

(No Model.)

F. H. RICHARDS.

SHUTTLE ACTUATING MECHANISM FOR SEWING MACHINES.

No. 571,457.

Patented Nov. 17, 1896.

Fig. 1.

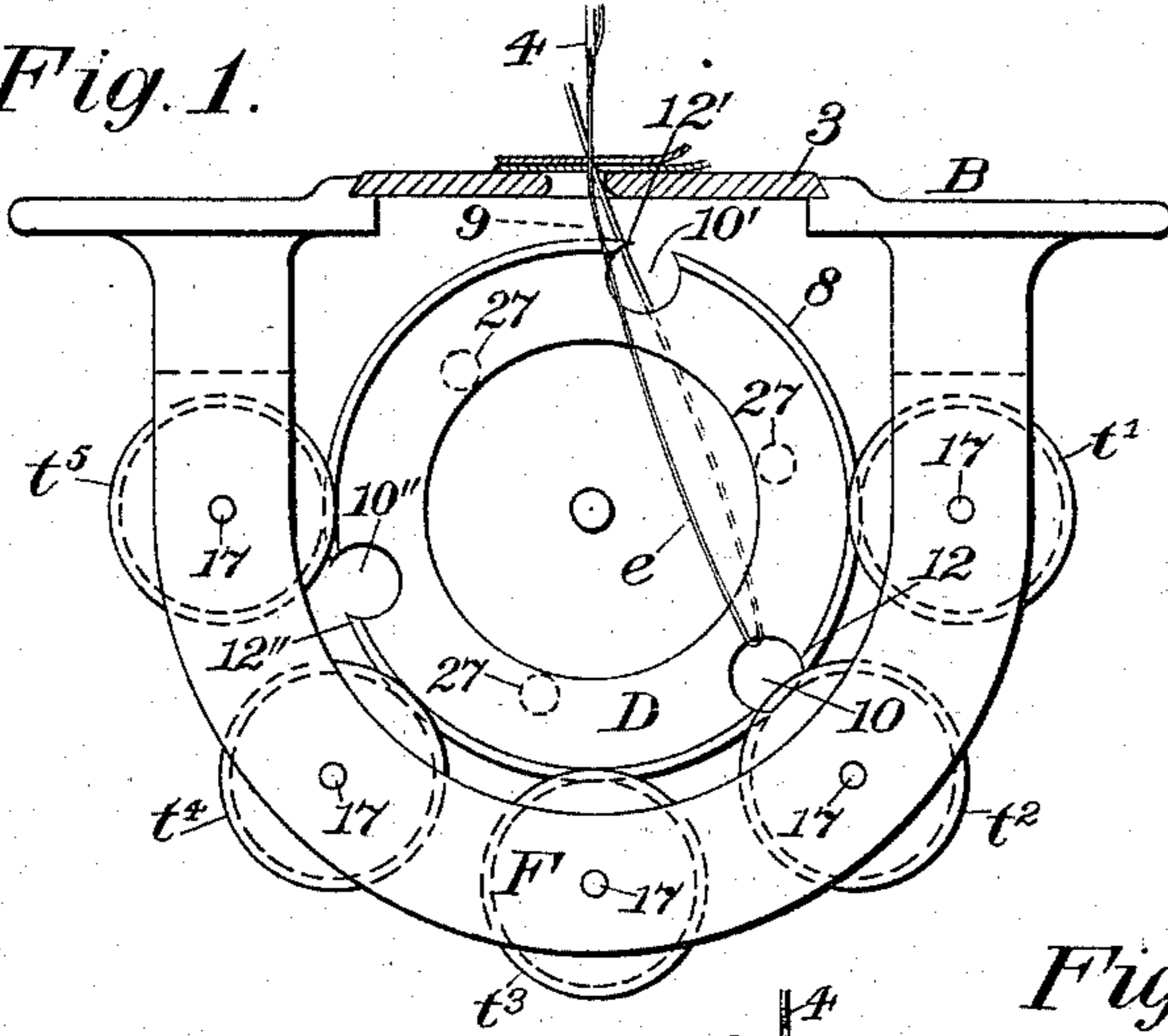


Fig. 3.

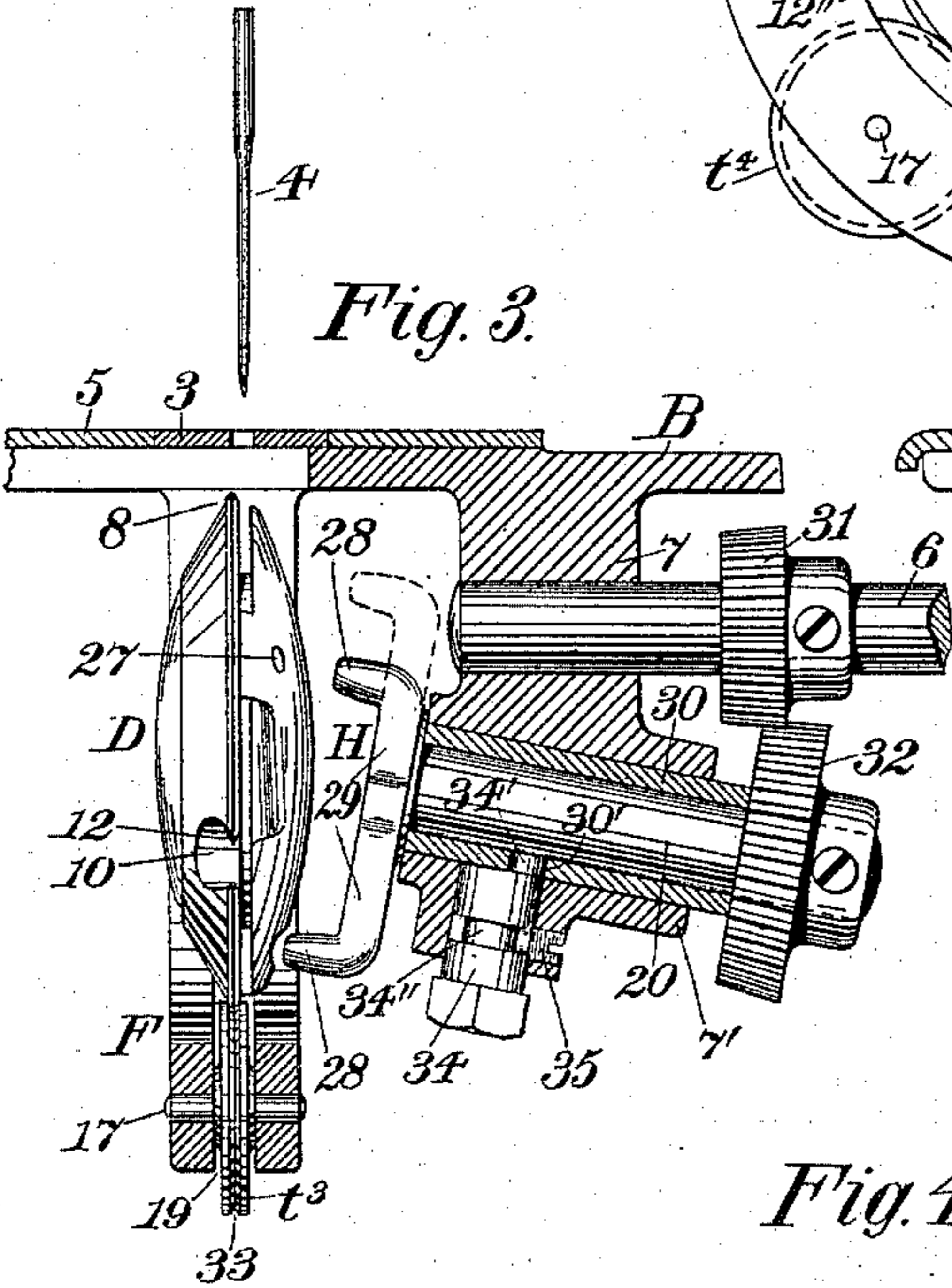


Fig. 2.

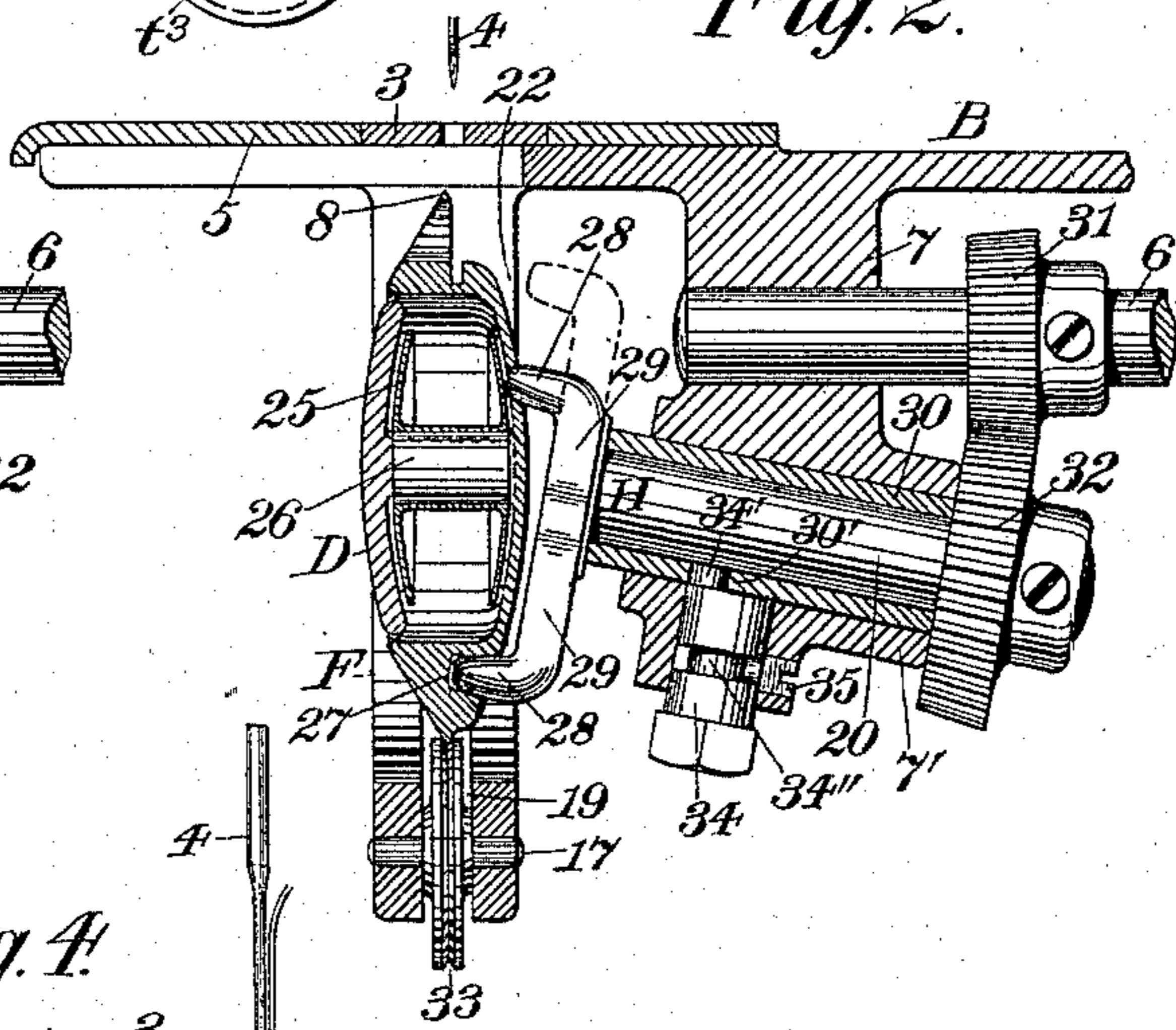


Fig. 4.

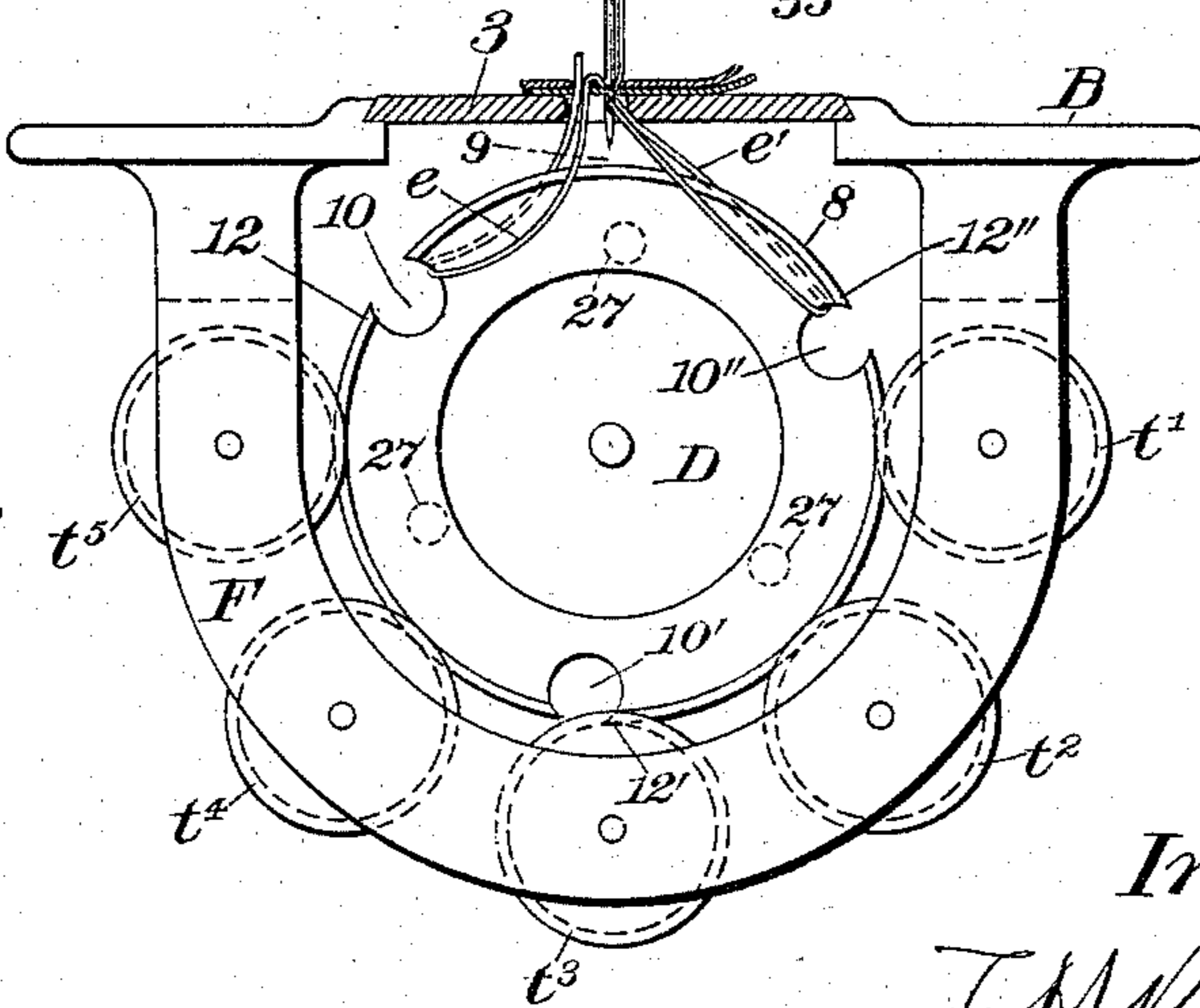
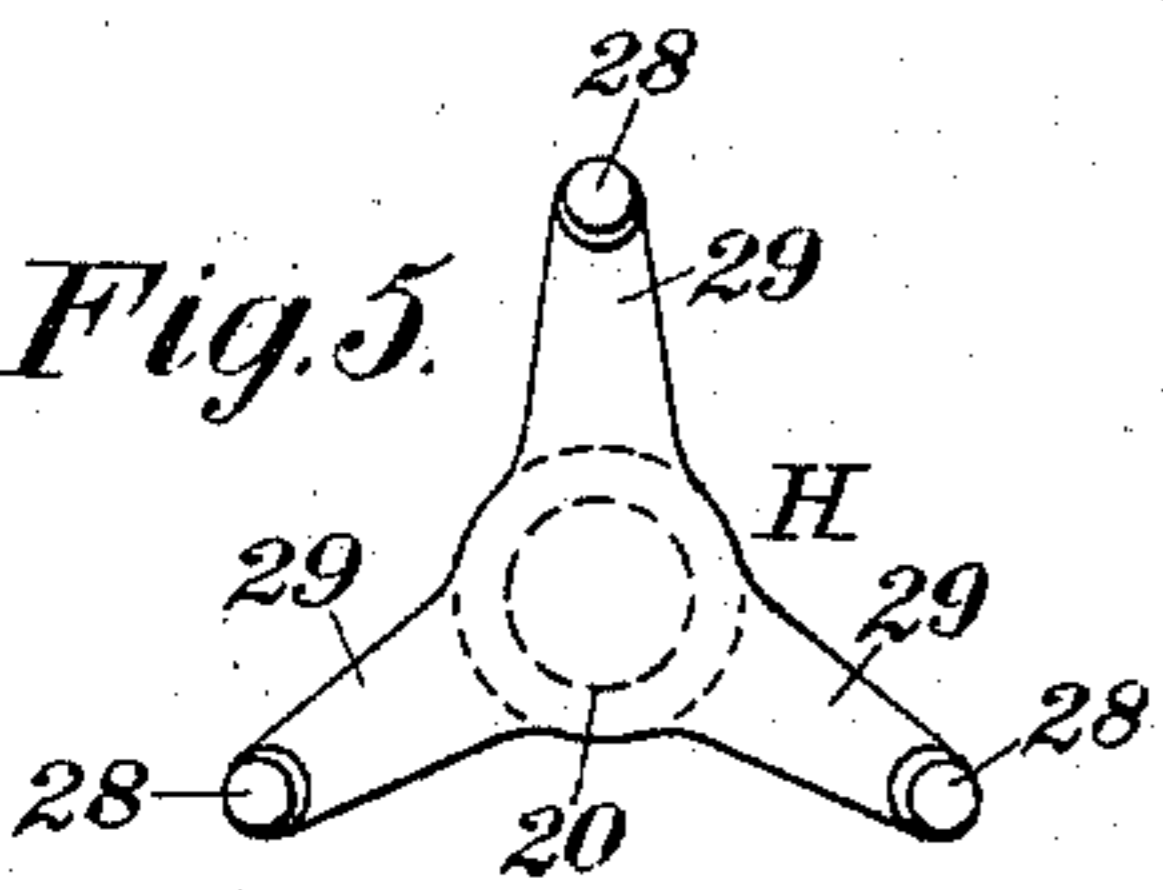


Fig. 5.



Witnesses:

J. L. Edwards Jr.
Fred. J. Dole.

Inventor:

F. H. Richards

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

SHUTTLE-ACTUATING MECHANISM FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 571,457, dated November 17, 1896.

Application filed October 22, 1894. Serial No. 526,588. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Shuttle-Actuating Mechanism, of which the following is a specification.

This invention relates to shuttle-actuating mechanism especially adapted for actuating the revolving shuttle or loop-taker of the class of sewing-machines which comprises the sewing-machine described in Letters Patent of the United States No. 493,131, granted to H. R. Tracy March 7, 1893.

The object of the present invention is to furnish a shuttle-actuating mechanism in and by which a peripherally-supported shuttle or member will be continuously actuated by a single shuttle-driver in constant engagement therewith; also to peripherally support said shuttle or member around a portion of its periphery, preferably by track-rolls remote from the upper side of the shuttle or member, so as to leave the necessary space adjacent to the upper edge of the shuttle and near the needle of the sewing-machine for the feed mechanism, and at the same time to permit the release of the loop of the needle-thread beyond the terminus of the peripheral supports for the shuttle—that is, beyond the last track-roll of the series—and also to furnish means in connection with the means for supporting the shuttle throughout a portion of its periphery (said supporting means being preferably in the form of a series of track-rolls located at and below the middle line of the shuttle) for positively holding the shuttle in engagement with said peripheral supporting means or track-rolls.

In the drawings accompanying and forming part of this specification, Figure 1 is a front elevation of a portion of a sewing-machine of the class specified and embodying my present invention. Fig. 2 is a sectional side elevation of the mechanism shown in Fig. 1 as seen from the right hand in said figure and showing the driving mechanism in operative connection with said shuttle. Fig. 3 is a sectional side elevation of the mechanism shown in Fig. 1 and as seen from the right

hand in said figure, but showing the driving mechanism and the shuttle disconnected. Fig. 4 is a view similar to Fig. 1, but showing some of the parts in different positions for illustrating certain features of my present improvements. Fig. 5 is a front view of the shuttle-driver as seen from the left hand in Fig. 2.

Similar characters designate like parts in all of the figures.

For the purpose of illustrating the construction and mode of operation of my present improvements I have shown herein the operative details as carried by suitable bearings and supporting devices underneath the forward portion (usually at the left hand) of an ordinary sewing-machine bed B. This bed or plate B is shown in Fig. 2 as provided with the usual throat-plate 3 for needle 4 of the sewing-machine. An ordinary slide-plate 5 is also shown removably supported in the plate B, beyond the throat-plate, for the usual purpose of obtaining more convenient access to the shuttle of the machine.

It will be understood that the needle 4 may in practice be carried and operated by some one of the several well-known needle-bar mechanisms which are now commonly used in sewing-machines.

The power for operating the shuttle-driving mechanism will preferably be supplied through a driving-shaft, such as 6, which in practice will be operatively connected with the needle-bar mechanism (not herein shown) of the sewing-machine and will usually make one rotation for each double stroke of the needle-bar. Said driving-shaft 6 may be supported in suitable bearings upon the machine, one of said bearings being herein shown as formed in a bracket depending from the plate B, said bracket being designated by 7.

The shuttle or loop-taker of the sewing-machine (designated herein in a general way by D) may be of any suitable construction and is preferably substantially the same as the corresponding loop-taker shown in the aforesaid patent, No. 493,131, and also described and claimed in the Patent No. 471,035, granted to H. R. Tracy March 15, 1892. In the present instance, however, the loop-taker is shown as peripherally supported upon a

portion of its periphery by means of track-rolls engaging the edge or track 8 of said shuttle.

The loop-taker D in the preferred form thereof herein shown has formed in the periphery thereof three equidistant openings or spaces 10, 10', and 10'', respectively, which openings extend through the periphery or track of the shuttle to form the loop-taking hooks 12, 12', and 12'', respectively, said hooks being adapted for engaging the needle-thread and drawing the same down to form loops after the manner described in the aforesaid Letters Patent, to which reference may be had for a more particular description of this operation. The loop *e* being taken at about the line 9, Figs. 1 and 4, is carried by the hook over toward the right hand and downwardly, as shown in these figures, until said loop is drawn out to its full length and is carried entirely around the shuttle, the thread being drawn, during the passage of the loop over the shuttle, against the upper wall of the corresponding opening 10, 10', or 10'', so as to clear the upper edges of the peripheral supporting means or track-rolls. One loop having been carried around the shuttle, as set forth, by one of the hooks, (as, for instance, the hook 12,) the next loop is taken by the second succeeding hook, as 12'', and as this new loop *e'* is drawn down the old loop *e* is drawn upward and after passing the last track-roll *t*⁵ of the series passes out of the recess or space 10 and is finally drawn upward against the under side of the cloth to engage the under thread, (not shown,) said latter thread being drawn out from a bobbin, such as 25, which is mounted for rotation upon the axial connecting pin or stud 26 of the shuttle.

The peripheral supporting means for engaging the shuttle peripherally and maintaining it in position for rotation with respect to said means is shown herein as comprising a series of track-rolls, (in the present instance five in number, though any suitable or convenient number may be used,) said track-rolls being designated, respectively, *t*¹, *t*², *t*³, *t*⁴, and *t*⁵. These track-rolls are or may be of duplicate construction and interchangeable with one another. They are shown herein as supported by pins 17 in some suitable roll-frame depending from the plate B. This frame (designated in a general way herein by F) is shown as of U-shaped form and as bifurcated to form a space 19, within which the track-rolls are supported by the aforesaid pins 17, said pins being shown herein as passing through the two side walls of said frame F and as spanning the space 19, the walls of said space forming lateral guides for maintaining the alinement of the rolls. The track-rolls will in practice be so located with reference to the shuttle that three or more of the rolls will always be in circumferential bearing-contact with the shuttle and so that only one of the spaces in the periphery of the shut-

tle will be adjacent to any one of the track-rolls at any one time.

In one side thereof the shuttle D is shown as having formed therein a plurality of driver-sockets 27, said sockets being in the present instance three in number. The shuttle-driver (designated in a general way by H) comprises a shaft or journal 20, whereby said driver may be supported and a series of pins 28, corresponding in number, location, and arrangement with the aforesaid driver-sockets of the shuttle and adapted for entering and withdrawing from said sockets during the rotary movement of the shuttle. These pins are shown herein as three in number and are mounted upon the outer ends of the arms 29 of a spider which is centered upon the end of the shaft 20 and disposed perpendicularly thereto. As a means for effecting the rotation of the shuttle the axis of the shaft 20 is inclined to the axis of the shuttle, so that the driver H stands in a plane oblique to the plane of rotation of the shuttle itself, as will be evident by reference to Figs. 2 and 3. By reason of this organization of said shuttle and its driver the relation between said members is the same as between two intermeshing bevel-gears, the driver-pins approaching the shuttle during one portion of their revolution and withdrawing therefrom during a following portion of said revolution. The shaft 20 is shown herein as journaled for rotation within a bushing 30, which bushing is loosely mounted for longitudinal movement in a bearing 7' in the bracket 7. Said bearing and bushing are shown as obliquely disposed in order to provide for the proper inclination of the driving-shaft 20 with respect to the shuttle. Bevel-gears, such as 31 and 32, are shown as mounted upon their respective shafts 6 and 20 for transmitting the movement of the former shaft to the driver H.

It will be understood that the actuating-pins 28 engage the sockets 27 in such a manner that one of said pins will approach the shuttle and enter one of said sockets before the succeeding pin withdraws from its socket, so that the shuttle is in positive engagement with the driver H and is constantly and positively actuated thereby. Said pins engage the sockets, as shown in Figs. 2 and 3, at the lower side of the shuttle and are so disposed as to withdraw from their respective sockets at about the same time that the thread-loops reach the point where they emerge from the recesses adjacent to the respective loop-taking hooks. Hence a space 22 is left between the end of the pin and the back of the shuttle, as shown in Fig. 2, through which the loop-thread may pass as it emerges from the respective recess or space 10, 10', or 10''. As each of the pins 28 reaches the position indicated in full lines by the upper pin in Fig. 2 it is nearly withdrawn from engagement with the corresponding socket in the shuttle, and a slight additional upward revoluble move-

ment of the pin suffices to withdraw said pin from its socket, as the movement of the pin at this time is in a plane which is rapidly retreating from the adjacent surface of the shuttle. The corresponding advancing movement of this plane toward the adjacent surface of the shuttle begins as said pin passes a diameter of the shuttle, which diameter is substantially in line with the needle 4, and said pin reengages its socket at a point upon the opposite line of said diameter, which point is at substantially the same distance from such diameter as is the point at which said pin emerged from the socket. As each of the pins leaves its socket at the same point in the path of movement of the pins and reengages said socket at a corresponding opposite point, and as said pins alternate in position with the loop-taking recesses of the shuttle, it will be evident that as each loop is formed and upon its travel beyond the horizontal diameter of the shuttle is carried in a direction opposite to the direction of movement of the next succeeding driving-pin said pin will be in a position out of engagement with its socket in the shuttle, and the loop will be enabled to pass said pin without interference therefrom. Correspondingly when said loop passes the other end of the horizontal diameter of the shuttle in its upward travel it will be moving in a direction opposite to the direction of movement of the next preceding pin, and said latter pin will also be out of engagement with its socket at the moment that the path of movement of the loop intersects that of said pin, and hence a clear space will always be provided for the disengagement of the loop from the shuttle to permit it to be drawn up against the fabric or material being operated upon. By this organization of the driving and the driven parts it will be observed that the pins enter and leave the sockets in the shuttle in a manner substantially similar to the movements of the teeth of intermeshing bevel-gears and that at the upper side of the shuttle the pins are always withdrawn from their respective sockets.

The several track-rolls are shown herein as provided with V-shaped grooves 33, which engage the side edges of the correspondingly-beveled periphery of the shuttle and maintain said shuttle against lateral displacement. It is evident, however, that any other means may be provided, either as a substitute for said grooves in the rolls or as auxiliary thereto, for maintaining said shuttle against lateral displacement, which means would usually be carried by the U-shaped frame. As the shaft 20 normally maintains the actuating-pins in a fixed plane with respect to the shuttle, and as said pins normally move in a circuit which bears a correspondingly-fixed relation to the shuttle, it will be evident that the engagement of the pins with the sockets of the shuttle will maintain said shuttle positively in engagement with the track-rolls

longitudinally of said rolls, while at the same time effecting the rotation of the loop-taker.

As a means for disconnecting the driving mechanism from the shuttle and permitting the removal of the loop-taker from its seat on the track-rolls I have shown herein the intermediate driving mechanism—which comprises the bevel-gear 32 and the means cooperating therewith for transmitting the movement of the primary driving-shaft 6 to the shuttle—as bodily movable longitudinally into and out of connection with the loop-taker. As shown herein, this means comprises a shifting device, such as the bolt 34, rotatable within a corresponding smooth bore in the bearing 7', which bore is drilled transversely of the shaft 20 and its journal. The inner end of said bolt is shown as formed with an eccentric-pin 34', engaging a corresponding transverse slot 30' in the bushing 30. In the position shown in Fig. 2 the eccentric is at the end of its movement nearest the shuttle, while in Fig. 3 said eccentric is at the limit of its movement farthest from said shuttle. As the bushing has a free though limited range of longitudinal movement in the bearing 7 it will be carried by the movements of the eccentric-pin in its transverse slot in the same direction, toward or from the shuttle, as is said pin, and hence by a quick turn of the shifting bolt 34 the parts may be readily brought into or withdrawn from engagement with the shuttle. When disconnected from its actuating-pin, a slight upward movement of the shuttle is sufficient to release it from the laterally-engaging walls of the peripheral grooves in the track-rolls, owing to the fact that none of them engages the loop-taker above the horizontal diameter thereof, and hence said loop-taker may be removed from the machine with great facility. For the purpose of maintaining the shifting-bolt against longitudinal displacement I preferably form said bolt with a peripheral groove 34'', which is adapted to be engaged by a locking-screw 35, working in a threaded hole disposed transversely of and intersecting the bore of the shifting device, and said screw having a smooth point engaging the peripheral groove of the shifting bolt.

By the described construction and organization I am enabled to furnish a peripherally-supported shuttle or loop-taker with a driver which does not interfere with the loops carried by the peripherally-disposed loop-taking hooks of the shuttle, in which organization the loop-taker is also maintained by its driver in positive rotative connection with a peripheral supporting means or series of peripherally-disposed track-rolls which only partially surround the loop-taker, and in which also the needle is disposed substantially upon a line passing through the center of the shuttle, whereby the loops are not only taken by the loop-taking hooks upon a line substantially coincident with a diameter of the shut-

tle, which diameter is in line with the needle, but also are carried around said shuttle in a plane also substantially in line with the needle.

5 Having thus described my invention, I claim—

1. In a sewing-machine, a rotary shuttle having two or more peripheral hook-formative recesses; in combination with shuttle-supporting means, consisting of a series of track-rolls extending around not more than one-half of the periphery of said shuttle and adapted for supporting said shuttle, whereby the same may be withdrawn from its supporting means in a direction corresponding to the plane of rotation of said shuttle, and having the successive supporting-points of said rolls separated by distances unequal to an aliquot part of the distance between any two hook-formative recesses; and means for rotating said shuttle, whereby two or more recesses will not be brought into juxtaposition with the supporting-rolls simultaneously, during the rotation of the shuttle, substantially as described.

2. In a sewing-machine, the combination with a rotary shuttle having a plurality of driver-sockets in one side thereof, and adapted to be peripherally supported for rotation; of a peripherally-disposed shuttle-support, comprising a series of rolls extending around not more than one-half of the periphery of said shuttle upon the under side thereof and adapted to support said shuttle, whereby the same may be withdrawn from its support in a direction corresponding to the plane of rotation of said shuttle; means for holding said shuttle against lateral displacement; and a revoluble driver having a plurality of actuating members corresponding in number with, and adapted for successively engaging, the sockets in said shuttle at one side the center of rotation thereof, and within the circuit of the shuttle-support, to thereby hold the shuttle during rotation thereof in positive engagement with its support, and prevent accidental displacement thereof through the openings in said support, substantially as described.

3. In a sewing-machine, the combination with a rotary shuttle having a plurality of driver-sockets in one side thereof, and adapted to be peripherally supported for rotation; of a peripherally-disposed shuttle-support, comprising a series of rolls extending around not more than one-half of the periphery of said shuttle upon the under side thereof and adapted to support said shuttle; and a rotary shuttle-driver supported for bodily shifting movement longitudinally of its axis into and out from operative relation with the shuttle, substantially as described.

4. The combination with a rotary shuttle having a plurality of relatively equidistantly-disposed hook-forming recesses in the periphery thereof, and also having a driver-socket in one face thereof, intermediate each successive pair of said recesses; of a series of

rolls sustaining said shuttle, the said rolls being located upon the under side and extending around not more than one-half the periphery of the shuttle, whereby the shuttle can be readily withdrawn from and reinserted in its operative position; and an obliquely-disposed revoluble driver having a plurality of driver-pins adapted for successively entering the driver-sockets in the shuttle.

5. In a sewing-machine, the combination with a shuttle adapted to be peripherally supported for rotation, and having a plurality of sockets in one face thereof; of means for peripherally supporting said shuttle; means for preventing lateral displacement of said shuttle; an obliquely-disposed rotary driver shiftable longitudinally, and adapted to thereby bring its shuttle-actuating pins into and out from operative relation with the shuttle, and said driver having a plurality of pins corresponding in number and location with the sockets in the shuttle, and normally adapted to successively engage said sockets during their travel through the lower portion of their circuit, and to withdraw therefrom, during their travel through the upper portion of their circuit to permit the passage of the needle-loops around the shuttle; and means for securing said driver longitudinally in any of its positions, substantially as described.

6. In a sewing-machine, the combination with a shuttle adapted to be peripherally supported for rotation, of means for peripherally supporting said shuttle, means for preventing lateral displacement of said shuttle, a rotary driver shiftable longitudinally into and out of engagement with the shuttle and normally in geared connection with the same and having a driving-shaft, a longitudinally-shiftable bushing fixed against longitudinal movement relatively to said driver and adapted to form a journal for the shaft of said driver and having also a peripheral transverse slot, a fixed journal-bearing for said bushing and adapted to permit longitudinal shifting of the bushing relatively thereto, a rotatable shifting bolt disposed transversely of said bushing and having an eccentric member adapted to engage the peripheral slot in said bushing and thereby shift the bushing and the driver to bring said driver into operative connection with or disconnect it from the shuttle, and means for preventing longitudinal displacement of said shifting bolt, substantially as described.

7. In a sewing-machine, the combination with a shuttle having a series of driver-sockets in one face thereof, and adapted to be peripherally supported for rotation; and with means for peripherally supporting said shuttle, and for preventing lateral displacement thereof; of shuttle-actuating mechanism consisting of a rotary driver having a series of pins adapted for successively engaging the sockets in said shuttle, and shiftable longitudinally into and out of engagement with the shuttle, and normally in geared connection

tion with the same, and having a driving-shaft; a longitudinally-shiftable bushing fixed against longitudinal movement, relatively to said driver, and adapted to form a
5 journal for the shaft of the driver; a fixed journal-bearing for said bushing, and adapted to permit longitudinal shifting of the bushing relative thereto; and a shifting device connected with said bushing, and adapted to
10 shift the same longitudinally, to thereby operatively connect said rotary driver with or disconnect it from the shuttle, substantially as described.

8. In a sewing-machine, the combination
15 with a shuttle adapted to be peripherally supported for rotation; of means for peripherally supporting said shuttle; means for prevent-

ing lateral displacement of said shuttle; a primary driving-shaft mounted for rotation and carrying a gear-wheel; and an interme- 20
diate, longitudinally-shiftable driving-shaft having a gear-wheel fixedly secured thereto, and normally in mesh with, and adapted to be shifted out from engagement with, the
25 gear-wheel upon the primary shaft, and also having shuttle-actuating driving-pins normally in engagement with the shuttle; and means for securing said intermediate driving-shaft longitudinally in any of its positions, substantially as described.

FRANCIS H. RICHARDS.

Witnesses:

FRED. J. DOLE,
FREDERICK A. BOLAND.