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7 Sheets—Sheet 1.

C. E. TIBBLES.

SEWING MACHINE.

No. 274,056.

Patented Mar. 13, 1883.

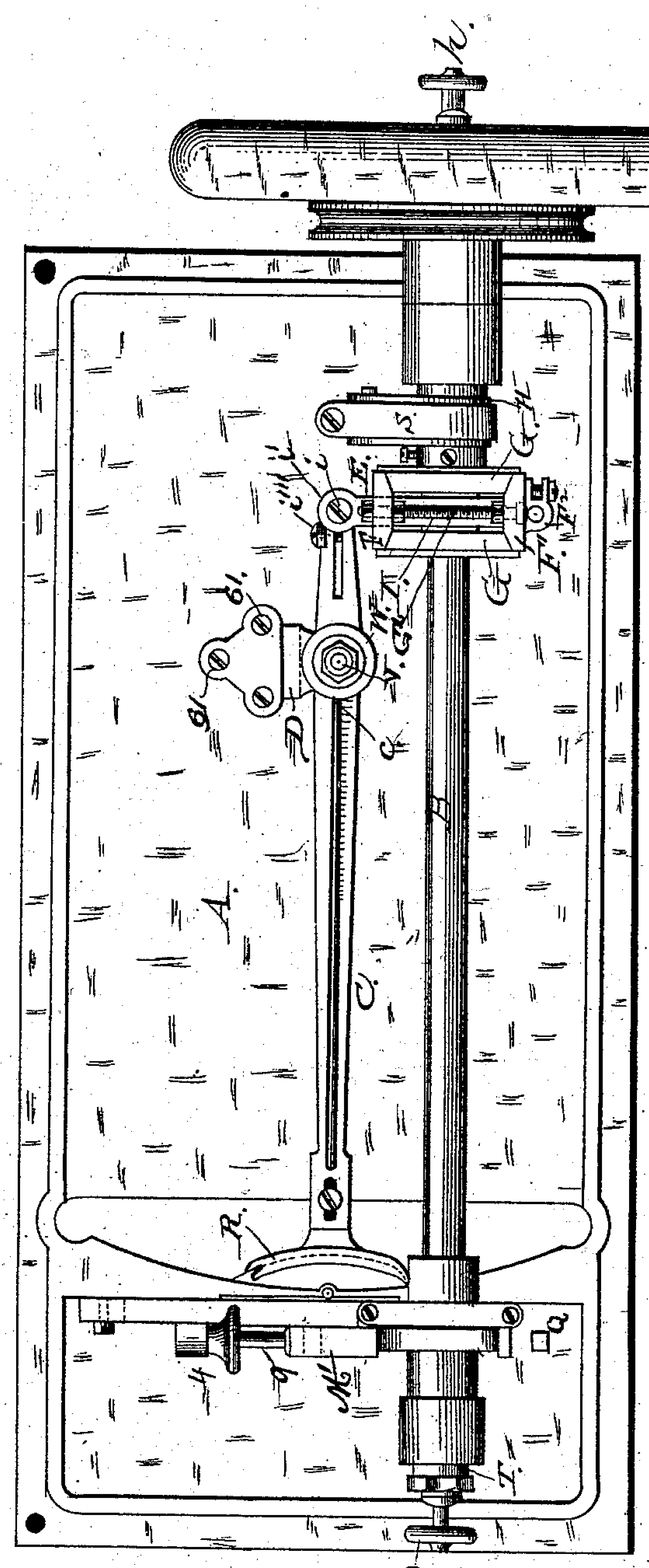

Fig. 1.

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R. K. Evans

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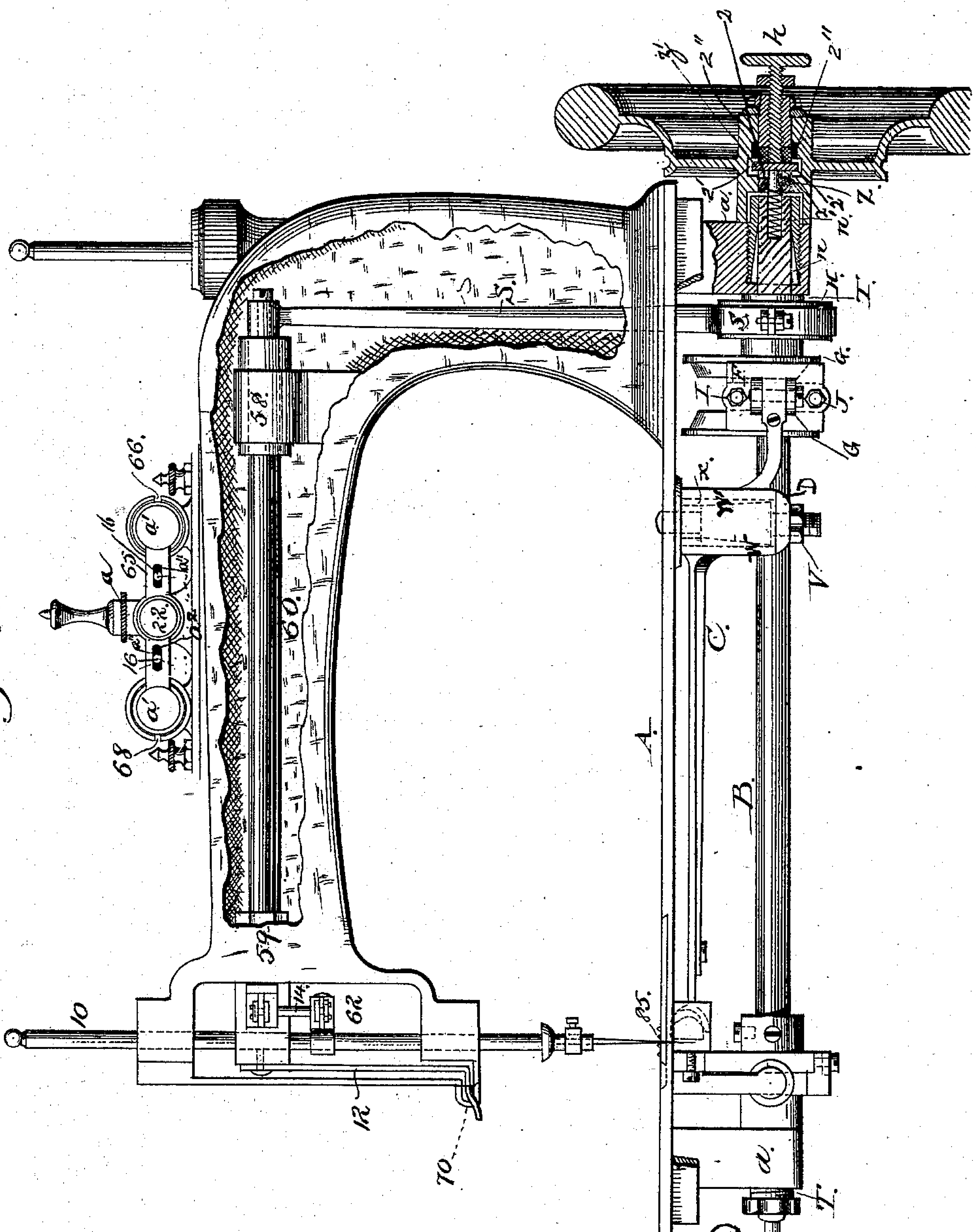

Fig. 2.

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C. E. TIBBLES.

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Fig. 3.

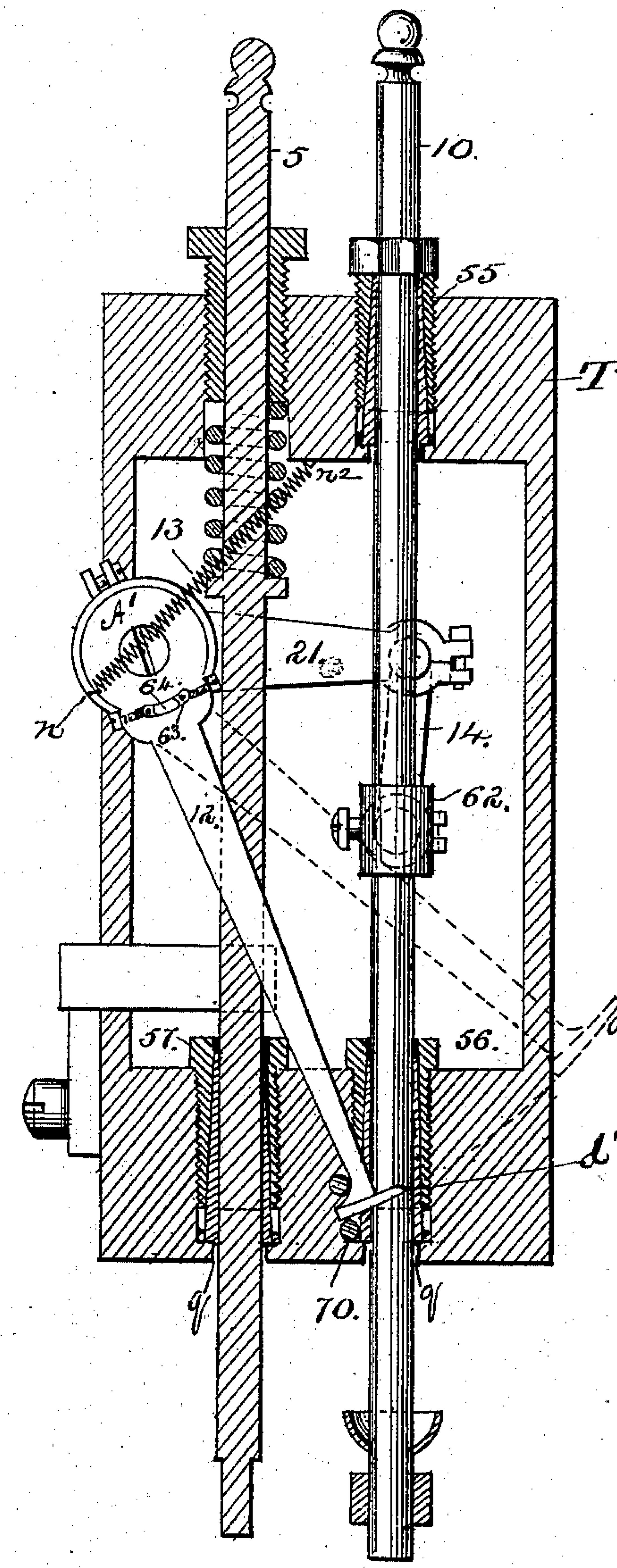
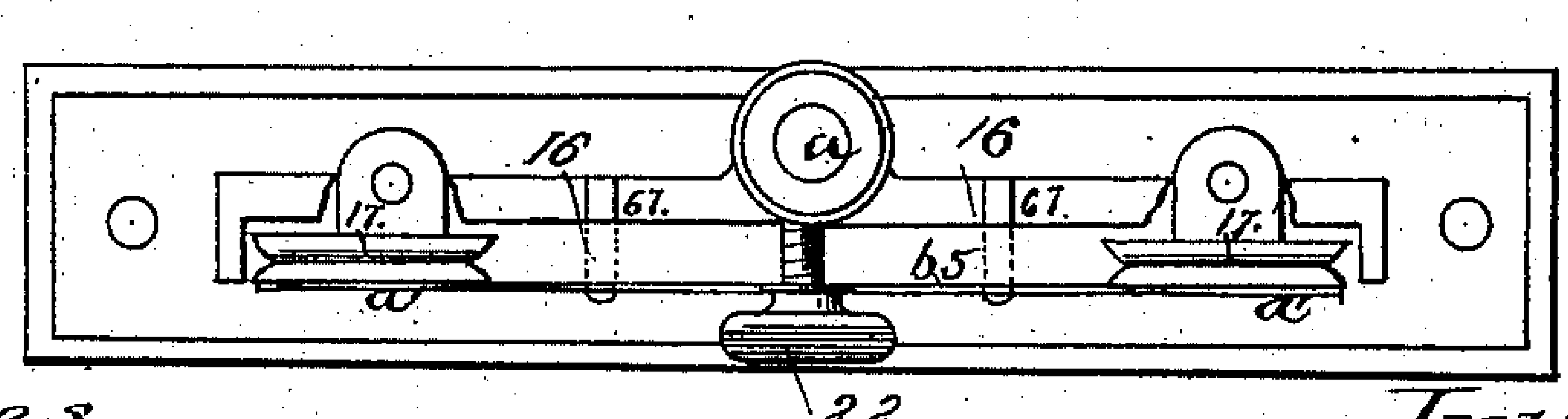


Fig. 4.



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C. E. TIBBLES.

SEWING MACHINE.

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Fig. 5.

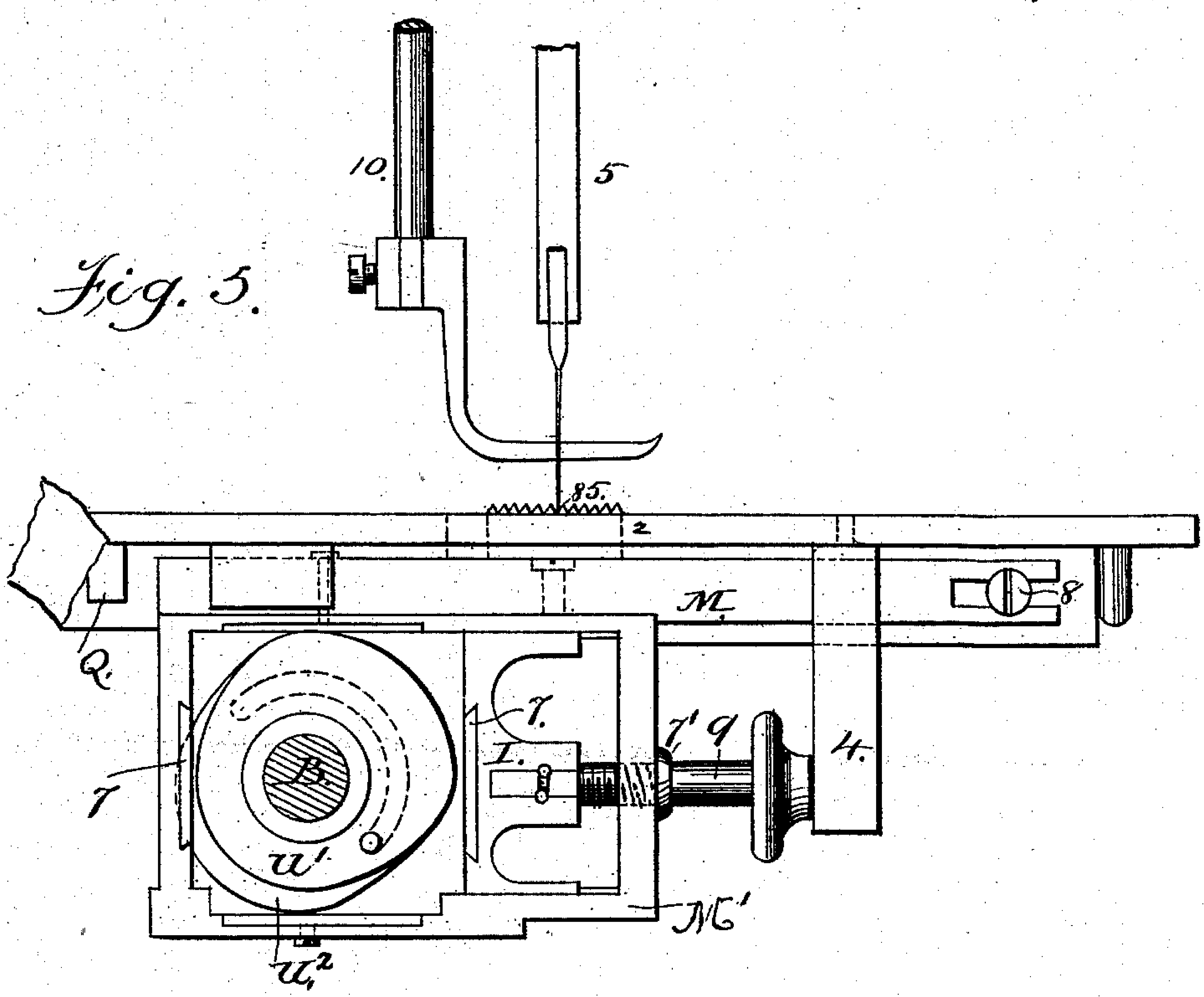


Fig 8.

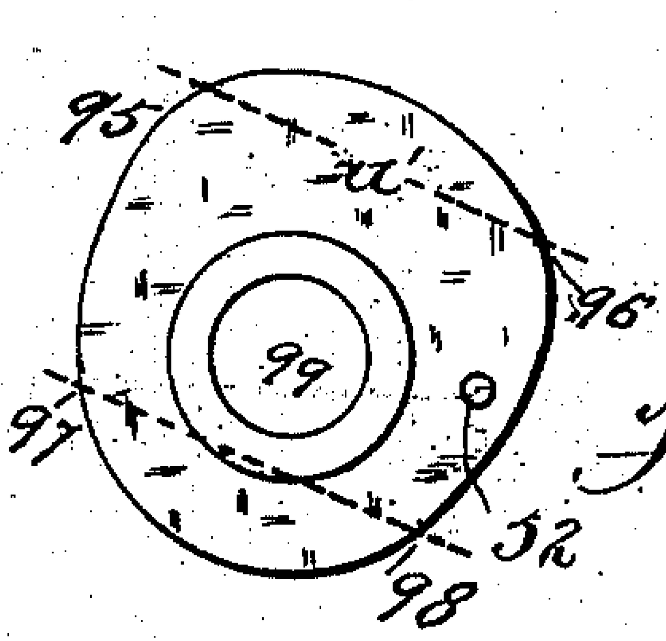


Fig. 9.

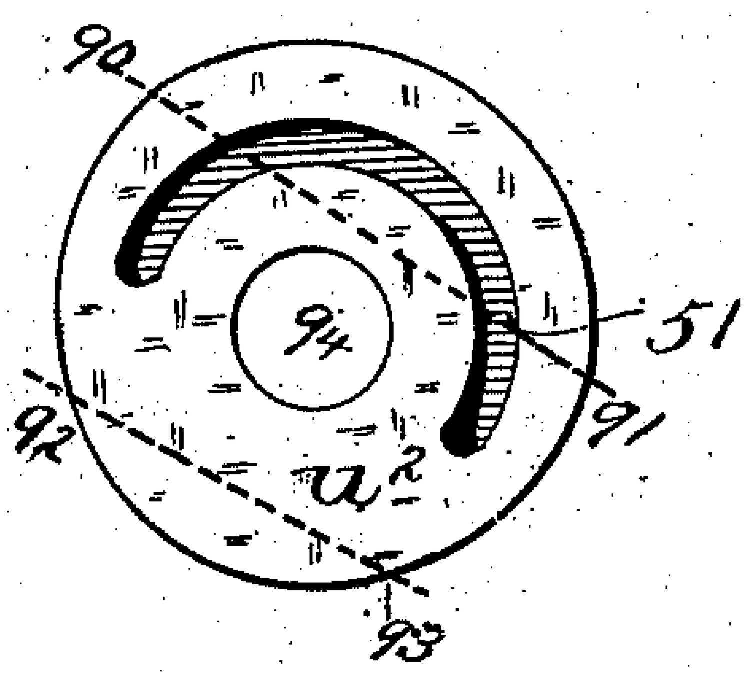
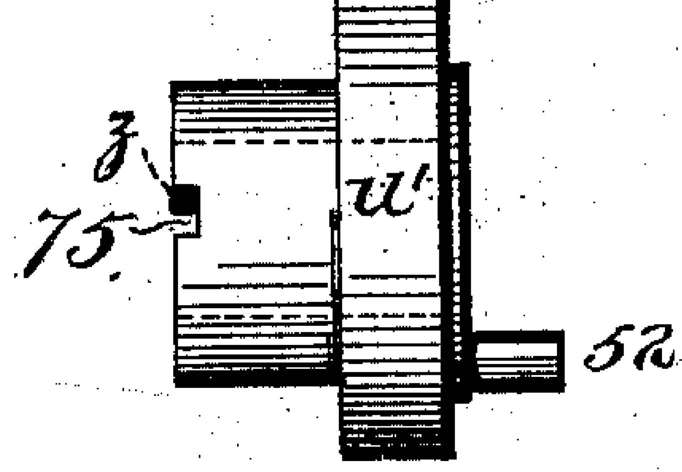


Fig. 10



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C. E. TIBBLES.

SEWING MACHINE.

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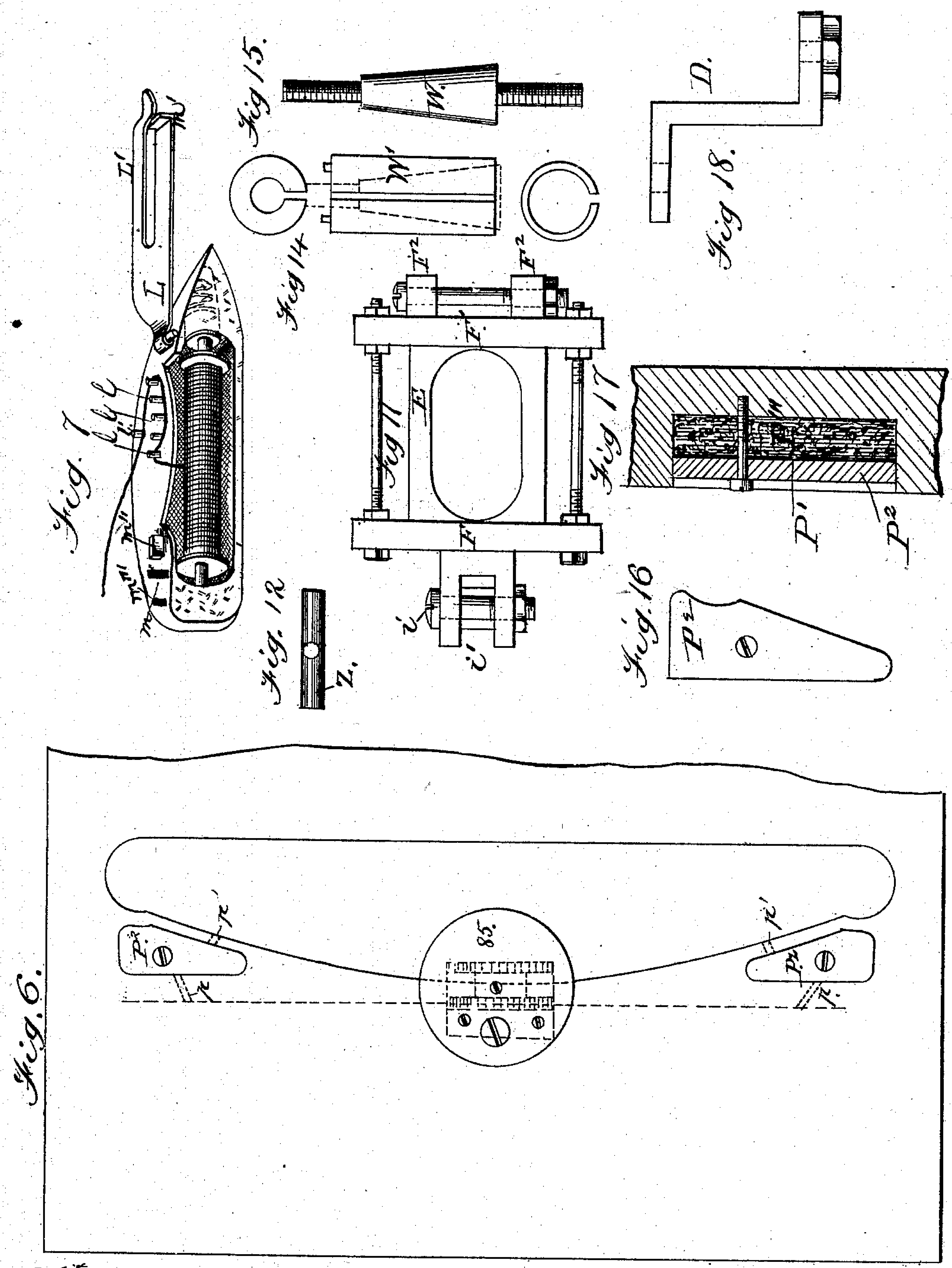

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C. E. TIBBLES.

SEWING MACHINE.

No. 274,056. Patented Mar. 13, 1883.

Fig. 23.

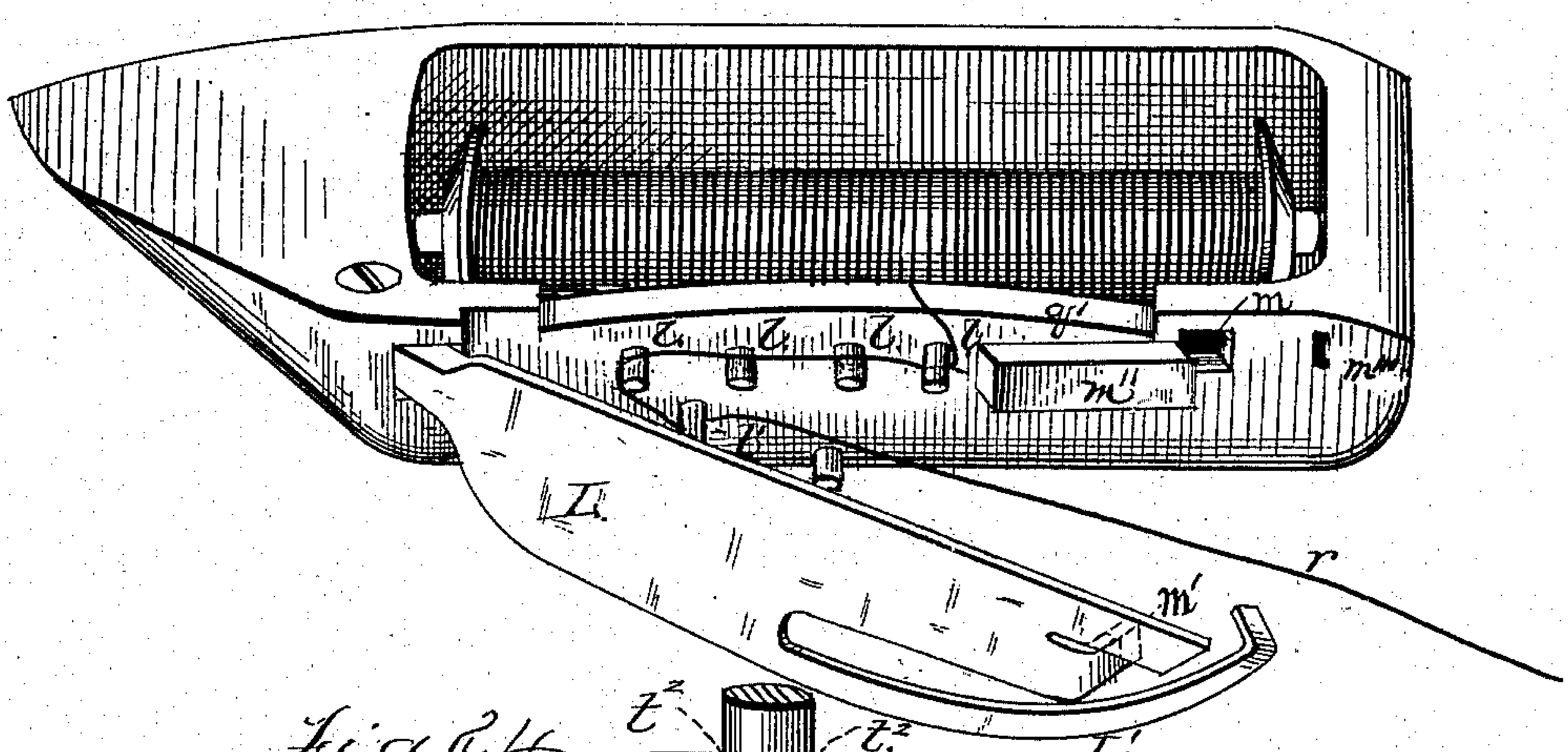


Fig. 24

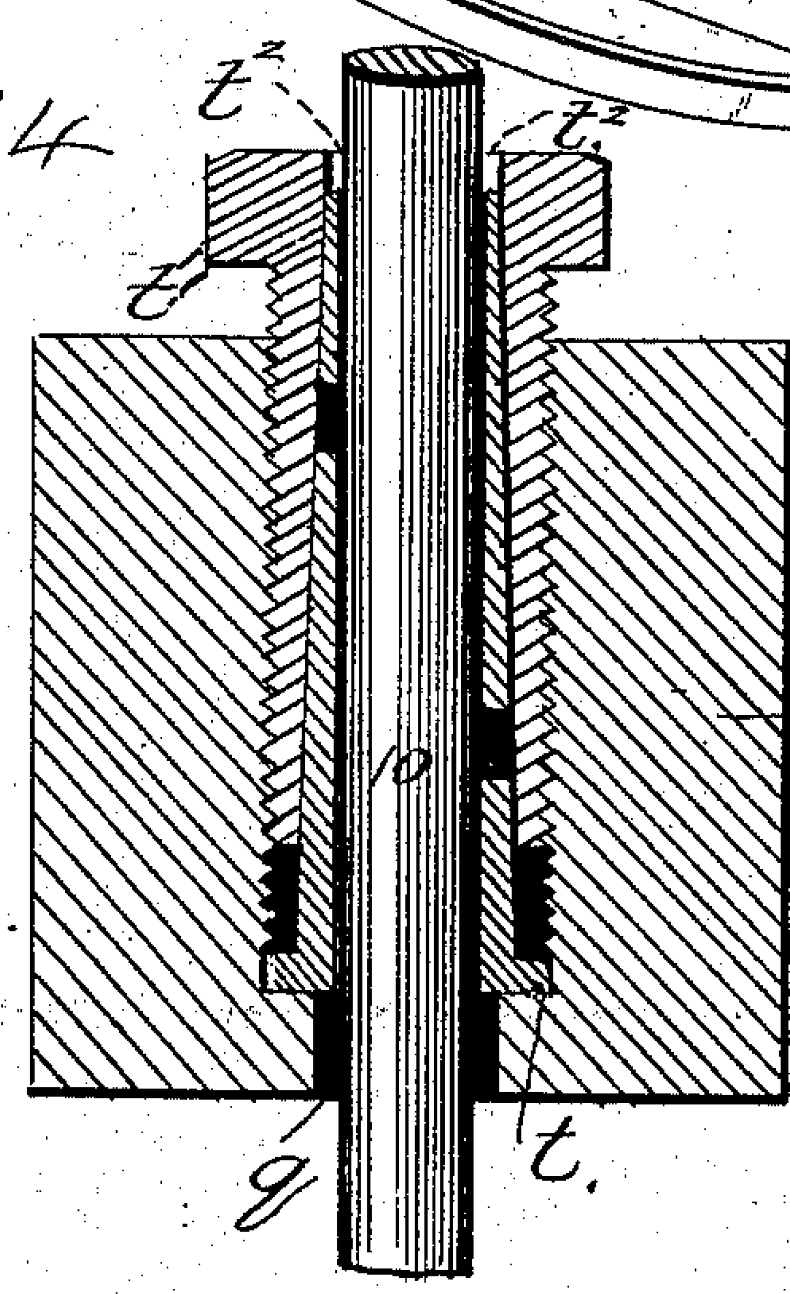
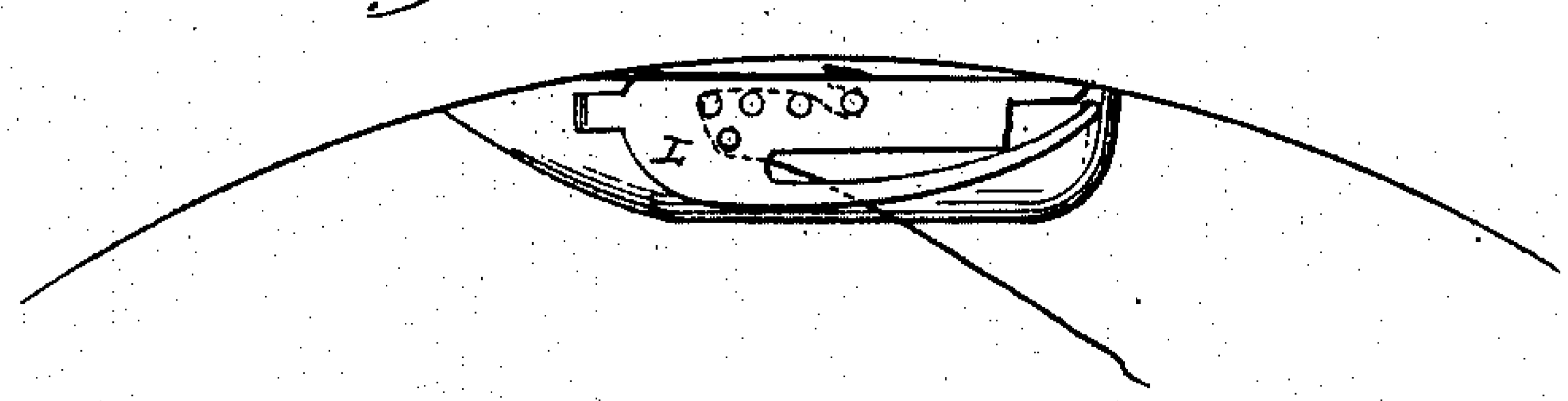


Fig. 13

Fig. 25.



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(No Model.)

7 Sheets—Sheet 7.

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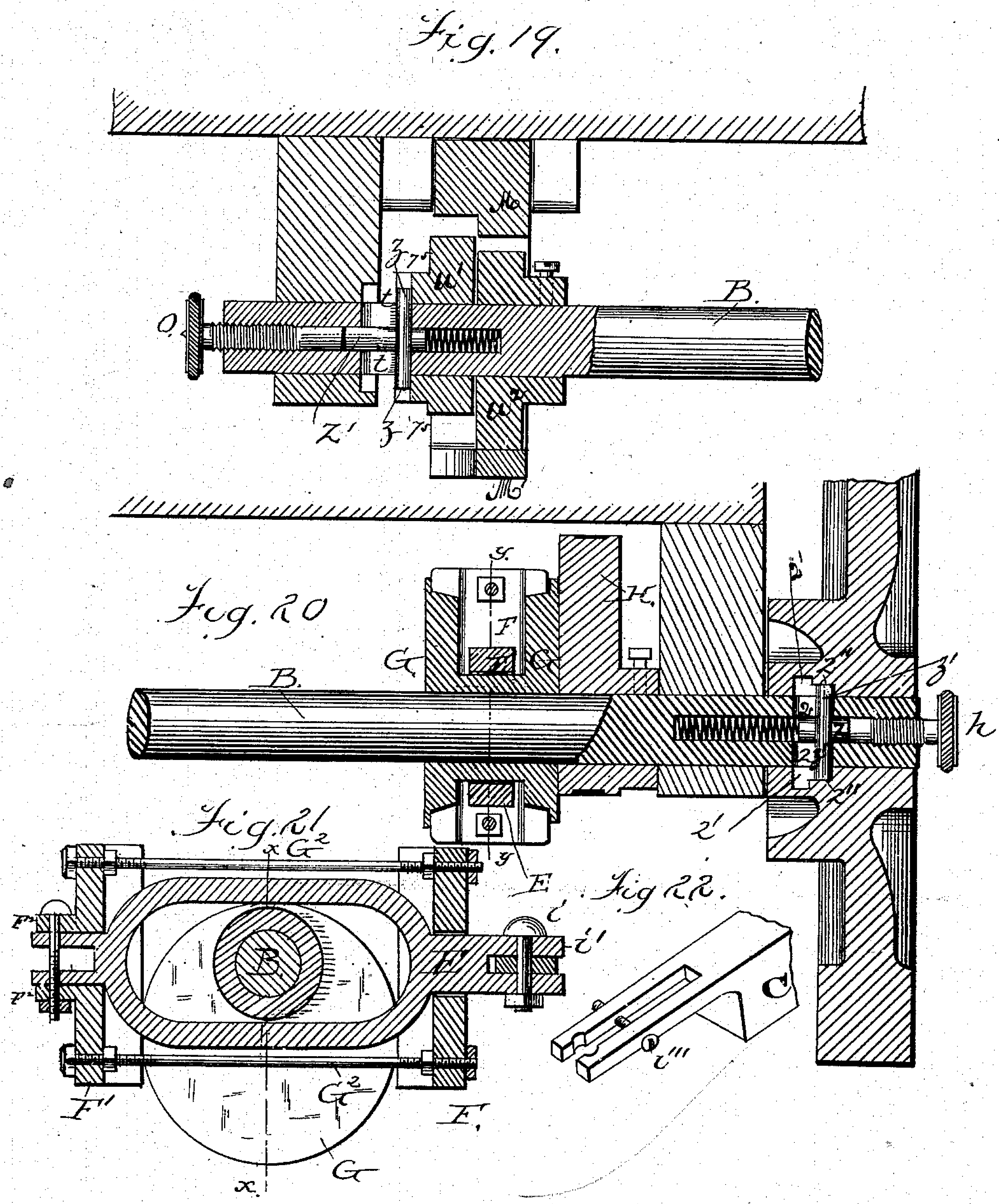

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UNITED STATES PATENT OFFICE.

CHARLES E. TIBBLES, OF BURLINGTON, IOWA, ASSIGNOR TO THE TIBBLES SEWING MACHINE COMPANY, OF SAME PLACE.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 274,056, dated March 13, 1883.

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

To all whom it may concern:

Be it known that I, CHAS. EDWIN TIBBLES, of Burlington, in the county of Des Moines and State of Iowa, have invented certain Improvements in Sewing-Machines; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a bottom plan of the bed-plate and operating mechanism. Fig. 2 is a side elevation, partially in section to expose some of the interior parts. Fig. 3 is an end view of the head of the machine with the face-plate removed, and partially in section to show the contained parts and bearings. Fig. 4 is a plan view of the upper tension. Fig. 5 is a detached view of the feed-bar and operating mechanism. Fig. 6 is a plan, showing the shuttle-race and lubricating devices. Fig. 7 is a perspective view of the shuttle. Figs. 8, 9, and 10 illustrate the feed-operating cam. Fig. 11 is a detached view of the cross-head which connects the shuttle-lever with its operating mechanism. Fig. 12 is the operating-pin of the locking mechanism at the ends of the main shaft. Fig. 13 is a view of the compressible sleeve with a spiral groove. Figs. 14 and 15 show tapering stud and split sleeve to form spindle for shuttle-lever. Fig. 16 shows cover to oil-receptacles in bed-plate. Fig. 17 is a section through an oil-receptacle in the bed plate. Fig. 18 is a view of the bracket to support the shuttle-lever. Fig. 19 is a vertical longitudinal section through the feed-operating cams. Fig. 20 is a vertical section through the shuttle-bar-operating mechanism on the line *x x* of Fig. 21. Fig. 21 is a vertical section through line *y y* of Fig. 20. Fig. 22 illustrates the split end of the shuttle-lever. Fig. 23 is an enlarged perspective view of the shuttle. Fig. 24 is an enlarged sectional view of the bearings of the moving shafts to take up lost motion. Fig. 25 is a diagram illustrating the form of the face of the shuttle in relation to the form of the shuttle race.

My invention relates to that class of sewing-machines known as "shuttle-machines," and has for its object to simplify the construction of the machine and enable the operator to work the machine with greater facility and certainty than heretofore.

My invention consists in certain elements of novel construction and arrangement of parts.

In order that those skilled in the art may make and use my invention, I will proceed to describe the exact manner in which I have carried it out.

In the said drawings, A is the bed-plate of the machine, and B the main shaft.

C is the shuttle-operating lever, which is sustained to the bed-plate by means of the bracket D, secured by screws 61 61, and bracing the spindle upon which said shuttle-lever oscillates. The forward end of the main shaft B carries two feed-operating cams, u' u^2. The cam u^2 is keyed rigidly to the shaft, and has on its inner face a semicircular slot or depression, 51, about one hundred and eighty degrees in length. The cam u' has projecting from it, at a point shown, a stud, 52, which, when said cam is placed loosely upon the shaft B, enters the slot or depression 51, so that there is a lost motion as between the two cams equal to the distance of half a revolution.

The cam u^2 is laid out as follows: The working-face of the cam for about three-eighths of a circle struck from the center 94—that is, from 90 to 91—is on a true circle. The portion from 92 to 93 is also a true circle struck from center 94 on a radius about three thirty-seconds of an inch less than the opposite curve. The points from 90 to 92 and 91 to 93 are joined on a curve of greater radius than either of the other radii. The cam u' is laid out as follows: The working-face is divided into four equal parts—two on different radii and two on the same radii. The portion 95 96 is struck from the center 99 on a radius equal to the radius of 90 91 in u^2. The portion 97 98 is struck on a radius one-quarter of an inch less than the portion 95 96, and these two curves 95 96 and 97 to 98 are joined on a curve of greater radius than the radii of curves 95 96 and 97 98. Hence it will be observed that there is a decided difference in the shape of cam u' and cam u^2, and this lack of identity of shape has a very important bearing on the successful practical operation of my invention. The cams u' u^2 work in a yoke, M', attached to the feed-bar M, which surrounds the cams on all sides, so that the cams shall have four bearing-points in the yoke on its interior surface, one bearing lifting the feed-bar, the next point of contact throwing the feed-bar forward, the third point of contact carrying the feed-bar downward by a positive movement, and the fourth point of contact retracting the feed-bar, whereby I obtain a four-way positive-motion feed movement. Within the yoke attached to the feed-bar is a movable cross-head, I, which forms one of the bearing-faces for the cams, and which by means of an adjusting screw-bar, 9, can be made to approach and recede from the fixed end of the yoke M′, thereby increasing or diminishing the throw of the feed-bar.

The outer end of this adjusting-bar 9 in the throw of the feed-bar and yoke strikes at each reciprocation an abutment, 4, to limit the travel of the feed-bar in one direction, while the feed-bar itself strikes an abutment, Q, at the opposite end, to limit the throw of the feed-bar in the opposite direction. By this construction the relative movement caused by the throw of the cams is always maintained as between the two abutments, and thereby the length of the stitch is made absolutely certain at each throw, regardless of the direction and the length of the stitch, or the direction in which the machine is moving and at what speed the machine may be moving, for there is no lost motion in the throw of the feed-bar, it being made absolute by bringing up against the abutments, as before described. The lost motion occurring between the cams by means of slot 51 and pin 52 enables the cam *u′* to adjust itself automatically, so that, regardless of the direction in which the fly-wheel may be turned, the feed-bar will always feed the goods in the same direction.

When it is desired that the feed of the machine shall be in the direction in which the fly-wheel moves—that is, from the operator when the wheel moves from the operator and to the operator when the wheel moves toward him—the loose cam *u′* is fixed to the driving-shaft by means of the set-screw O, which passes into the center of the end of the shaft and operates the spring-pin Z′, which has cross-pin *z* passing through slots *t t* in the shaft and beyond its circumference, which cross-pin is made to enter a recess, 75, in the outer face of the said loose cam and allow a very limited amount of lost motion, as seen in Fig. 10. When in this position the feed of the machine will invariably be in consonance with the direction in which the fly-wheel is turned, and on account of the limited lost motion, due to recess 75 being larger than cross-pin *z*, the machine feeds in perfect time with the other operating parts of the machine.

On the shaft B, adjacent to the fly-wheel, is an eccentric, H, for operating the needle-bar by means of a strap and arm, S, in the usual manner. Next to this eccentric H, I place an operating mechanism for the shuttle-carrying lever C. Two eccentrics, G G, are fixed to the shaft B, and upon these ride a reciprocating cross-head composed of the vertical pieces F F′, having bearing-faces for said eccentrics, and secured at the top and bottom by horizontal screws G^2, provided with jam-nuts to hold the cross-head or frame in an absolutely rigid condition.

The vertical piece F′ is provided with projecting ears F^2, to which is hinged one end of a link, E, which passes through the opening in F′, straddles the shaft B, and passes out through the opening in F, which opening is larger than the said link, so as to permit the latter to have some lateral play. The link E has a bifurcated end, *i′*, through which passes the screw *i*, that engages with the split end of the shuttle-lever C, that rests in said bifurcation.

At the joint of the shuttle-lever and link E all lost motion is compensated for by screw *i* drawing together the bifurcated end of link E, said screw *i* forming the connecting-pivot for lever C and the set-screw *i‴*, which draws together the split end of lever C around the screw-pin *i*. By this construction I am enabled to get a direct longitudinal thrust on the operating-eccentrics for the shuttle-lever, and there is no rising or falling or irregular movement whatever to produce irregular wear of the eccentrics. The slight oscillation necessary for bar E is provided for in a slight enlargement of the opening in the vertical piece F. All lost motion due to the wear of the eccentrics G G and vertical pieces F F′ is taken up by the horizontal screws G^2 and their jam-nuts.

The fulcrum of lever C is any desirable pivot, W W′, adapted to take up wear, and is sustained in the bracket D, which is secured to the bottom of plate A. In compensating for wear, a nut upon the end of the pivot of lever C, if screwed up tightly, would tip the bracket D out of a vertical line and interfere with the perfect working of the machine. Hence I make this bracket D removable, so that when the bearing wears I can remove the bracket and dress down the surface adjacent to the bed-plate, so as to reduce in reality its length and get a true movement.

In order that bobbins may be wound with facility by a friction device bearing against the fly-wheel, and without wearing the moving parts of the machine, I have provided a means for readily rotating the fly-wheel independently of the main shaft. This I accomplish by making the interior of the hub of the fly-wheel with a cylindrical chamber, 2′, and in the edge of such chamber cutting two recesses, 2″ 2″, opposite each other. In a hole bored longitudinally and centrally in the shaft is a loose pin, Z, through which passes a drive-pin, *z′*, projecting beyond the surface of the shaft through longitudinal slots 2 2, cut through the shaft into the central hole. The inner end of rod or pin Z bears on a coiled spring, the constant pressure of which holds it outwardly against a set-screw, h, which controls the position of pin Z. If the set-screw is withdrawn until the spring pushes the pin Z outwardly sufficiently far for the projecting ends of the drive-pin z' to engage in the recesses $2''$ in the edge of the chamber $2'$, then the fly-wheel will be keyed to the shaft and the rotation of one causes the rotation of the other; but if the pin Z is pushed inwardly until the projecting ends of the drive-pin z' enter chamber $2'$, then there is no clutching contact between the shaft and the fly-wheel, and the latter alone turns.

I am fully aware that many devices have been made to perform this same office in various machines. Hence I make no broad claim to any special element recited, but confine myself to the combination and arrangement of the mechanical elements shown and described.

The upper tension is on the upper side of the arm, and consists in a post, a, which carries a cross-arm, 67, (see Fig. 4,) at the ends of which are secured, on vertical pivots, a pair of automatically-adjusting friction-plates, 17 17, against which the passing thread is held by means of two other friction-plates, a' a', fastened to the ends of a spring-plate, 65, through the center of which passes a set-screw, 22, into post a, by means of which the spring forces plates a' a' against the plates 17, and the tension on the thread passing between the said plates and through guides 66 and 68 is increased or diminished at will. The inner faces of plates a' necessarily change in the vertical plane of position as spring 65 is released or depressed, and as they change the pivoted friction-plates 17 change with them automatically by means of the conveyed pressure, and thus the friction-surfaces always remain absolutely parallel. The spring 65 has slots a^2 on each side of the center, through which project guide-pins 16 to keep it in position.

I will now describe my take-up mechanism. On the end of a rock-shaft, 60, oscillated from the main shaft, and just within the face-plate, I loosely pivot the head A' of my take-up arm 12, the lower end of which is provided with a hook, d', to hold the thread. In the head of the take-up arm, concentric to the pivot, is cut a curved slot, 64, and into this slot projects a stud, 63, from the head of the rock-shaft. This stud operates the take-up arm 12 from the rock-shaft, and is in such relation to the curved slot that when the rock-shaft is at its lowest depression the stud bears against the lower end of the slot, and vice versa. A spring, 13, has one end secured to the head of the take-up arm at the point n, and the other end to the head of the machine—say at n^2—and is arranged to keep a constant but varying tension on the head of the take-up arm 12. When the take-up arm is at its lowest depression the tension of spring 13 is greatest and in a line above the center of the pivot of the head, so that it tends to keep the take-up arm down after it is once depressed. As the rock-shaft is vibrated the spring holds the arm down till stud 63 strikes the upper end of slot 64 and, overcoming the stress of spring 13, lifts the take-up arm. This movement transfers the tension of the spring across the center of motion of the head of the take-up arm and in a line below the center, at the same time obviously weakening the tension by allowing the spring to shorten. It will be seen that in this position the spring will hold up arm 12 with an elastic or yielding force until the rock-shaft, moving in the opposite direction, makes the stud traverse the slot 64 until it strikes its lower end and carries the take-up arm downward. The pause in the take-up at the end of the upward movement is to hold the thread taut to prevent it from entangling with the needle before the needle enters the goods, and obviates all necessity for a thread-controller, and the pause at the end of the lower movement is to allow the shuttle time to pass through the loop without strain on the thread, and obviates any lifting of the shuttle from the cradle.

To avoid frequent use of the oil-can, I provide the bed-plate at desired points with recesses cut into the surface of said plate to contain oil, and have minute ducts to convey the oil to the surfaces to be lubricated. For illustration, I have shown these recesses at P', provided with covers P^2, and having ducts p p p' p' leading to the shuttle-race and the bearings of the feed-bar.

To partially destroy or counteract the noise caused by the vibration of the bed-plate, I provide recesses in the bed-plate with a packing of fibrous or other material calculated to destroy the resonance of the machine; and in this particular instance, for purposes of illustration, I show the recesses P' P' filled with felt or wool P''', through which the oil percolates after saturation.

In order to provide a compensating-box for the movable shafts or rods, whereby all lost motion caused by wear may be taken up, I provide such shafts—10, for instance—with a split compressible bushing surrounding the shaft, and having its interior surface conforming to the shape of the moving shaft, and its exterior tapering or conical. The thicker end of this bushing rests against a shoulder, t, on the interior of the outer or supporting box, T', and over it fits a nut, t', having an interior surface corresponding to the taper of bushing t^2, and an exterior-threaded cylindrical surface which screws into the tapped outer or supporting box. The nut is somewhat shorter than the bushing, and the opening in its head is of a size not to come in contact with the shaft. So, also, is the opening q through the lower face of the supporting-box T', in order that the shaft shall come only in contact with the tapering bushing t^2. A spiral split passes once or more around the bushing t^2, and when the interior surface of said bushing wears away, by screwing down the nut t' the tapering bushing is evenly compressed throughout its length and tightened around the shaft.

I am aware that heretofore split compressible bushings have been used with compressing devices constructed like those shown and described by me. I am also aware that a diagonal split has been made in such compressible bushings; but I am not aware that heretofore such bushings have been made with a spiral split passing once or more around it, and I therefore confine my invention to such specific construction.

The shuttle, Figs. 7 and 23, is an open-faced shuttle dressed at the heel and point in a curve parallel to the curve of the race, while intermediately the face is either straight or a curve of a larger radius than the curve of the race, whereby the face of the shuttle does not touch the race between the heel and point, and the shuttle-thread *r* may be passed without danger of abrasion directly over the face of the shuttle to the friction devices. These friction devices consist of a set of pins, *l l l l*, set in line, around which the thread is rove, and another pin, *l'*, out of line, around which the thread is last passed, so that the thread passing the pins in opposite directions will not rub or chafe, as in other shuttles now in use, where pins are used in about the same manner as tension devices.

A latch, L, hinged near the point of the shuttle and provided with a slight bend near its hinge and with a spring-arm, L', closes down over the tops of the pins and rests its free end on a flat projection, *m''*, so as to prevent the latch from coming in contact with the top of the shuttle and binding the thread. A spring end. *m'*, of the latch catches in the hole *m*, and the same kind of a device on the end of spring-arm L' catches in hole *m'''*. This spring-arm prevents the shuttle-thread from getting between the shuttle and the race. The upper edge, *q'*, of the face of the shuttle is made convex to compensate by the curvature for the unwinding of the bobbin irregularly, as has been before done by curved devices, but none where the edge of the shuttle proper has been cut away. Hence I confine myself to this precise construction in this particular.

I am aware that the use of cams on the main shaft to cause a machine to feed the work in one direction while the fly-wheel is rotated in either direction is old. I am also aware that an eccentric has been used to move the feed in the same direction the fly-wheel is rotated. I therefore do not claim either application of cams as broadly new.

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

1. In a sewing-machine, the combination, with the feed-bar and driving-shaft, of the feed-cams consisting of the cam u^2, keyed to the shaft and provided with a semicircular groove or depression, 51, and the cam *u'*, provided with the stud 52, entering the groove 51, whereby a lost motion between the cams of a half-revolution is permitted, for the purpose set forth.

2. The cams *u'* u^2, having an engaging groove and stud, the cam *u'* being provided with recess 75, in combination with a movable locking-pin, Z', and a set-screw, O, for operating the same through the interior of the shaft, as described.

3. In a sewing-machine having a variable direction of feed, the feed-bar M and the yoke M', in combination with the adjusting-bar 9 and the abutments 4 and Q, substantially as specified.

4. The main shaft B, provided with the eccentrics G G, in combination with the cross-head reciprocating in a horizontal plane connected to and in combination with the shuttle-lever C, substantially as set forth.

5. The actuating cross-head, consisting of the vertical pieces F F', in combination with the horizontal screws G^2 and eccentrics G G, substantially as set forth.

6. The vertical piece F, having ears F^2, to which is keyed link E, in combination with link E, having a bifurcated end, and projecting through an opening in piece F' laterally larger than the link E, whereby said link has a lateral play entirely independent of the cross-head, substantially as described.

7. The cross-head F F' and G^2 and the link E, having a bifurcated end, and screw *i*, projecting through F, in combination with the shuttle-lever having a split end, *i'''*, all constructed, arranged, and operated as set forth.

8. The main shaft B, bored at its end, and provided with slots 2 2, in combination with the movable pin Z, having a projecting cross-pin, and a fly-wheel provided with the cylindrical chamber 2', having offsets 2'', and set-screw *h*, substantially as described.

9. The upper tension device consisting of post *a* and bar 67, carrying pivoted friction-plates 17 17, in combination with central set-screw, 22, slotted spring-plate 65, friction-plates *a' a'*, and pins 16 16, all constructed, arranged, and operated as set forth.

10. The take-up arm having a head provided with a curved slot, 64, and the rock-shaft 60, provided with a stud, 63, projecting through slot 64, in combination with springs 13, substantially as described.

11. The bed-plate A, provided with recess to contain oil, and ducts *p p'* to conduct the oil to the surfaces to be lubricated, substantially as set forth.

12. In a sewing-machine, the bed-plate provided with chambers, in combination with the inclosed fibrous or other non-resonant material for the purpose of deadening the sound, as described.

13. The compressible tapering bushing t^2, provided with a spiral slit passing once or more than once around said bushing, as described.

14. In a sewing-machine shuttle, the pins

l l l in line, in combination with the pin *l'* out of line with pins *l l*, for the purpose specified.

15. In a sewing-machine shuttle, the latch L, provided with a slight upward bend at its hinge, in combination with the flat projection *m* to prevent the latch binding the thread, as set forth.

16. An open-faced shuttle having the upper edge of the face made convex, for the purpose set forth.

17. An open-faced shuttle having its heel and point dressed to coincide with and bear against the curvature of the race, and the intermediate face cut so as not to come in contact with the race, in combination with a curved race, substantially as described.

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