts, one of these cams will act upon the stems of the needles at one end of a set comprising half the needles, the other cam acting upon
75 the stems of the needles at the opposite end of said set, as shown in Fig. 3, so that by intermittently moving first one and then the other of these cams the needles of the set may be gradually thrown out of action, com-
80 mencing at the end needles of the set and working inward one needle at a time, and when sufficient of the needles have been thrown out of action they may be gradually thrown into action again by reversing the movement of
85 the cam-plates. During the entire narrowing and widening operation the needles on the other half of the head should be lifted, so as to be out of action, and in order to effect this I provide a vertically-movable supporting-
90 cam 19, extending half-way around the cam-ring and having a portion projecting through a slot 20 in said ring. This cam is provided with a handle 21, by which it may be readily
95 lifted, so as to elevate and throw out of action the needles supported thereby, the needles being maintained in the elevated position by the action of a spring 22 engaging with a recess 23 in each needle, as usual. The cam-plates 17 and 18 are connected by
100

brackets 24 to an annular rack 25, which rests upon the fixed frame of the machine, and the cam-plates 17 are connected by brackets 26 to an annular rack 27, resting on the rack 25.

5 With the rack 25 is adapted to engage a double pawl 28, which is hung to a pin 29, passing through a slot 30 in the frame 1, this pin being connected by a rod 31 to one arm of a lever 32, hung to a stud 33 on the frame, 10 and having a vibrating movement imparted to it from the cam or eccentric 34 on the driving-shaft through the medium of a rod 35. When the pawl is adjusted so that one of its fingers engages with the rack, the latter 15 is fed forward; but if the pawl is shifted so as to bring the other finger into engagement with the rack the latter will be retracted.

In order to effect the automatic reversal of the pawl upon the carrier, the same has an 20 arm 36, which is acted upon by pins 37 on the rack when the latter reaches the limit of its movement in either direction—that is to say, supposing the rack to be moving forward, the pin 37 will strike the arm 36 and 25 reverse the pawl, so that on the next movement of the latter the rack will be moved backward, and at the end of the backward movement the pawl will be shifted into position for moving the rack forward. A 30 spring-finger 38, carried by the rod 31, has a head engaging with notches in a disk 39, secured to the lower end of the pin which carries the pawl, so that accidental shifting of the latter is prevented. Precisely the same 35 devices are used for operating the rack 27, the rod 31 in this case, however, being secured to the other arm of the lever 32, so that the pawls act alternately.

After each cam-plate has been moved forward 40 and back and has reached the limit of its backward movement and the pawls have been shifted into position for again moving the racks forward the rack-operating mechanism should be thrown out of gear and allowed to remain 45 out of gear during the time that the machine is used for making tubular fabric, the rack-operating devices being again thrown into gear when the proper length of tubular fabric has been completed and the formation of 50 a bag or pocket is to be repeated. In order to effect this automatic stoppage of the rack-operating mechanism, the cam or eccentric 34, whereby the same is actuated, is driven by a clutch 40, the operating-lever 41 of which is 55 hung to the shipper 42 and has a projecting finger 43, acted upon by a pin 44 on said rod, so that as the latter moves outward to shift the belt from the loose pulley to the fast pulley the clutch must be operated so as to 60 throw the cam or eccentric 34 out of action, the movement of the rod in the opposite direction, however, being permitted without effecting a positive movement of the clutch. This backward movement is effected by a 65 coiled spring 45 engaging with the lower end of the pivot-stem of the arm 41 and with the shipper-rod 42, so that in case the engaging

parts of the clutch are not in position for engagement when the shifting-rod moves the arm 41 can yield until the parts are in position 70 for engagement, whereupon the clutch will be thrown into gear under the action of the spring 45.

The automatic operation of the belt-shifting rod is effected by a weight carried by the 75 tube of fabric which is being produced. The rod is connected by a link 46 to one arm of a lever 47, hung to a bearing on the fixed frame, and when the formation of the pocket upon the tube has been completed and the needles 80 in the other part of the head have been depressed into operative position the lever 47 is operated so as to raise its short arm, thus projecting the bar 42 and bringing the lever 85 and link into line with each other, so that they will resist the retraction of the shifting-bar under the action of the spring 48. This effects the shifting of the belt onto the fast pulley and the throwing out of action of the clutch 40; but as soon as sufficient length of 90 tubular fabric has been produced the weight of the lower end of the tube strikes a plate 49, carried by a rod 50, which is connected to one arm of a lever 51, hung to the frame, the other arm of said lever being provided with 95 a weight 52. When the plate 49 is depressed, therefore, the lever 51 acts upon the end of the short arm of the lever 47 and depresses the same, so as to bring the said lever and the link 46 out of line with each other, where- 100 upon the rod 42 will be instantly retracted under the action of the spring 48, the belt will be shifted from the fast to the loose pulley, and the clutch will be operated so as to 105 throw the cam or eccentric 34 into gear. The driving-shaft is now operated by hand to effect the desired reciprocation of the cam-box during the formation of the heel or toe pocket upon the tube, after the completion of which the shipper-rod may be operated through the 110 medium of the lever 47, so as to again throw the belt onto the fast pulley and again proceed with the formation of tubular work.

It should be noticed that accidental movement of the racks 25 and 27 is prevented by 115 means of spring-fingers 55, which engage with the teeth of the racks, as shown in Fig. 3.

I claim as my invention—

1. The combination of the vertical needle-cylinder of a knitting-machine, the needles, 120 and the operating-cams for acting upon the bits of said needles, with slotted shifter-cams located below the operating-cams and acting upon the needle-stems below the bits, so as to throw said bits into and out of range of 125 the operating-cams, substantially as specified.

2. The combination of the needle-cylinder and its needles, the operating-cams acting on the bits of the needles, slotted shifter-cams located below the operating-cams and acting 130 on the stems of the needles below the bits, so as to throw said bits into and out of range of the operating-cams, annular racks carrying said shifter-cams, reciprocating pawls engag-

ing with the racks to turn the same, and mechanism for operating said pawls, substantially as specified.

3. The combination of the needle-shifting
5 cams, the rack for operating the same, the duplex pawl acting on said rack and having a projecting arm, means for reciprocating the pawl, and pins carried by the rack and acting on said arm of the pawl to effect the au-
10 tomatic reversal of the same at each limit of its movement, substantially as described.

4. The combination of the cylinder and its needles, operating-cams for the needles, shifter-cams acting on said needles, racks
15 carrying said cams, pawls, one engaging with one rack and the other with the other rack, a vibrated lever, and rods connecting one pawl to one arm of said lever and the other pawl to the opposite arm of the same, substan-
20 tially as specified.

5. The combination of the cylinder and its needles, operating-cams for the needles, cams for shifting said needles into and out of operative position, racks carrying said cams, pawls for operating the racks, a pawl-operating le- 25 ver, a cam or eccentric having a rod connected to said lever, a driving-shaft for the eccentric, a shipper-rod, a clutch for connecting the eccentric to the driving-shaft, and an arm on said clutch connected to the shipper- 30 rod to throw said cam or eccentric into or out of action, substantially as specified.

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

EMIL FRANCK.

Witnesses:

WILLIAM D. CONNER,
JOHN T. LEWIS.