

(Model.)

3 Sheets—Sheet 1.

W. F. DIAL.  
SEWING MACHINE.

No. 480,181.

Patented Aug. 2, 1892.

Fig. 1.

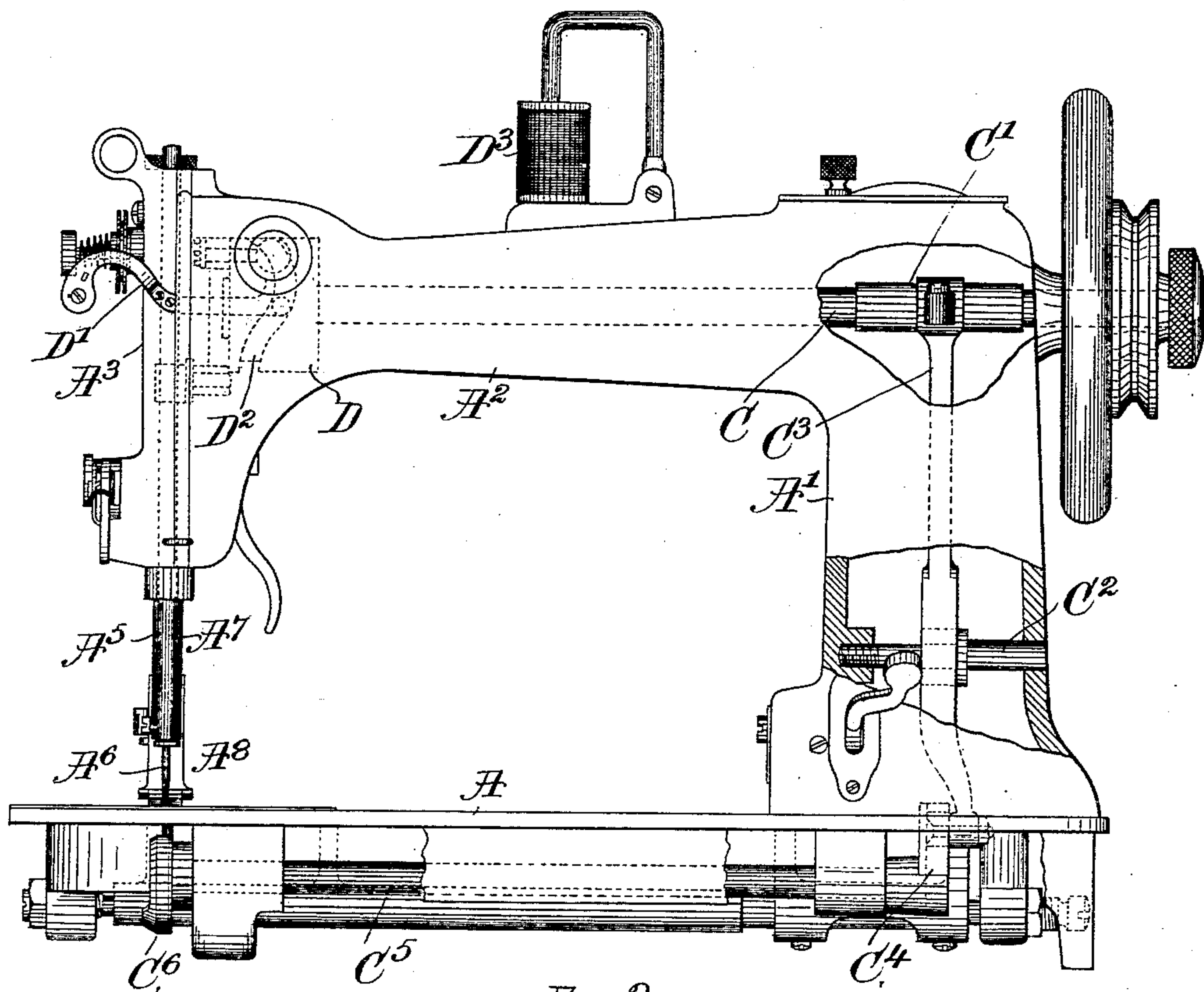
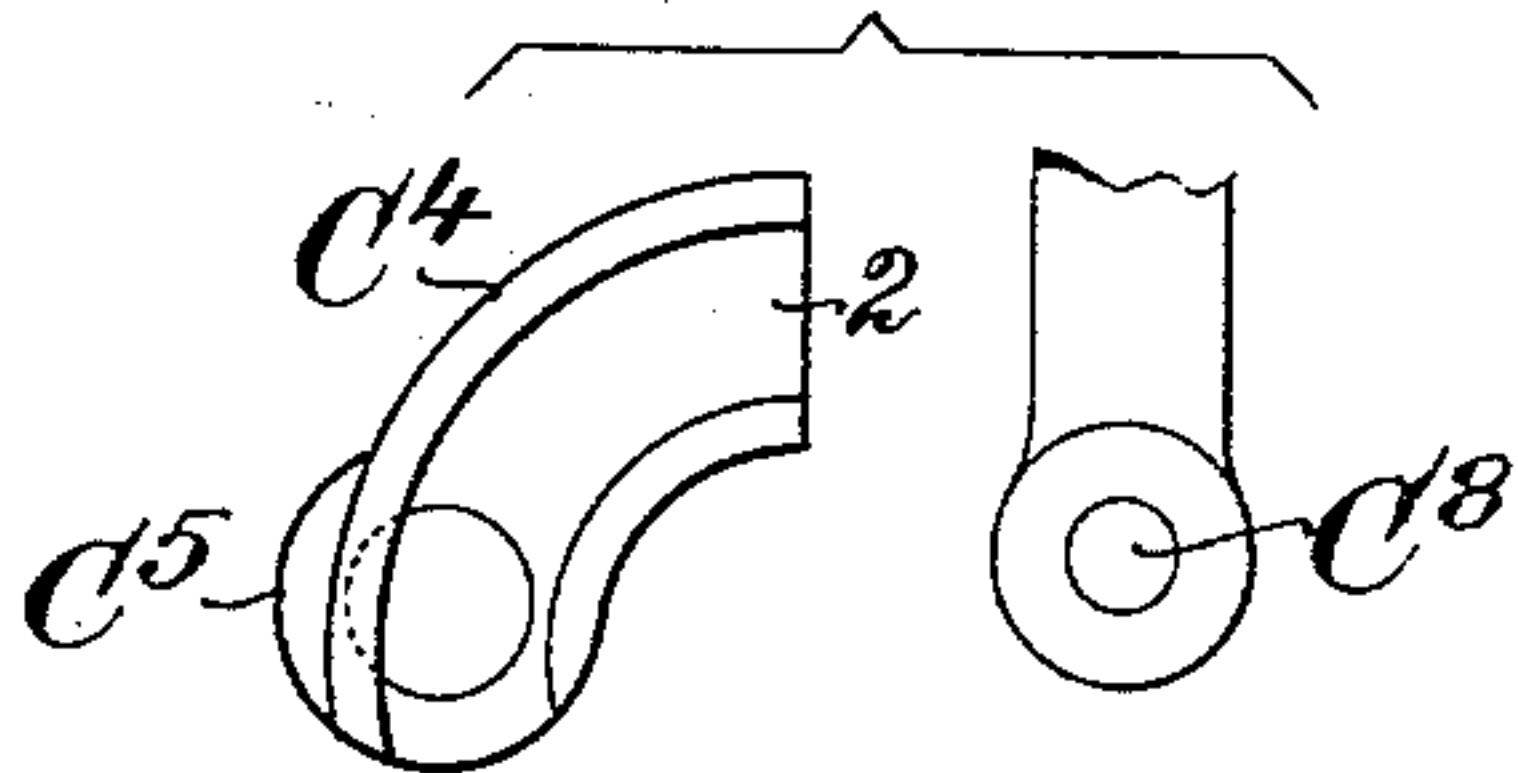


Fig. 2.



Witnesses.

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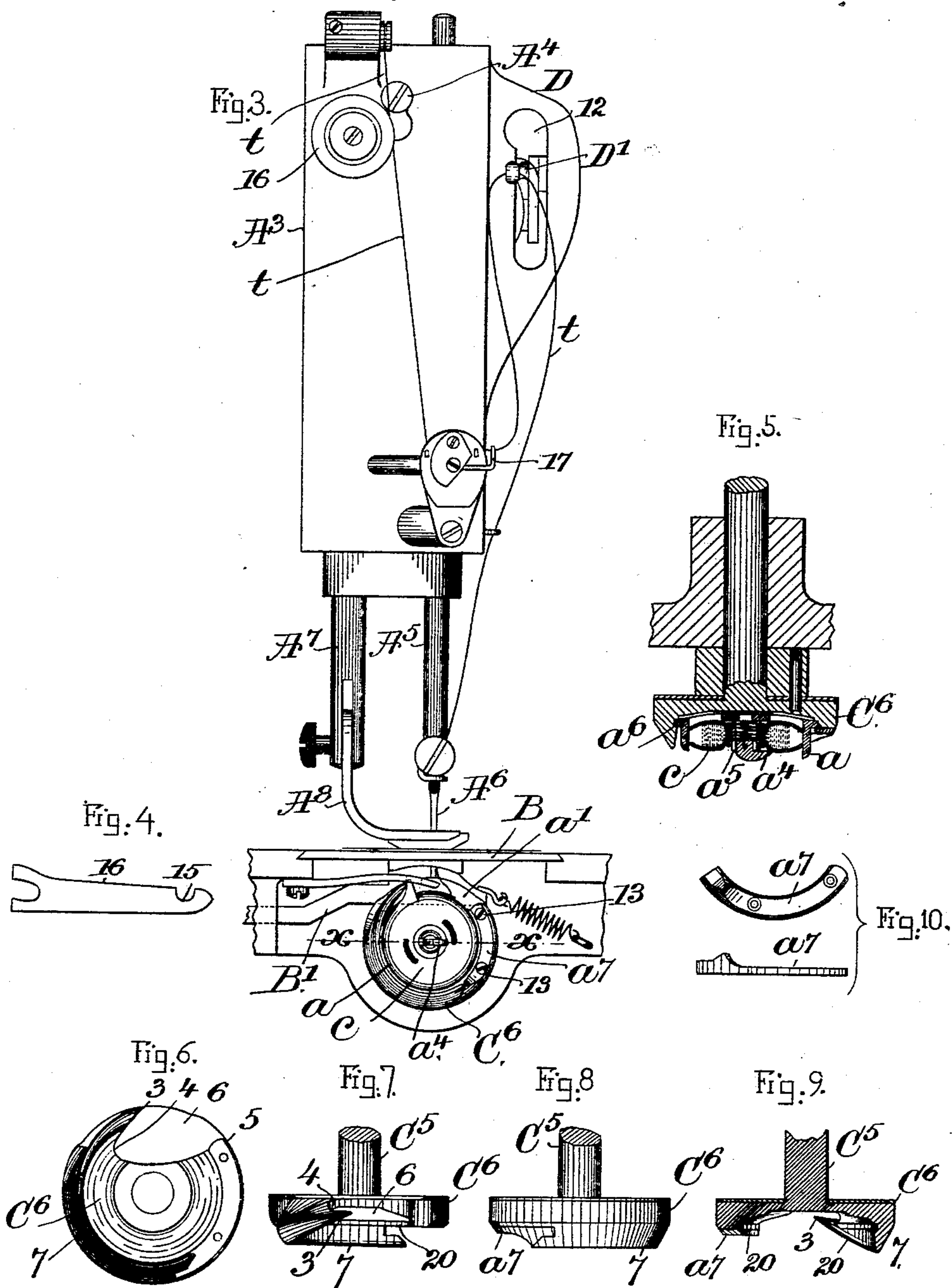
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W. F. DIAL.  
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Witnesses.

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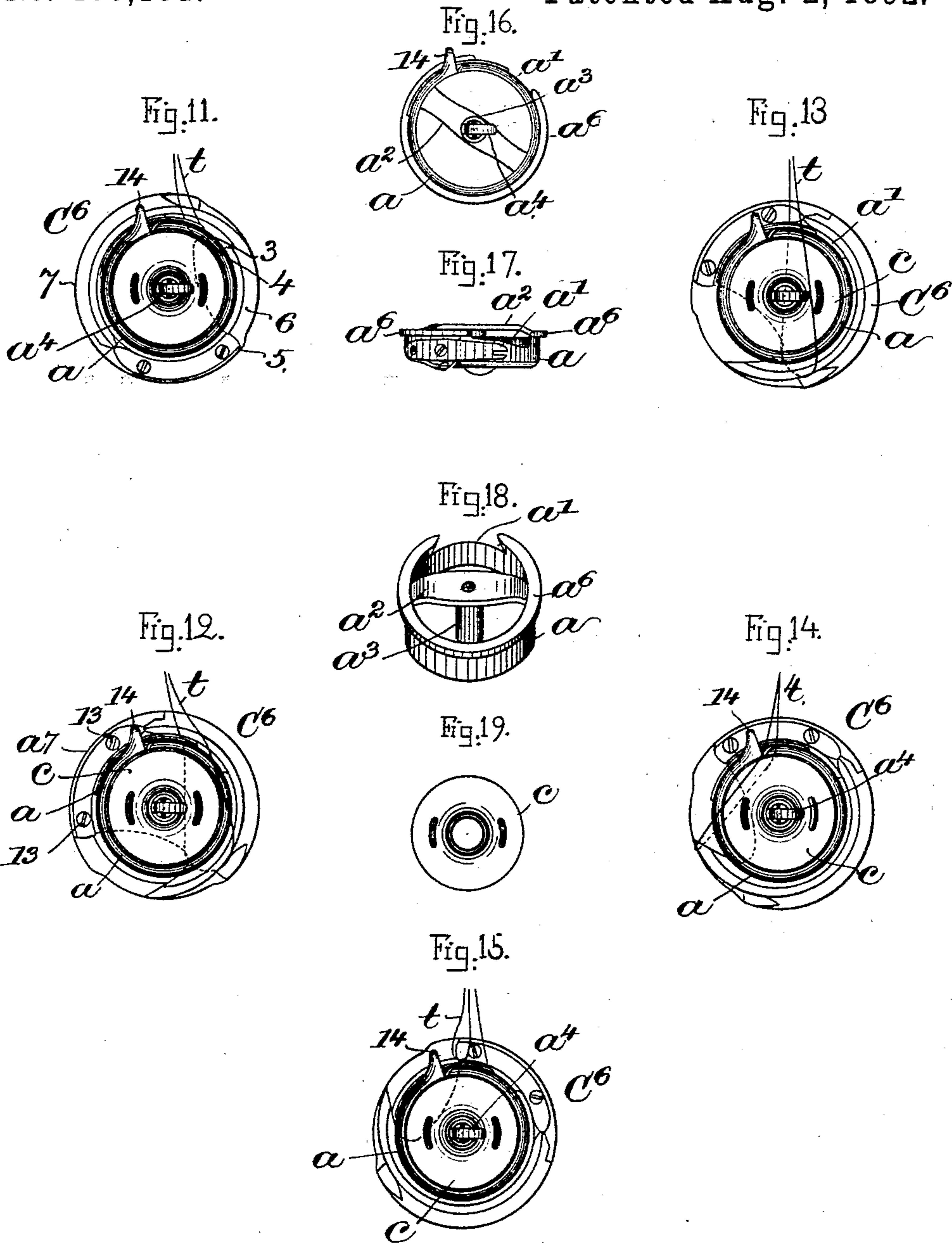
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3 Sheets—Sheet 3.

W. F. DIAL.  
SEWING MACHINE.

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Witnesses.

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# UNITED STATES PATENT OFFICE.

WILBUR F. DIAL, OF BRIDGEPORT, CONNECTICUT, ASSIGNOR TO THE  
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## SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 480,181, dated August 2, 1892.

Application filed May 21, 1892. Serial No. 433,826. (Model.)

*To all whom it may concern:*

Be it known that I, WILBUR F. DIAL, of Bridgeport, county of Fairfield, State of Connecticut, have invented an Improvement in Sewing-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

10 This invention has for its object the improvement of that class of sewing mechanism wherein a circularly-moving loop-taker engages a loop of needle-thread and without passing through it casts the said loop about  
15 an under thread in a wound mass, said under thread being located within a circle traversed by the point of the loop-taker. One form of loop-taker of this class is represented in United States Patent No. 420,847, dated February 4,  
20 1890.

Before proceeding to describe my invention I will premise by saying that in machines of the class referred to as heretofore commonly constructed the under thread has been wound  
25 upon a bobbin contained in a bobbin-case, and the latter when put in place in the cavity at the face of the loop-taker has been controlled as to the extent of its outward or lateral movement toward and from the face of  
30 the loop-taker by a so-called "bobbin-holder," and this bobbin-holder has been considered an essential requisite. The loop-taker referred to has taken a thread from an eye-pointed needle and has drawn the thread to form a  
35 loop, and said loop has been cast off the point of the loop-taker about the bobbin-case containing the under thread, and the loop-taker during this operation has had to pull sufficiently hard on the thread to enable the lat-  
40 ter to make a path for itself between the bobbin-case and the inner cavity of the loop-taker, the strain being sufficient to move the bobbin-case radially with relation to the center of motion of the loop-taker and also later-  
45 ally or away from the face of the loop-taker, and the outer half of the loop of needle-thread when being cast about the bobbin-case has had to make a path for itself between the bobbin-case and the inner face of the usual bob-  
50 bin-case holder. In order that the bobbin-case might be so moved, it has been necessary

to make the diameter of the bobbin-case sufficiently less than the diameter of the cavity in the loop-taker to enable the loop of needle-thread to be passed about the bobbin-case  
55 and between it and the face of the bobbin-holder and of the loop-taker, and this space, it will be obvious, has had to be sufficient for the coarsest thread required. As a result of this looseness the bobbin-case has had im-  
60 parted to it a jumping movement, which increases with the speed of the machine, and such jumping of the bobbin-case has acted to pinch and abrade the needle-thread more or  
65 less, according to the speed, the jumping manifesting itself audibly, the noise increasing with the speed. So, also, this class of machine has commonly had co-operating with its  
70 loop-taker a loop-check, which acts to detain the loop of needle-thread just after the latter has been cast off or about the bobbin-case and  
until the point of the loop-taker engages a new loop, and thereafter the loop-taker in the  
75 formation of a new loop draws away from the loop-check the old loop and causes it to enter into the stitch then being finished by the action of the loop-taker in making a new loop.  
The loop-taker referred to has behind its point and extending partially about its pe-  
80 riphery an overhanging flange or lip, which serves the purpose of a cast-off, and the face of the hook is provided with a substantially circular cavity, except where the said cavity  
85 is cut away and opened out at a point between the heel of the cast-off and the throat of the hook, said cavity constituting what is denominated "needle-clearance" and being of  
90 sufficient size to leave between the inner face of the bobbin and the loop-taker a space long enough for the reception of the needle while the latter is below the cloth-plate.

It will be remembered in that class of machines wherein a circularly-moving shuttle passes entirely through a loop of needle-  
95 thread the shuttle usually runs in a race requiring oil; but by the use of a loop-taker of the class described in the organization hereinafter to be specified the presence of oil at or about the under thread is entirely ob-  
100 viated.

Seeking to improve the class of machine using a loop-taker substantially such as in



the said Patent No. 420,847 and to overcome difficulties heretofore experienced in that class of machines I have devised mechanism co-operating with the said loop-taker whereby the employment of the usual bobbin-holder opposite the face of the loop-taker is rendered unnecessary, dispensing with the bobbin-holder relieving the thread from injury, which is frequently the case while the thread is passing between the face of the bobbin-case and the said holder, for the holder offers in practice very considerable resistance to the thread, the resistance being detrimental to a greater or less degree in proportion to the speed of the machine and the fineness or quality of the thread used.

It will readily be understood that it is a great desideratum in a sewing-machine to be able to utilize any thread which the owner can get, and hence I have tried in my experiments to produce a stitch-forming mechanism of the class referred to which will not at all abrade the needle-thread, or, in other words, I have aimed to so manipulate the loop of needle-thread that it will be subjected to no more, but rather less, strain and friction than is produced when a thread is carried by a rotating shuttle. The point of a loop-taker connected directly to a rotating shaft always travels in a defined path with relation to the path of movement of the eye-pointed needle, whereas the point of a circular shuttle will, it will be obvious, deviate more or less from the needle-line, owing to wear between the shuttle and its race, such deviation of the point of the shuttle with relation to the path of the needle resulting not only in skipping stitches, but in the breaking of needles, such difficulties increasing with the speed of the machine.

In my improved machine I employ a bobbin case or shell located between the under thread and the interior flange or lip of the loop-taker, the said bobbin case or shell being preferably of metal and being restrained from rotation with the loop-taker. This bobbin case or shell is provided at its inner edge with an open notch or pocket, and this pocket is so located with relation to the path of movement of the eye-pointed needle and the point of the loop-taker when the latter engages the needle-thread and the throat of the loop-taker back of its point is so constructed that as the point of the loop-taker engages the needle-thread it draws the latter down quickly toward the center of rotation of the loop-taker and puts one-half of the said loop into the notch or pocket in the bobbin-case and holds the bight of the loop within the circle occupied by the bobbin-case and within the needle-clearance. The half of the loop of needle-thread put into the pocket or notch in the bobbin case or shell referred to remains there during the entire operation of expanding the loop, the other half of the loop during its formation crossing the outer face of the bobbin

case or shell and finally being cast off the point of the loop-taker, the loop-taker giving up its loop before its point arrives again at the needle, a take-up acting quickly to take up the loop and draw it from the point of the loop-taker and out through said pocket or notch referred to, thus setting the stitch before the point of the loop-taker again arrives at the needle to draw another loop, the loop thus once discharged from the loop-taker point never again coming against the said loop-taker and bobbin-case. In this way each stitch is made and finished before a loop for a second stitch is commenced.

I have represented the bobbin case or shell as having an open face for the reception of the under thread, the latter in this present instance of my invention being wound upon a bobbin mounted upon a post carried by a cross-bar forming part of the rear side of the bobbin case or shell, and to enable this bobbin case or shell to remain in proper position within the circumference of the loop-taker without the aid of the usual bobbin-holder I have provided the bobbin-case, except the small portion thereof occupied by the notch or pocket referred to, with a radial fin, which enters an annular groove in the inner wall of the overhanging lip or flange forming the cast-off portion of the loop-taker.

The machine herein to be described may be run at very high speed without the employment of oil in connection with its under-stitch-forming devices and without subjecting the thread used to any strain or friction whatever except at the instant of tightening or setting the stitch.

In the construction of the loop-taker a portion of the overhanging flange or lip referred to is made removable, in order that a bobbin case or shell in case of necessity may be removed and a new one supplied.

Figure 1 in side elevation, partially broken out, represents a sewing-machine embodying my invention. Fig. 2 is a detail showing the crank at the end of the loop-taker shaft and part of the lever having the pin to enter the slot of the crank. Fig. 3 is a partial front-end elevation of the machine shown in Fig. 1. Fig. 4 is a detail of the finger co-operating with the bobbin case or shell. Fig. 5 is a partial section in the line *x*, Fig. 3. Fig. 6 is a front or face view of the loop-taker alone with part of its flange removed. Fig. 7 is a top or plan view of the loop-taker shown in Fig. 6. Fig. 8 is a view of the loop-taker shown in Fig. 6, but inverted and with the entire flange. Fig. 9 is a horizontal section of the hook shown in Fig. 8. Fig. 10 in two views shows the detachable portion of the loop-shedder or cast-off flange. Figs. 11 to 15, inclusive, show successive positions of the loop-taker and its co-operating parts. Fig. 16 shows the bobbin case or shell in front elevation; Fig. 17, a top or plan view of the bobbin case or shell shown in Fig. 16. Fig. 18 is



a perspective view of the bobbin case or shell, and Fig. 19 shows the bobbin by itself.

A is a bed-plate; A', an upright; A<sup>2</sup>, an overhanging arm, and A<sup>3</sup> the head-plate or cap attached by screw A<sup>4</sup> and covering the bearings for the needle-bar A<sup>5</sup>, having the eye-pointed needle A<sup>6</sup> and the presser-bar A<sup>7</sup>, having the presser-foot A<sup>8</sup>. The bed-plate has a throat-plate suitably slotted for the passage of the needle and the usual feed-points of the usual feed dog or device B' of the four-motioned variety and but partially shown. The arm A<sup>2</sup> has suitable bearings for the main or needle-bar-actuating shaft C, having a suitable crank C', which actuates a lever C<sup>3</sup>, slotted to embrace and slide over or rock on a fulcrum C<sup>2</sup>, the lower end of lever C<sup>3</sup> having a roller or other stud C<sup>8</sup>, said stud entering a curved slot 2 in an arm C<sup>4</sup>, attached to a shaft C<sup>5</sup>, to the opposite end of which is fixed the loop-taker C<sup>6</sup>, having a point 3, a throat 4, a heel 5, and a needle-clearance space 6, and a groove 20 within its overhanging flange.

The needle-bar shaft has on it a take-up cam D, (shown by dotted lines, Fig. 1,) having a suitable peripheral slot D<sup>2</sup>, in which enters a roller or other stud of a take-up lever D', the said cam actuating the said take-up positively in all directions. The take-up is extended through a slot 12 in the plate A<sup>3</sup>. The needle-thread t, taken from some suitable source, as the spool D<sup>3</sup>, is subjected to the action of a tension device 16 and then to a slack-thread controller 17 and is led to the eye of the take-up and to the eye of the needle. The bobbin case or shell a, circular in shape, has at its rear side an open notch or pocket a'. This notch or pocket is so located with relation to the path of the needle at the time when the point of the loop-taker engages the needle-thread and the throat of the loop-taker back of its point is so shaped or its angle from its point is such that as soon as the point 3 engages the needle-thread the throat 4 of the point instantaneously puts one-half of the loop into the pocket and within the space circumscribed by the bobbin case or shell, carrying said loop in toward the center of rotation of the loop-taker, the said half remaining in said pocket, while the other half of the loop in the further rotation of the loop-taker is by the cast-off flange or lip 7 passed across the front of the bobbin case or shell, as in Figs. 12 and 13, the loop when the point 3 arrives in the position Fig. 14 slipping off the point 3 and being drawn up quickly by the take-up D', the loop of needle thread being during this operation cast about the under or second thread, the needle-thread during the operation described, except at the time of the action of the take-up, being substantially free from any strain or abrasion.

In this present embodiment of my invention I have shown the under or second thread as wound upon a small disk-bobbin c; but

this invention is not limited to the particular shape or construction of the under-thread mass, as it may be of any usual or customary shape or character.

I have herein represented the bobbin-case of a form open at its outer end and provided at its inner end with a bridge a<sup>2</sup>, having an outwardly-extended post a<sup>3</sup>, provided with a retaining device, shown as a pivoted latch a<sup>4</sup>, acted upon by a spring a<sup>5</sup>, (see Fig. 5,) said latch when turned over substantially parallel to the bridge serving to keep the bobbin on the said stud. This construction is of great advantage, for owing to the open front of the bobbin-case the latter may be kept in the space at the front of the loop-taker and the bobbin be put into or from the bobbin-case without removing the bobbin-case, as heretofore common in this class of machine. The bobbin case or shell is also shown as provided with a radially-projecting fin a<sup>6</sup>, except for the small portion of the bobbin-case occupied by the notch or pocket a', said fin entering the groove 20 in the inner wall of the overhanging flange or lip of the loop-taker. (See Figs. 5, 7, and 9.) The loop-taker has a portion a<sup>7</sup> attached thereto by screws 13 13, said portion a<sup>7</sup> being omitted from Figs. 6 and 7 and shown separately in two views in Fig. 10.

A bobbin case or shell may be put into position in the loop-taker cavity while the portion a<sup>7</sup> is removed, and then by putting back the portion a<sup>7</sup> the bobbin case or shell will be kept in position against removal, the fit of the fin in the groove of the loop-taker being a substantially close one, for owing to the fact that the needle-thread is put in the notch or pocket and there held said thread is not compelled to pass between the periphery of the fin a<sup>6</sup> and the inner wall of the flange of the loop-taker. The bobbin case or shell interposed between the thread mass and the inner wall of the flange or lip of the loop-taker is restrained from rotation with the loop-taker because of a projection or horn 14 thereof, which is engaged by a notched part 15 of a finger 16. The fin on the bobbin case or shell, co-operating with the loop-taker, as described, renders the usual bobbin-holder unnecessary. The needle-clearance forms a space for the needle while the point of the loop-taker is drawing the needle-thread to make and cast a loop thereof about the under thread, the said needle-clearance and notch or pocket a' being in open communication as the point of the loop-taker engages the loop, so that one-half of the said loop put into the pocket while the needle-clearance space is opposite the pocket remains therein until the needle-clearance in the further movement of the loop-taker again comes opposite the said pocket, at which time the loop of needle-thread is drawn out from the pocket and up to the cloth by the take-up.

The loop-taker shaft is adapted to have imparted to it a variable movement during the



formation and discharge of each loop of needle-thread, the accelerated speed commencing as the point of the loop-taker commences to enter and expand the loop of needle-thread, the fast or accelerated speed continuing until about as the take-up commences to act. This accelerated movement is effected, as herein shown, by the stud  $C^3$  of lever  $C^3$ , working in the curved slot 2 of the arm  $C^4$  of the rock-shaft  $C^5$ . This invention is not, however, limited to the exact devices shown by which to impart a variable motion to the loop-taker, as instead I may use any other devices commonly used in sewing-machines for imparting variable movements to a rotating loop-taker.

My invention comprehended in providing the rear edge of the bobbin case or shell with a notch or pocket is not limited to the shape of the bobbin case or shell or to the exact shape of the loop-taker or to the distance about the periphery of the loop-taker that the cast-off flange or lip is extended, and I consider the open face of the bobbin-case of very great advantage. Herein it will be noticed that the throat of the loop-taker starts from the point of the loop-taker and leads in toward the center of motion of the loop-taker in a direction to intersect the needle-clearance, and the inclination of the throat is such as to quickly draw down the loop of needle-thread into the pocket  $a'$  within the circle defined or circumscribed by the inner end of the bobbin case or shell, and the overhanging flange or cast-off of the loop-taker is so shaped that in its rotation it carries one-half of the loop of needle-thread out away from the loop-taker shaft.

My improved loop-taker, constructed as described, operates very differently from a loop-taker composed of a bowl-shaped disk located wholly at one side of the vertical plane in which the eye-pointed thread-carrying needle moves, it being formed by cutting into the edge of the bowl a diagonal slot, for a loop of needle-thread engaged by such a point could not act to draw down into a pocket in a bobbin case or shell and hold a loop of needle-thread within the inner periphery of the bobbin case or shell, as herein provided for.

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

1. An eye-pointed needle and a circularly-moving loop-taker provided with a point having as a continuation of it an overhanging cast-off flange or lip, said point having a throat leading inwardly toward the center of motion of the said loop-taker, combined with a bobbin case or shell having an open notch or pocket and containing an under thread, the throat of the loop-taker pulling one-half of the loop of needle-thread into the said open notch or pocket as the loop-taker commences to draw the loop, the part of the loop put into the said notch or pocket remaining therein and being drawn out therefrom after the loop has been cast about the under thread, substantially as described.

2. An eye-pointed needle and a loop-taker provided with a point prolonged by an overhanging flange or lip to serve as a cast-off and having a throat and a needle-clearance space, the throat leading into the said clearance-space toward the center of motion of the loop-taker, and a bobbin case or shell containing an under or second thread, said case having an open notch or pocket into which one-half of the loop of needle-thread is extended and held within the space circumscribed by the loop-taker while the loop of needle-thread is being cast about the under or second thread, combined with a take-up to draw the said loop out of said notch or pocket and off from the point of the loop-taker and finish the stitch before the point of the loop-taker in its continued movement again engages the loop of needle-thread, substantially as described.

3. An eye-pointed needle and a loop-taker provided with a point prolonged by an overhanging flange or lip to serve as a cast-off and having a throat and a needle-clearance space, the throat leading into the said clearance-space toward the center of motion of the loop-taker, and a bobbin case or shell containing an under or second thread, said case having an open notch or pocket into which one-half of the loop of needle-thread is extended and held within the space circumscribed by the loop-taker while the loop of needle-thread is being cast about the under or second thread, combined with a take-up to draw the said loop out of said notch or pocket and off from the point of the loop-taker and finish the stitch before the point of the loop-taker in its continued movement again engages the loop of needle-thread and with devices to rotate said loop-taker at a variable speed during the formation of each stitch, substantially as described.

4. An eye-pointed needle and a circularly-movable loop-taker provided with a point, a cast-off flange, a throat, and clearance-space, combined with a bobbin case or shell having at its rear side an open notch or pocket and having an open face for the reception of a mass of under or second thread, substantially as described.

5. An eye-pointed needle and a circularly-movable loop-taker provided with a point, a cast-off flange, a throat, and clearance-space, combined with a bobbin case or shell having at its rear side an open notch or pocket and having an open face for the reception of a mass of under or second thread and provided with a radial fin to enter a groove within the overhanging flange constituting the cast-off, substantially as described.

6. An eye-pointed needle and a circularly-movable loop-taker provided with a point, a cast-off flange, a throat, and clearance-space, combined with a bobbin case or shell having at its rear side an open notch or pocket and having an open face for the reception of a mass of under or second thread and provided with a radial fin to enter a groove within the



overhanging flange constituting the cast-off and having a post and locking device, the post receiving about it the under or second thread, substantially as described.

- 5 7. A sewing-machine containing the following instrumentalities, viz: an eye-pointed thread-carrying needle, a take-up, a cam to operate the same, a circularly-moving loop-taker provided with a point, a flange or cast-off in continuation thereof and grooved internally, a needle-clearance space, and a throat leading from the point inwardly toward the center of motion of the loop-taker and to the needle-clearance space, a bobbin case or shell having an open face for the reception of a bobbin containing an under or second thread and having a radial fin and at its inner end an open notch or pocket into

which the point and throat of the loop-taker puts one-half the loop of needle-thread prior to casting said loop about the under or second thread, said throat holding said loop within the said notch or pocket and within the space circumscribed by said bobbin case or shell until the take-up takes the loop of needle-thread off the point of the hook, and means to restrain the rotation of the said bobbin case or shell with the said loop-taker, substantially as described. 20 25

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses. 30

WILBUR F. DIAL.

Witnesses:

G. W. GREGORY,  
F. M. NOBLE.