(No Model.)

4 Sheets—Sheet 1.

M. GANDY.

SEWING MACHINE.

No. 282,625. Patented Aug. 7, 1883.

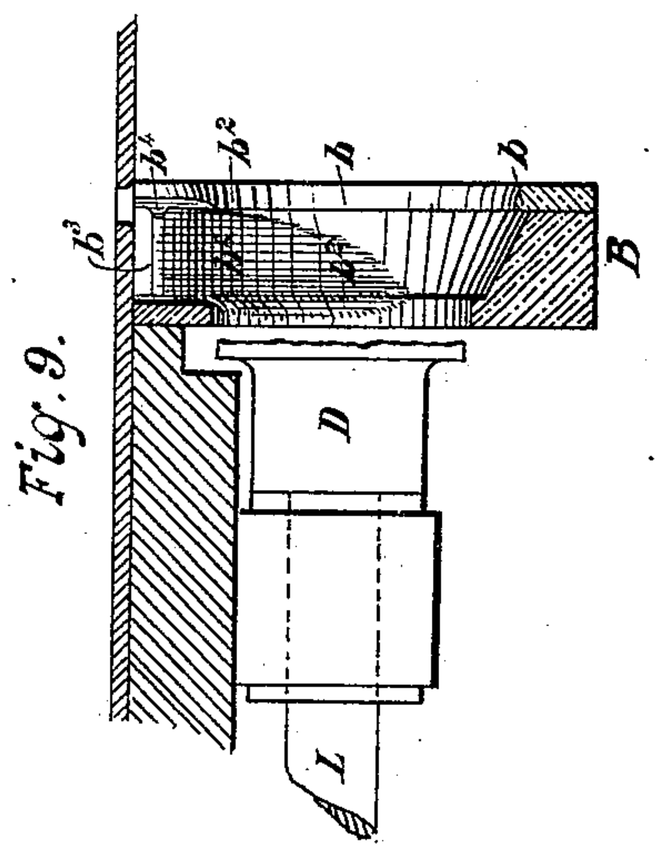

Fig. 9.

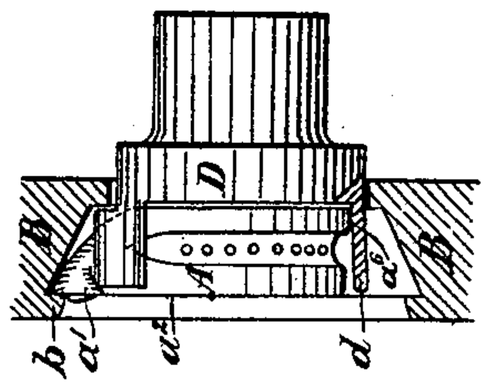

Fig. 2.

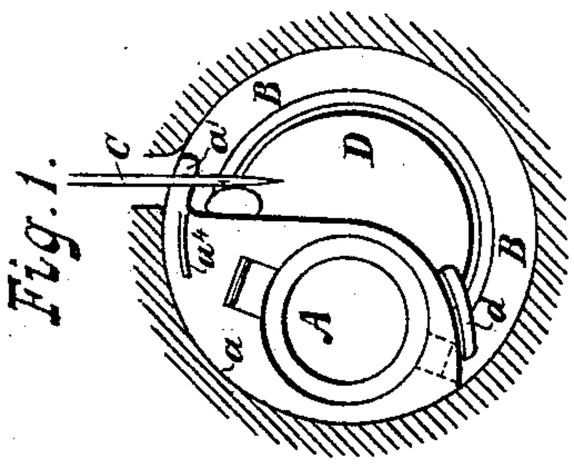

Fig. 1.

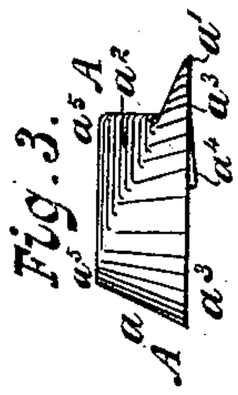

Fig. 3.

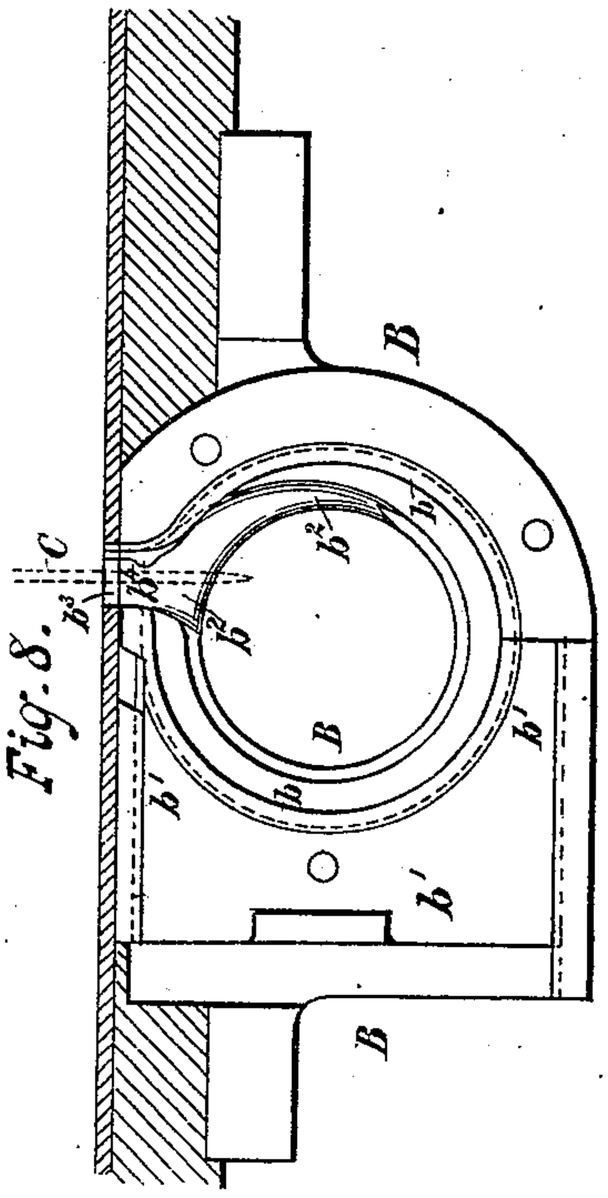

Fig. 8.

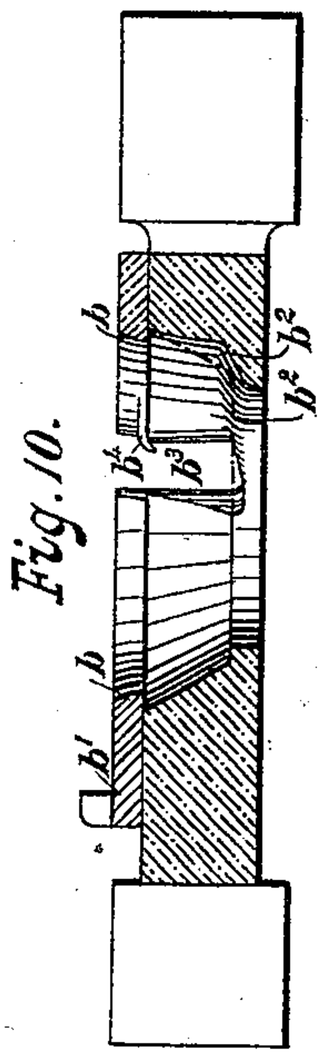

Fig. 10.

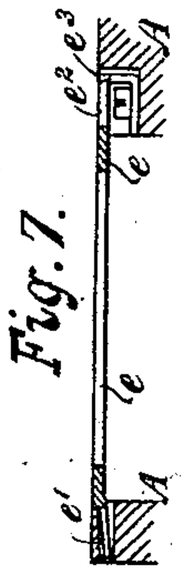

Fig. 7.

Fig. 4.

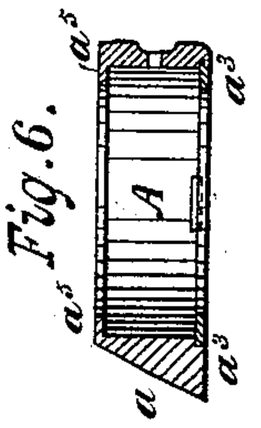

Fig. 6.

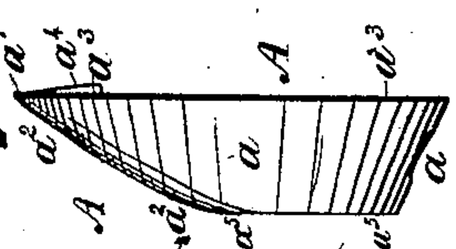

Fig. 5.

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M. GANDY.

SEWING MACHINE.

No. 282,625. Patented Aug. 7, 1883.

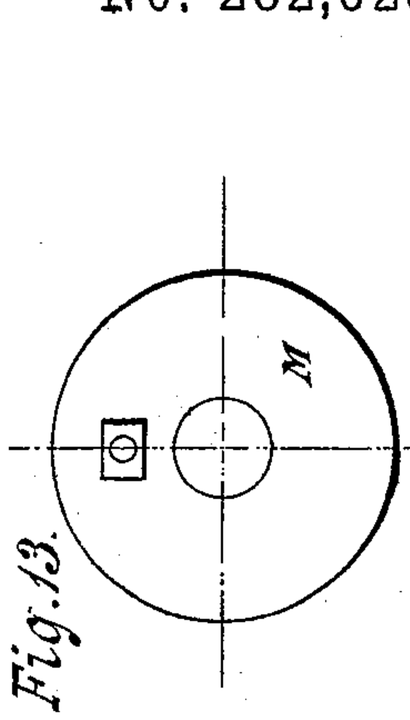

Fig. 13.

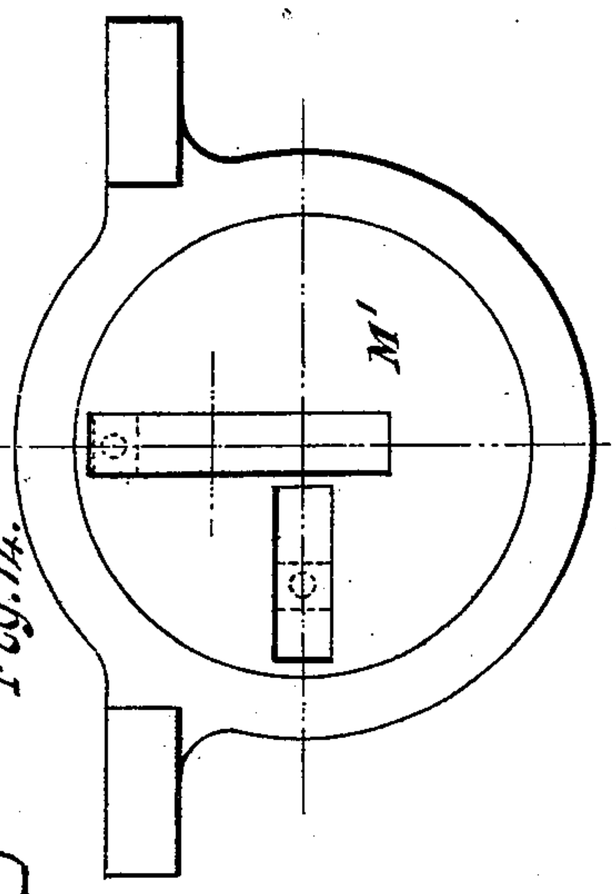

Fig. 14.

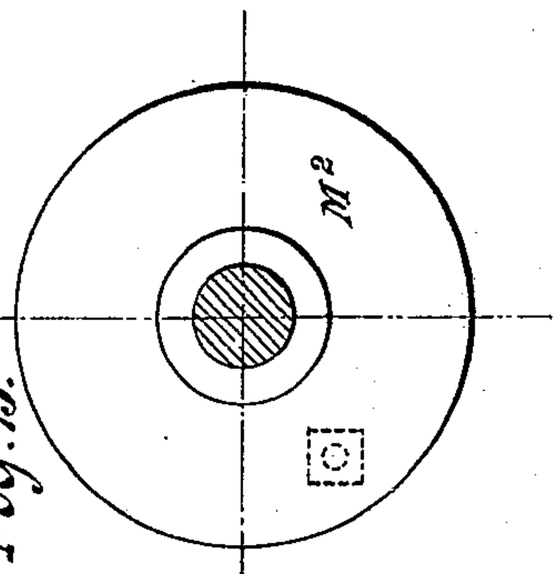

Fig. 15.

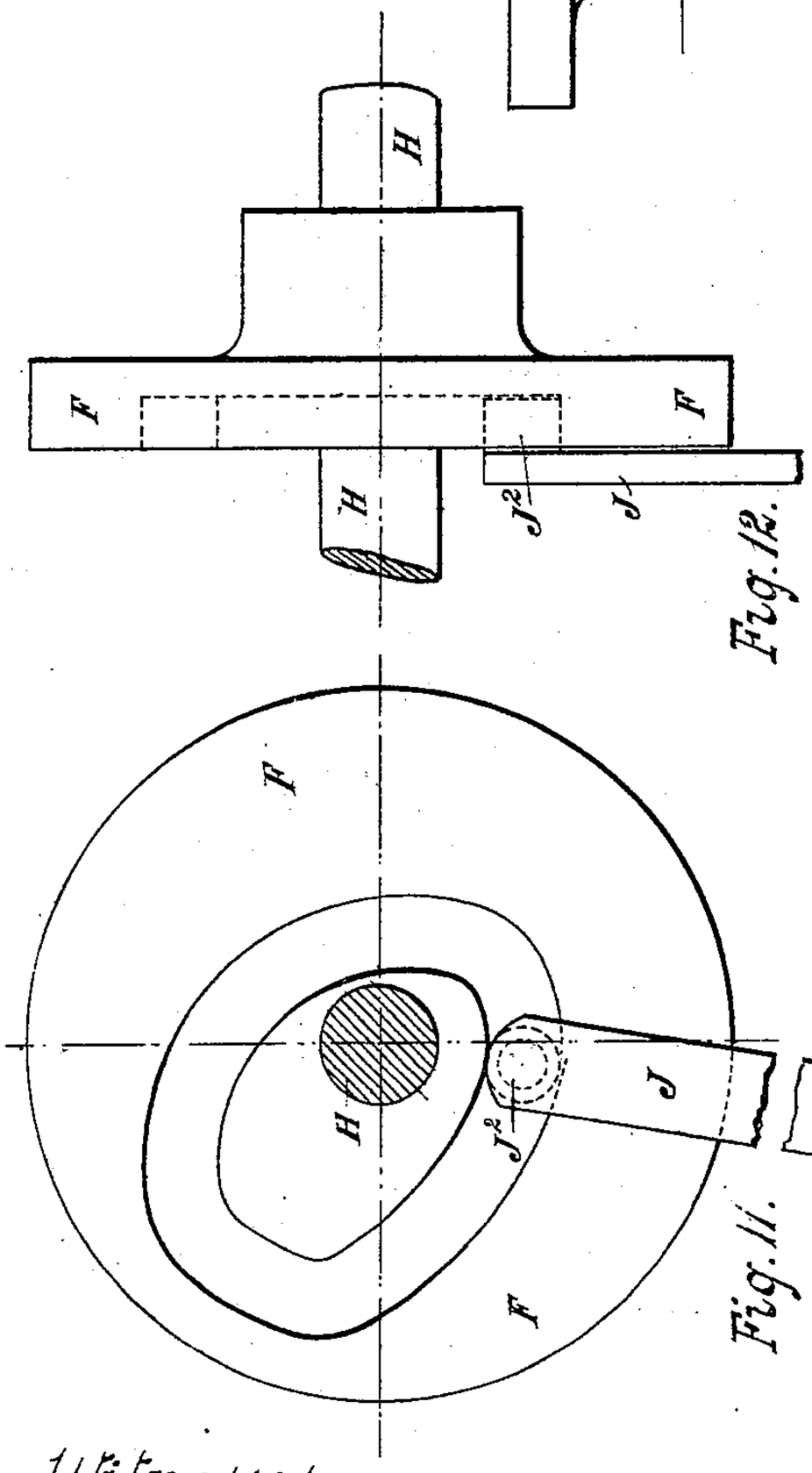

Fig. 12.

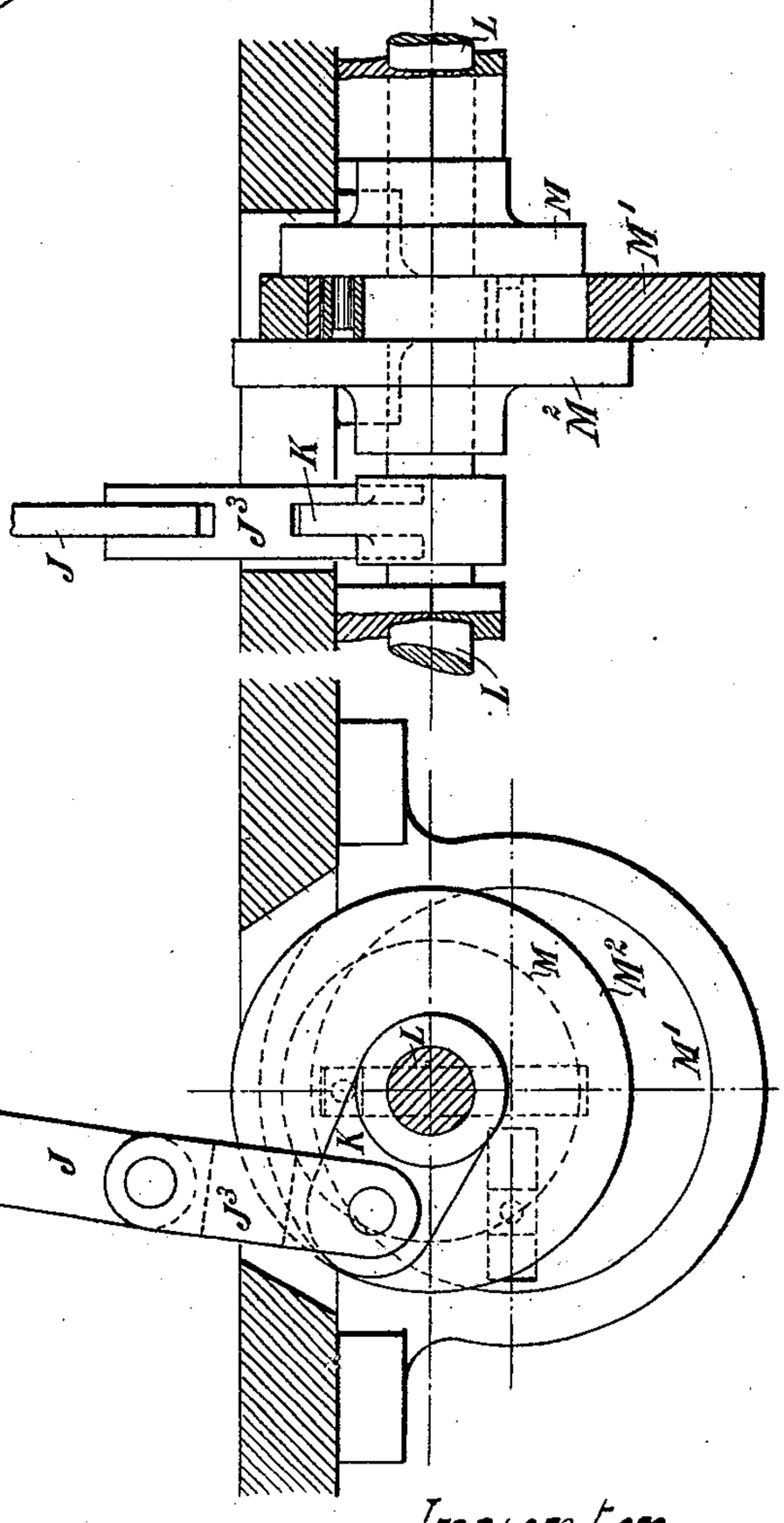

Fig. 11.

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(No Model.)

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SEWING MACHINE.

No. 282,625. Patented Aug. 7, 1883.

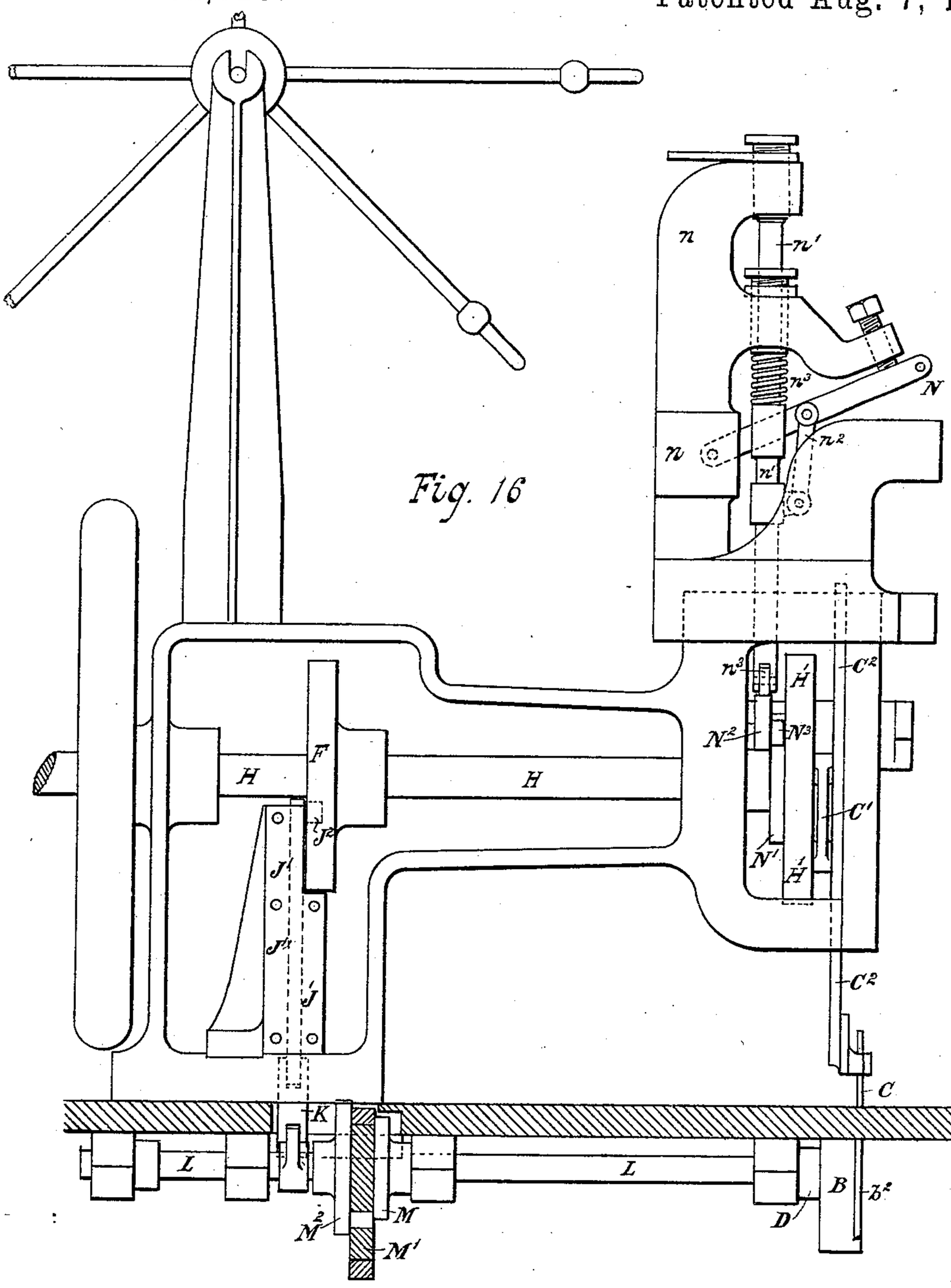

Fig. 16

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(No Model.) 4 Sheets—Sheet 4.

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SEWING MACHINE.

No. 282,625. Patented Aug. 7, 1883.

Fig. 17.

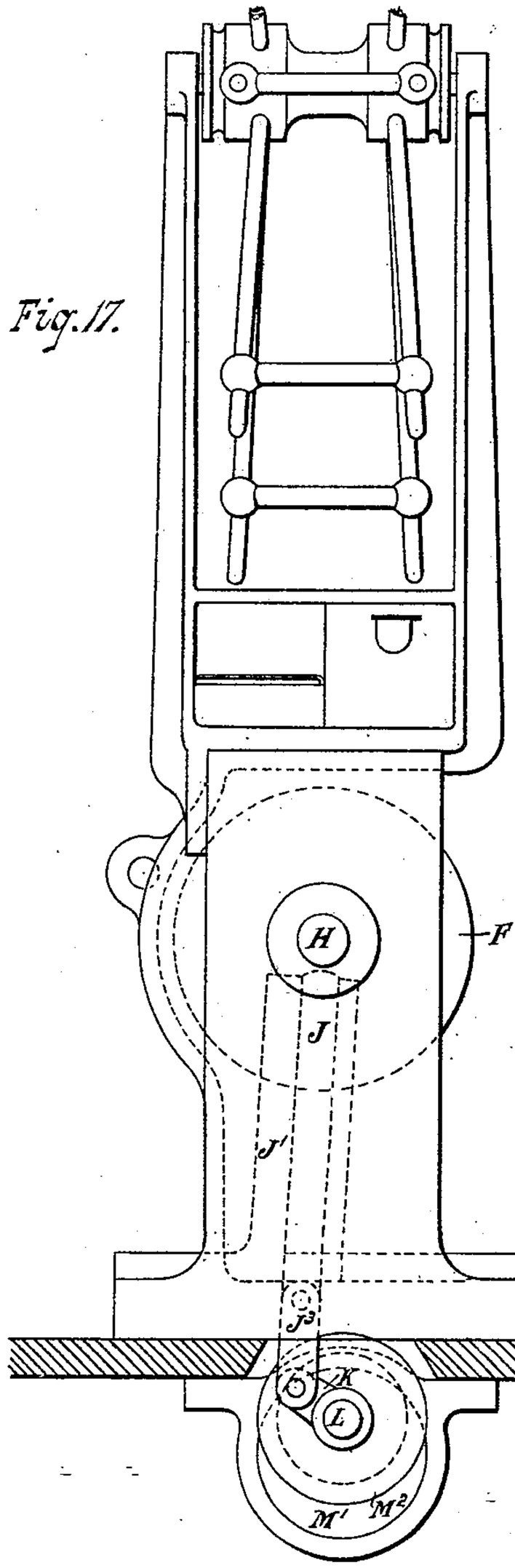
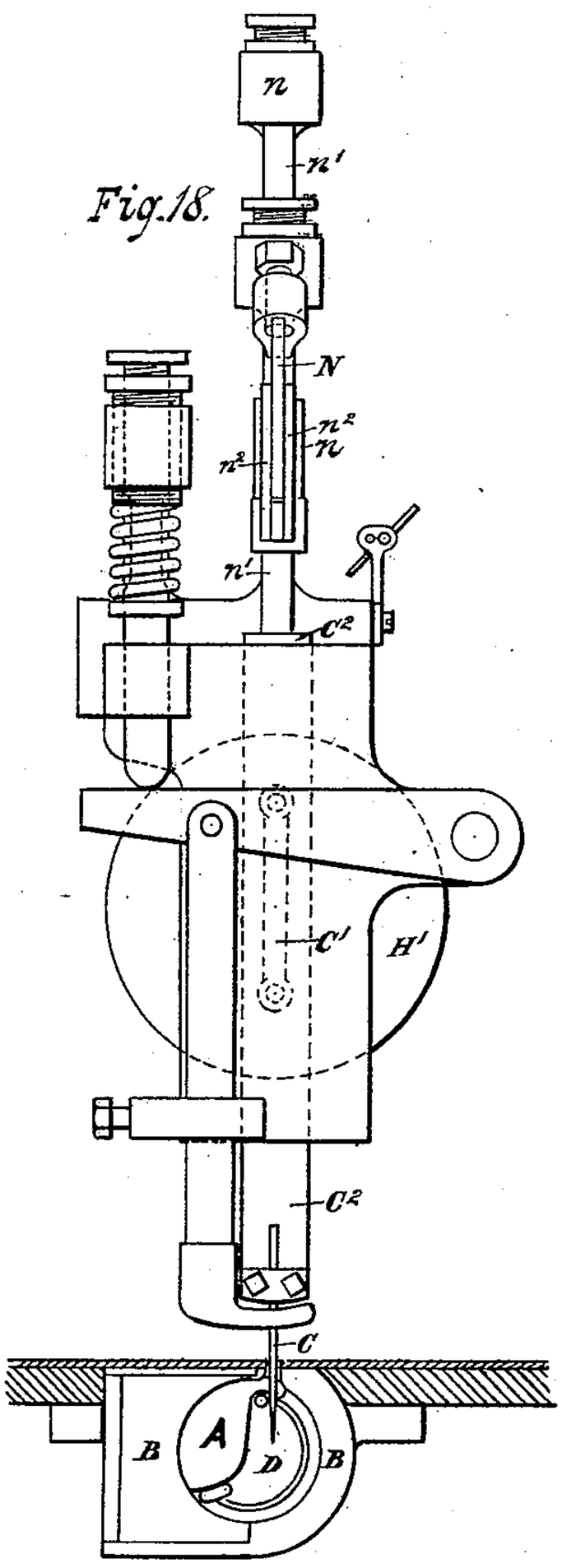


Fig. 18.



Witnesses
Frederick John Cheesbrough
Ernest R. Ruston

Inventor
Maurice Gandy

UNITED STATES PATENT OFFICE.

MAURICE GANDY, OF LIVERPOOL, COUNTY OF LANCASTER, ENGLAND.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 282,625, dated August 7, 1883.

Application filed November 20, 1882. (No model.)

To all whom it may concern:

Be it known that I, MAURICE GANDY, a subject of the Queen of Great Britain, and residing at 5 Ansdell Street, in the city of Liverpool, in the county of Lancaster, in that part of the United Kingdom of Great Britain and Ireland called England, manufacturer of cotton belting, have invented certain new and useful Improvements in Sewing-Machines, and that the same has not been patented to me, or to others with my knowledge or consent, in any foreign country, or in Great Britain; and I do hereby declare that the following is a full, clear, and exact description of my invention, sufficient to enable others skilled in the art to which it appertains or with which it is most nearly connected to make, use, and put the same into practice, reference being had to the sheets of drawings making a part of this specification, and to the letters and figures of reference marked thereon, which correspond with those used in this specification, like letters and figures being used to denote the same or corresponding parts throughout the various views and figures.

My invention consists of the combination of certain mechanical devices arranged to coact with reference to each other to produce the result hereinafter fully specified, the points of novelty being designated in the claims concluding this specification.

In sewing-machines previous to my invention, to enable the needle to be clear of the work before the shuttle drew the thread through the work, it has been proposed to construct the shuttle with a long beak, so as to take the loop, but not to draw the loop and pull the thread downward until the needle is clear of the work. By my invention I effect this object by causing the movement of the shuttle to be stopped at that point in the cycle of its operation when its beak or point has just taken the loop of the thread from the needle, the movement of the shuttle being arrested until the needle is clear of the work, when the shuttle resumes its movement and draws the thread down, passing through the enlarged loop, and having preferably an accelerated motion for the looping operation.

The following illustrates an example of my invention when applied to a sewing-machine with an oscillating or rotating shuttle, reference being had to the annexed drawings, in which—

Figure 1 is a face elevation, showing a shuttle, shuttle-carrier, and shuttle-race according to my invention. Fig. 2 is a vertical section through Fig. 1. Fig. 3 is a plan of the shuttle viewed from the top. Fig. 4 is a perspective view of the shuttle. Fig. 5 is a back elevation of the shuttle. Fig. 6 is a horizontal section of the shuttle. Fig. 7 is a section showing snap-ring for spool-case. Fig. 8 is a face elevation of the shuttle-race. Fig. 9 is a vertical section of the shuttle-race. Fig. 10 is a horizontal section of the shuttle-race viewed from below. Fig. 11 is a front elevation of the shuttle-driving gear. Fig. 12 is a side elevation of Fig. 11. Figs. 13, 14, and 15 are views of variable-motion mechanism for driving the shuttle. Fig. 16 is a side elevation of a sewing-machine arranged to work and operate a shuttle according to my invention. Fig. 17 is a back end view of Fig. 16. Fig. 18 is a front end view of Fig. 16.

In carrying out my invention I use a novel form of shuttle A—namely, I construct the shuttle thus: The external form of the shuttle is that of a pointed oval with a beveled back, *a*. The shuttle has a small hooked point, *a'*, the function of which is to enter the loop of the thread just before the motion of the shuttle A is arrested. In order to afford an easy passage for the loop of the thread over the shuttle A, the shuttle hook or point *a'* is cut away at its back a^2, with an easy fall from the hook-point *a'* in the line of the axis of the oval. The face a^3 of the shuttle and hook-point *a'* are flush, having a plane surface; but at the hook-point *a'* I form a small ridge, a^4, or projection, flush at the front point and rising gradually for a short distance in line with the bearing-edge of the shuttle. This ridge or projection is on the face of the shuttle A, just clear of the flange *b* of the race B, hereinafter spoken of, and has for its object to prevent the thread entering between the flange *b* of the race B and the shuttle A. On the face side of the shuttle, or that side next to the needle C, it is flat, or nearly so, for the reason that on the face side it has to keep flush up to the flange *b* on the

race, so as to enable it to enter the loop of the thread properly, and thus insure against the missing of stitches. After the point a' of the shuttle has entered the loop and taken up all the slack of the thread below the work, leaving the thread straight, so that the needle C, in its upstroke, has no slack thread to carry up with it through the work, and thus form a kink or curl, the shuttle A stops—namely, its motion is arrested—and the needle C continues to rise until its eye is clear of the work. The shuttle A now moves forward, enlarges the loop, and passes through it. At this point it is necessary that no obstruction should be in the way of the free passage of the thread as it is rapidly drawn down across the face a^3 of the shuttle A, to pass round it to give slack to the other side, so as to enlarge the loop sufficiently for the shuttle A to pass through. As the enlargement of the loop is much greater at the back side, a^5, of the shuttle—in fact, the thread runs perpendicularly or straight on the face a^3 of the shuttle A, while all the swell of the loop is at the back side, a^5, of the shuttle A, or away from the needle C—hence the thread requires to run freely and without any friction, as it all has to pass down from the top bobbin, through the work, round under the shuttle A, and up at the back, as the thread at the back side, a^5, of the shuttle A is fast to the work and cannot give down any slack; hence all the slack for the loop of the thread must pass down the face a^3 of the shuttle A, under it, and up at the back side, a^5, with the utmost ease, so as to avoid chafing the thread, as each part of the thread has to pass and repass many times before it becomes taken up in the work. Thus, suppose it takes two inches of thread to form the loop large enough for the shuttle A to pass through, and each stitch only absorbs one-eighth of an inch, it follows that every part of the thread must pass and repass through the eye of the needle C and round the shuttle A fifteen times before it is at rest in the work, during which time the thread undergoes a great amount of wear and tear through being so constantly in friction, and hence anything that can be done to lessen the wear and tear lessens the liability to breakage of the thread and must be of great advantage in work. It thus follows that the form of shuttle that takes the least quantity of the needle-thread to form the loop which it has to pass through must be the best form to use to save breakage of thread. This object is attained by the use of the shuttle A, which has an inclined or bevel back, a, as hereinafter mentioned, and is so constructed and used that the thread passing at an angle over the back of the shuttle A is used in the smallest quantity.

There is another advantage in the bevel form of the back of the shuttle A—namely, the impossibility of the looped thread riding on the back a of the shuttle when it is carrying forward the loop and extending or swelling it to pass through. Thus when the shuttle A is extending or swelling the loop to pass through, the end of the needle-thread, that forms the loop and is at the back side, a^5, of the shuttle A, and across the shuttle A up to and fast to the work, is the tightest, and by leading across the back side, a^5, of the shuttle to the throat-plate of the machine, it must of a necessity, as it is carried forward by the shuttle A, tend to ride on the top of the back a of the shuttle A, and thus become jammed in the shuttle-race B and break, unless some provision be made to cause it to pass freely over and off the back a of the shuttle before it is caught in the race B. This provision is obtained by the bevel form of this shuttle A, as the thread slips off as the shuttle A moves forward in the race B.

Other forms of shuttle having rounded, ridged, grooved, or flat backs have been used with a spring appliance to cause the loop to clear the shuttle A; but such appliances are uncertain in their action and are liable to break and get out of order, thus causing great delay. The bevel form of shuttle is not liable to any of these drawbacks; hence the great advantage in its certainty of action without any of the before-mentioned appliances, it being a guard in itself.

By a "bevel-shuttle" is meant a shuttle where the face-diameter is larger than that of the back-side diameter, or whose one side is of larger diameter at the rim than the other side at the rim, whether face or back side. This bevel-shuttle, being heavier on the side having the large diameter than it is on the side with the small diameter, has the further advantage of being easily kept up to contact with the flange b on the needle side of the shuttle-race B, and thus insuring it being always in the position to take the loop properly. This is done by allowing the shuttle A to rest on the back side, a^5, with the small diameter, either by putting a slight bevel on the heel a^6, or base of the shuttle, where it rests on the horn d of the shuttle carrier or driver D, or by putting a slight bevel on the horn d of the driver D, or by slightly beveling both the shuttle-heel a^6 and the horn d, or by merely making the horn d take or bear on one side of the base or heel a^6 of the shuttle A. In either case the shuttle A will then rest on the side that is lightest and farthest from the flange b of the race B, and resting on that side only, it will cause it to lean the upper or beaked part, a', against the flange b of the race B, from the commencement of its forward stroke until after it has taken the loop and its motion has been arrested or stopped before passing the loop. Then as it passes forward through the loop and tilts over, this leaning action or tendency being released by the reverse position of the shuttle A, the loop will not be impeded in its free action over the shuttle A. The shuttle then returns to its vertical position, ready for another stitch, when the leaning action will again be brought to bear to keep the shuttle A in its position in the forward stroke. This bevel-

shuttle A works in a circular race, B, turned with a bevel to correspond to the bevel of the shuttle A, and having a flange, *b*, on the face side to hold the shuttle A in its place, a part of which flange is made to slide laterally at *b'* to enable the shuttle A to be taken out to have the bobbin changed. About a fourth of this bevel-race B is hollowed out or cut away at b^2, so as to give free action to the loop when it is being carried forward and extended by the shuttle A, preparatory to its passing completely through. Were the part of this bevel-race B not cut away at b^2 or hollowed out to give free play to the loop, it would jam in the race B and be broken by the shuttle A. The flange of the shuttle-race *b*, which the hook *a'* of the shuttle A meets when advancing across the throat b^3 of the race B, is formed with a lip, b^4, over which the loop rides. This, in conjunction with the provision a^4 on the shuttle, before spoken of, effectually prevents the thread jamming between the shuttle and the race.

The shuttle is operated in the race B by means of an oscillating shuttle-driver of ordinary construction, working in the shuttle-race and receiving its oscillating or rocking motion and its stop from the shuttle shaft and gear, hereinafter described.

The shuttle A is recessed to receive the bobbin or thread-holder, which is placed in this recess and retained on one side by a flange forming part of the shuttle, and on the other by a flush snap-ring, *e*, with two projections, one of which, *e'*, is a small tenon, which fits into a corresponding mortise in the heel of the shuttle. The other projection, e^2, engages with a spring, e^3, inserted in the front part of the shuttle A, as shown at Fig. 7.

To give the correct motion to the oscillating shuttle above described, I use a cam, F, on the driving-shaft H of the sewing-machine, which cam F gives the necessary variable movement and stop to the shuttle A, which it actuates by means of a vertical sliding rod, J, inclosed in a guide-bracket, J', which prevents the rod J having any lateral motion. This sliding rod J is provided at its upper end with a roller-stud, J^2, that works in the cam F. The lower end of the sliding rod J is connected to a crank, K, on the shuttle-shaft L by a link, J^3. Thus as the cam F rotates it imparts to the sliding rod J, and thereby to the shuttle-shaft L, a variable motion and stop or pause, which motion and stop or pause is imparted by the shuttle-shaft L to the shuttle A in its race B. The shuttle-shaft L is in two lengths, which are coupled together by the three disks, M M' M^2, (shown at Figs. 13, 14, and 15,) the function of which is to give a farther variable motion to the shuttle A during its oscillation. The needle C, being at its lowest point, rises and throws out the loop which the point or beak *a'* of the shuttle A enters, and then advances until it has taken up all the slack of the loop, thus leaving a perfectly-straight thread for the needle C to pass up without liability to kink or curl. The shuttle A then stops or pauses until the needle C has risen up through the work on a straight thread without causing snip, twist, kink, or curl, thus avoiding any breaking of the thread, as the thread is not drawn until it has a clear hole to pass through. This immunity from breakage is obtained by giving the stop or pause to the shuttle A after it has well entered the loop and taken up all the slack of the loop; such stop or pause continuing until the needle has risen clear of the work, when, having the hole made by the needle in the work clear, the shuttle A draws down the thread, opens the loop, and passes through, when it again pauses before returning, while the take-up N draws the thread through and completes the stitch, thus avoiding any friction on the thread. The shuttle A then returns back to the correct position to make another stitch, where it again passes to enable the needle to complete its downward stroke and rise to throw out the loop. Thus there are three distinct motions and stops or pauses in every cycle of motion of the shuttle.

To enable the operation to be correctly performed, the take-up N is worked by a suitable form of cam, N', that gives down just the exact quantity of thread that is required by the needle C and shuttle A at the different stages of the stroke, so as to enable the needle C and shuttle to perform their work without having any undue slack in the thread at any time, which is a great advantage in sewing thick, hard, or heavy work, as undue slack is apt to kink. I work the take-up N by a cam contrivance, N'—namely, on the end of the driving-shaft H at the head of the machine I employ a crank-disk, H', that acts as the crank for the connecting-rod C', that works the needle-bar C^2 up and down. I shape this crank-disk H' into an outside cam, N', of the required form; or I make it a box-cam on the reverse side. In connection with this cam I have a rocking lever, N^2, which has a roller-stud, N^3, on it, which roller-stud N^3 runs on the cam N' and causes the rocking lever N^2 to move up and down and actuate the check-lever or take-up N, which is thus mounted, namely: On the head of the machine there is a bracket, *n*, which serves as the bracket for the check-lever or take-up N, and at the same time forms a guide for a vertical sliding bar, *n'*, which is connected to the check-lever N by a link or connecting-rod, n^2. This vertical sliding bar *n'* has a roller, n^3, on its lower end, which runs on the rocking lever N^2, before mentioned, or in the box-cam, as the case may be. The take-up N is thus caused to rise and fall in accordance with the motion of the rocking lever N^2 or the box-cam N'.

The check-lever N passes through a slot in the sliding rod *n'*, and is, as before stated, attached to the rod by a link, n^2, thus causing the sliding rod *n'* to impart to the check-lever N a vertical radial movement.

To the sliding bar *n'* and check-lever N there

is applied a spiral spring, n^3, or other suitable adjustable buffer, to relieve the check-lever N from the concussion or jerk caused by its very sudden movements when running at a high speed.

The needle-bar C^2 is worked by a connecting-rod, C′, from the crank-disk H′, as above mentioned.

What I claim as my invention is—

1. In a sewing-machine, the combination of a shuttle, A, a shuttle-carrier, D, a shuttle-case, B, and a needle, C, and mechanism, substantially as described, for operating the needle and shuttle, whereby said shuttle is caused to pause in its movement after its beak has entered the loop of the needle-thread until the eye of the needle is above the work, as set forth.

2. In a sewing-machine, a rotating or oscillating shuttle, A, consisting of a segment of a circular disk having a sloping externally-curved surface equal to and corresponding with the arc of the raceway B, in which it travels, and having an irregular internally-curved surface, substantially as shown, forming a blunt point on the rear end of the shuttle and a beak, a', on its front end to take the loop, and having a rib, a^4, to clear the thread, substantially as described.

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