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F. CHASE.

SEWING MACHINE.

No. 445,924. Patented Feb. 3, 1891.

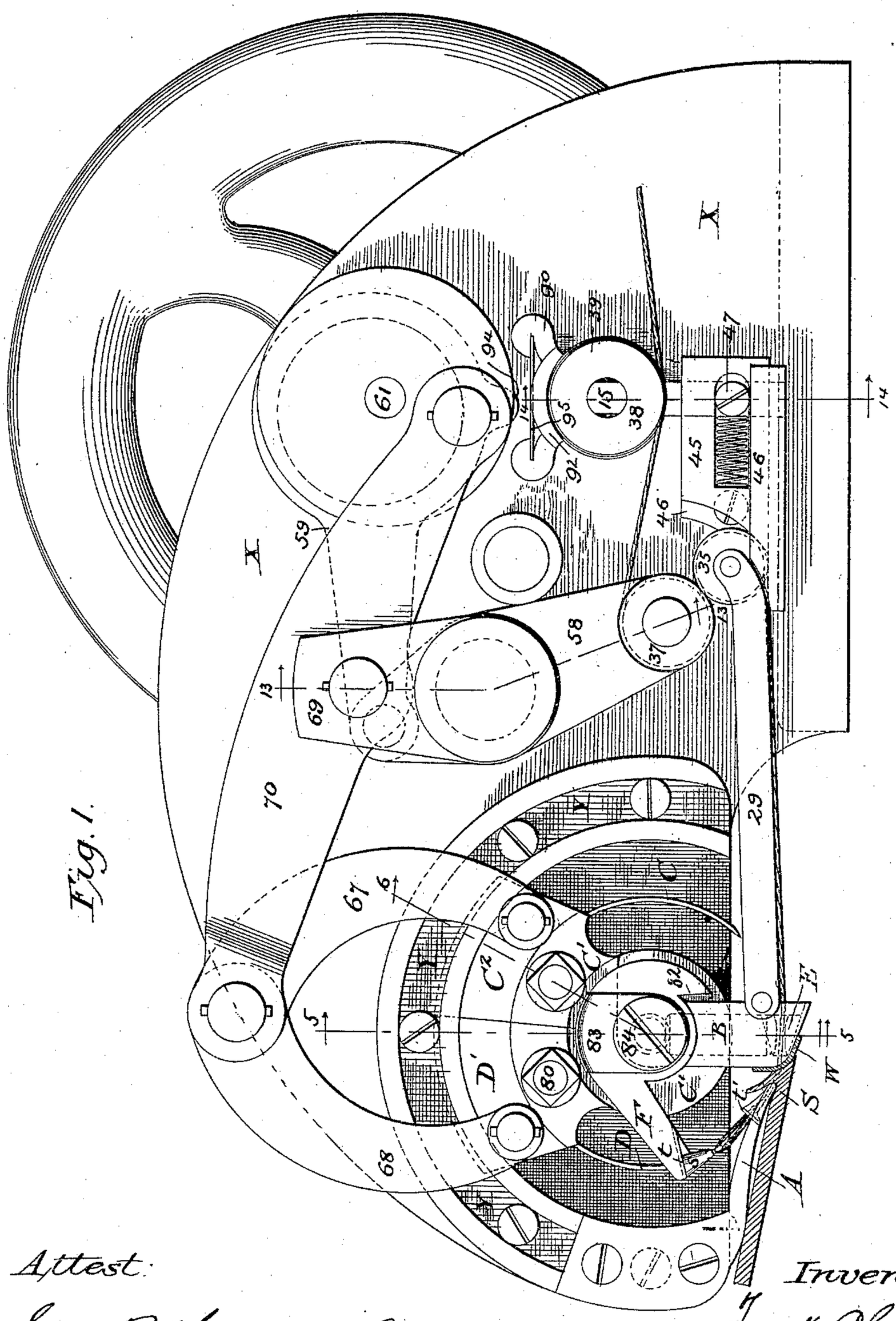

Fig. 1.

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his Attorney.

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F. CHASE.

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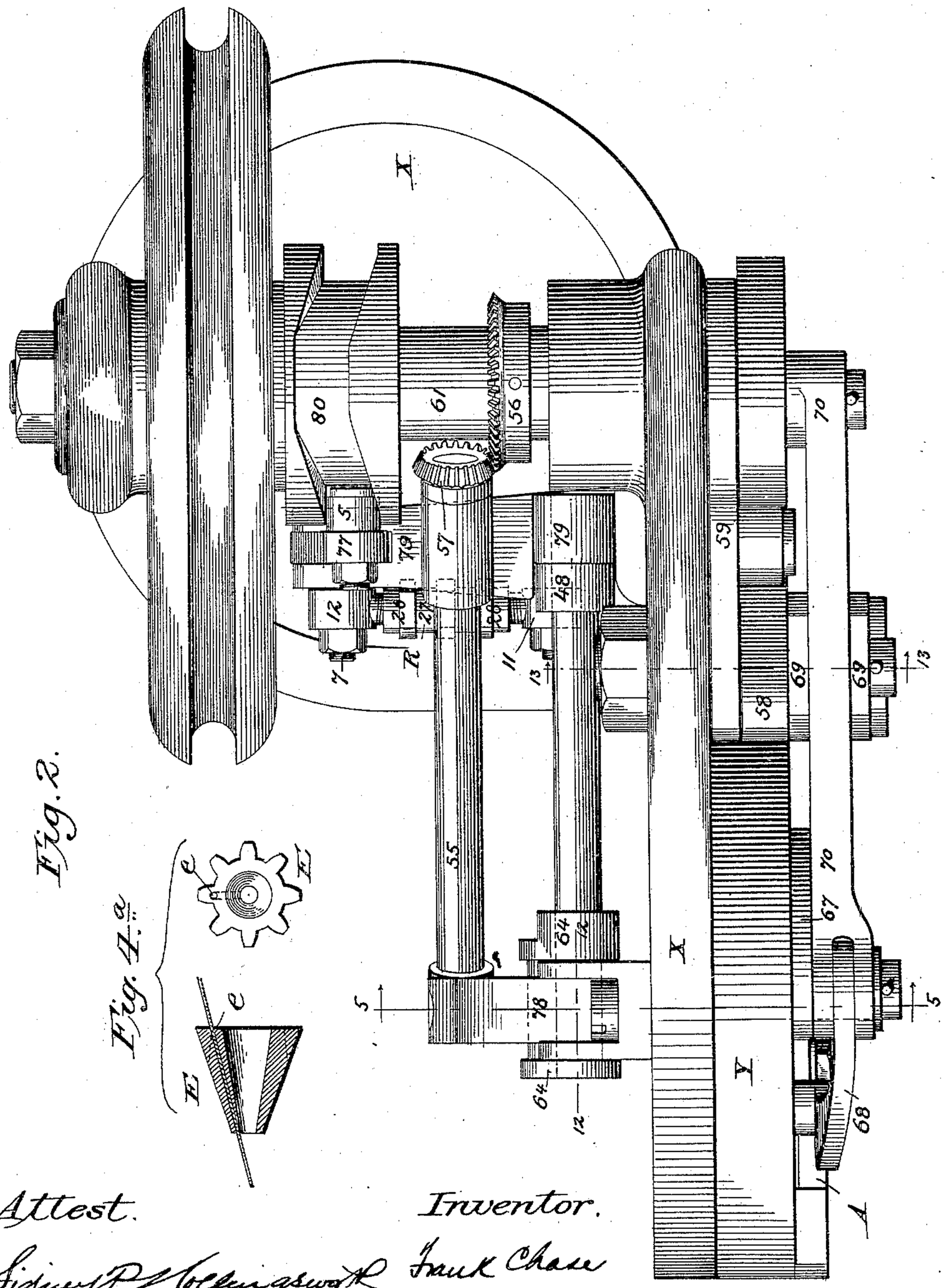

Fig. 2.

Fig. 4.

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SEWING MACHINE.

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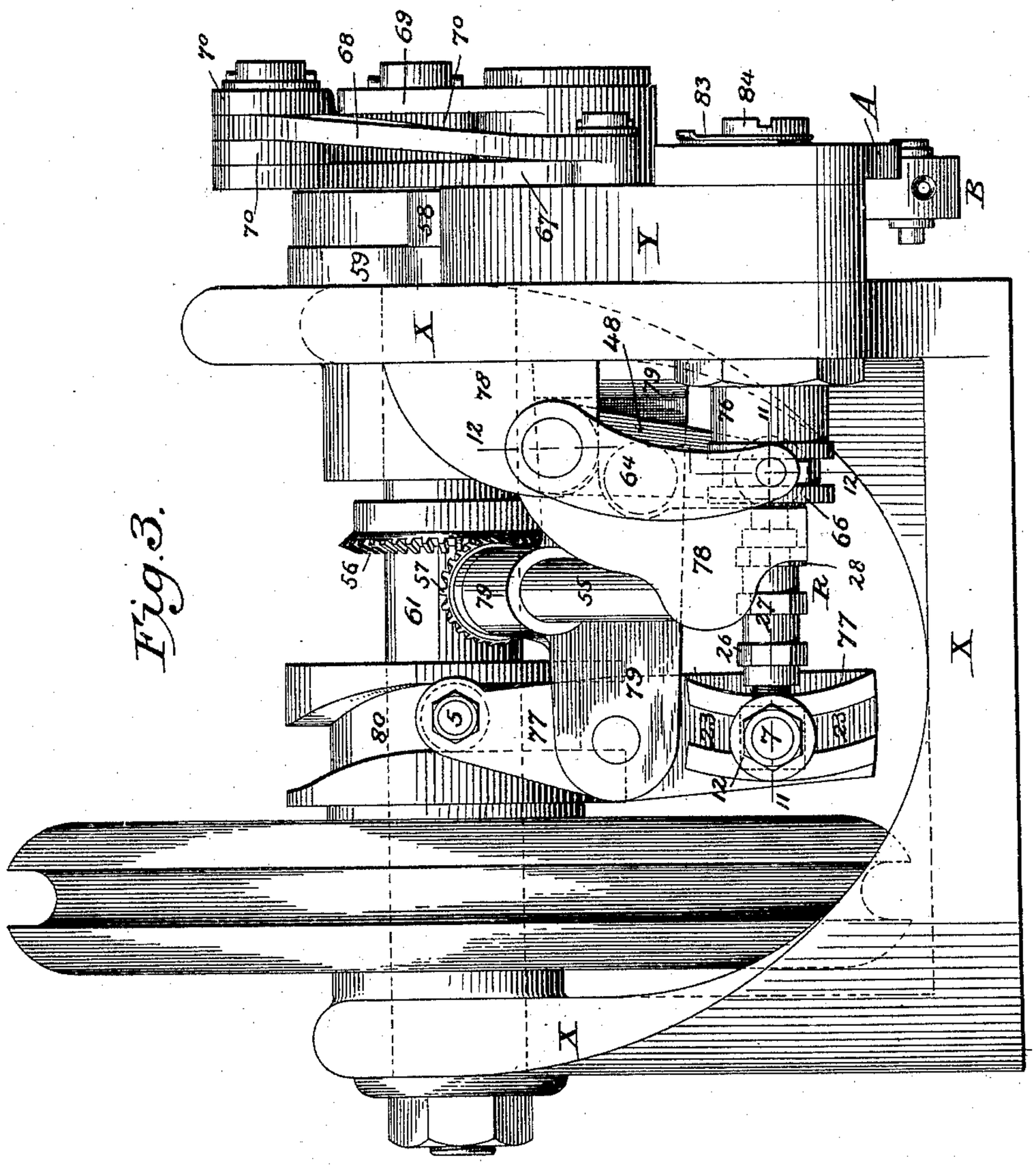

Fig. 3.

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F. CHASE.

SEWING MACHINE.

No. 445,924. Patented Feb. 3, 1891.

Fig. 11
ON LINE 11—11

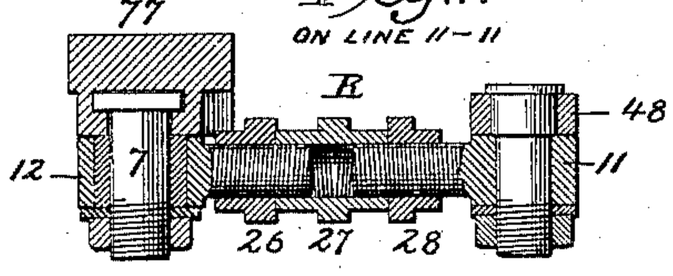

Fig. 4.
ON LINE 4—4

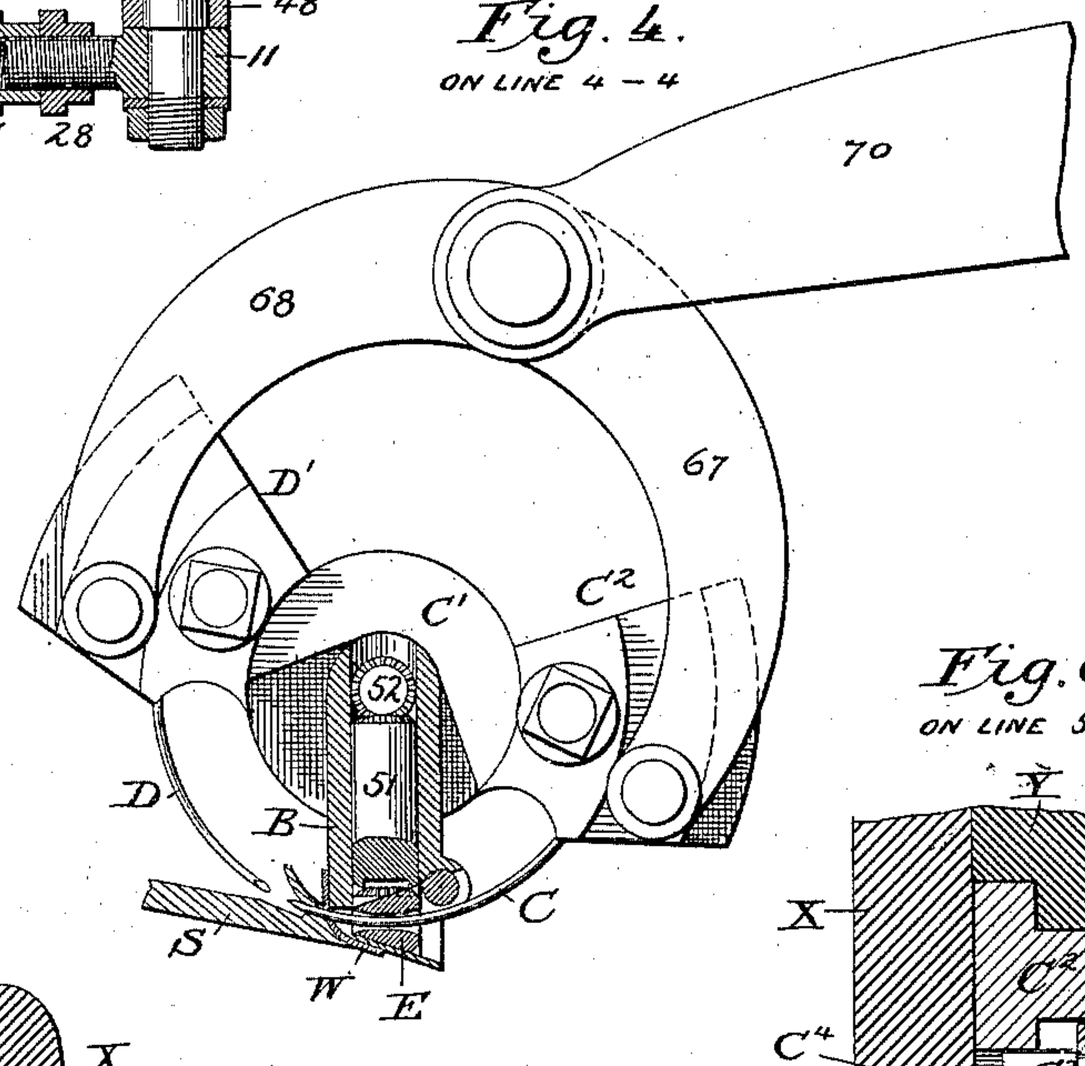

Fig. 10

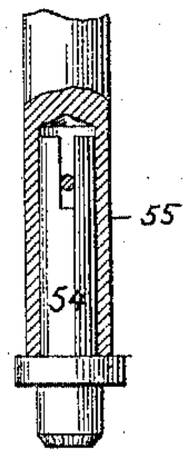

Fig. 6
ON LINE 5—6

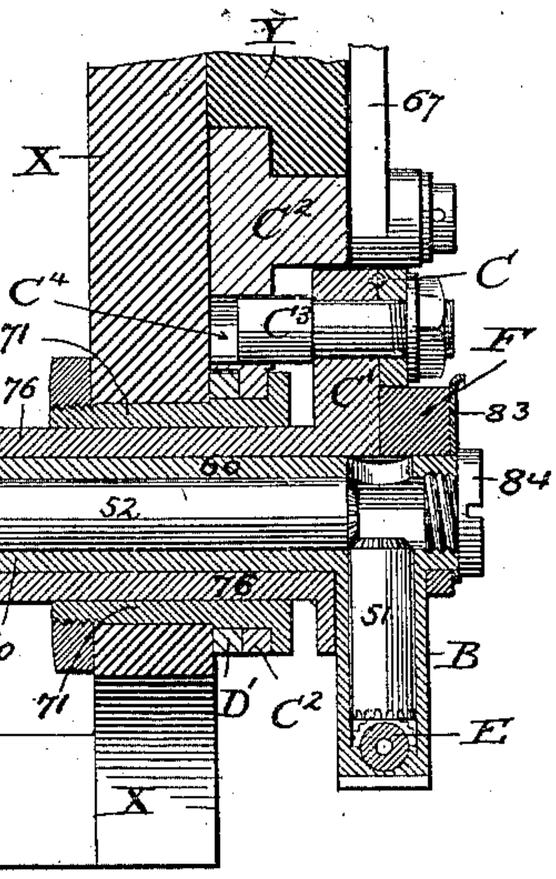

Fig. 5.
ON LINE 5—5

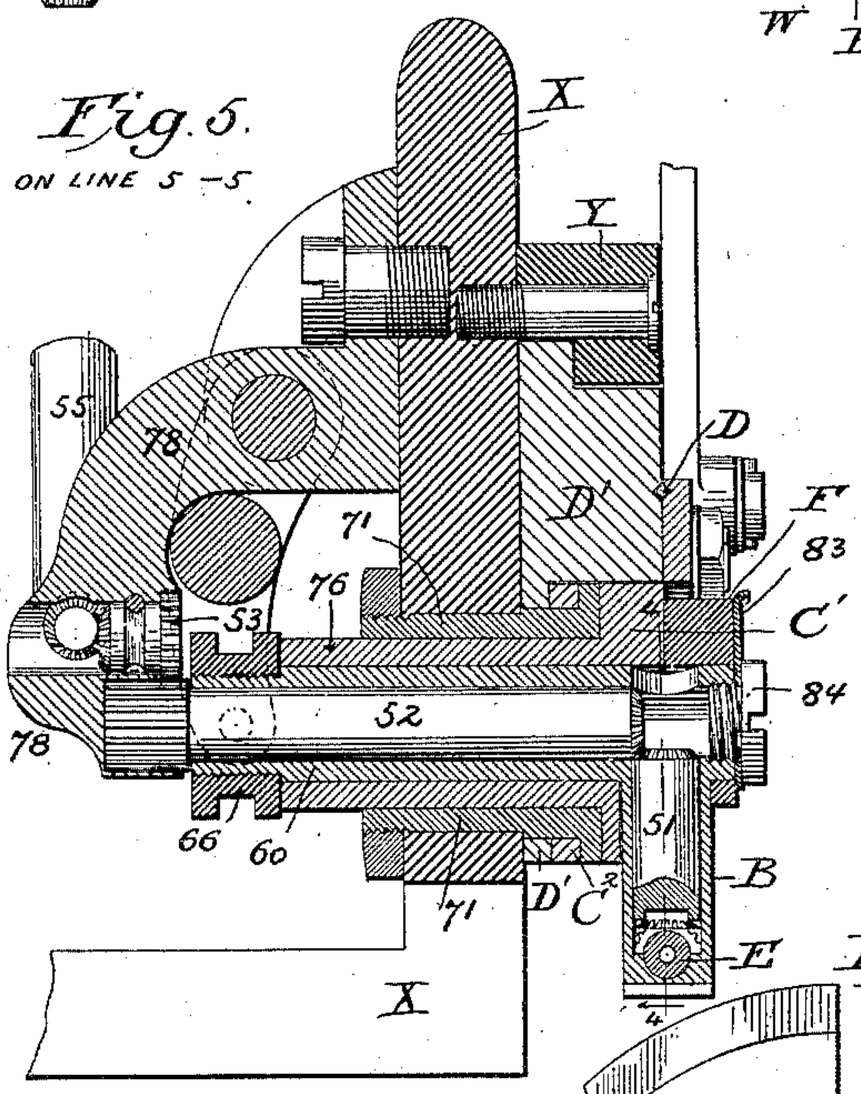

Fig. 7.

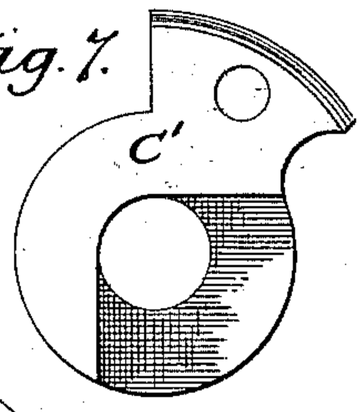

Fig. 8.

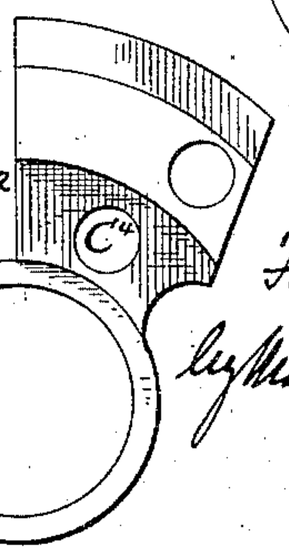

Fig. 9.

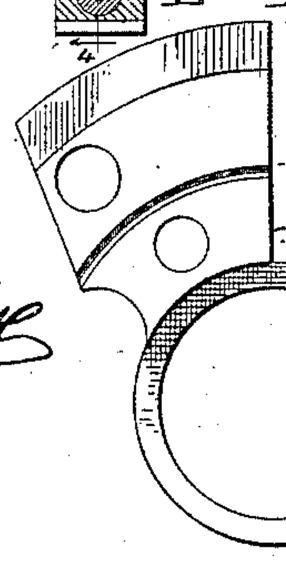

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Fig. 12.

ON LINE 12–12

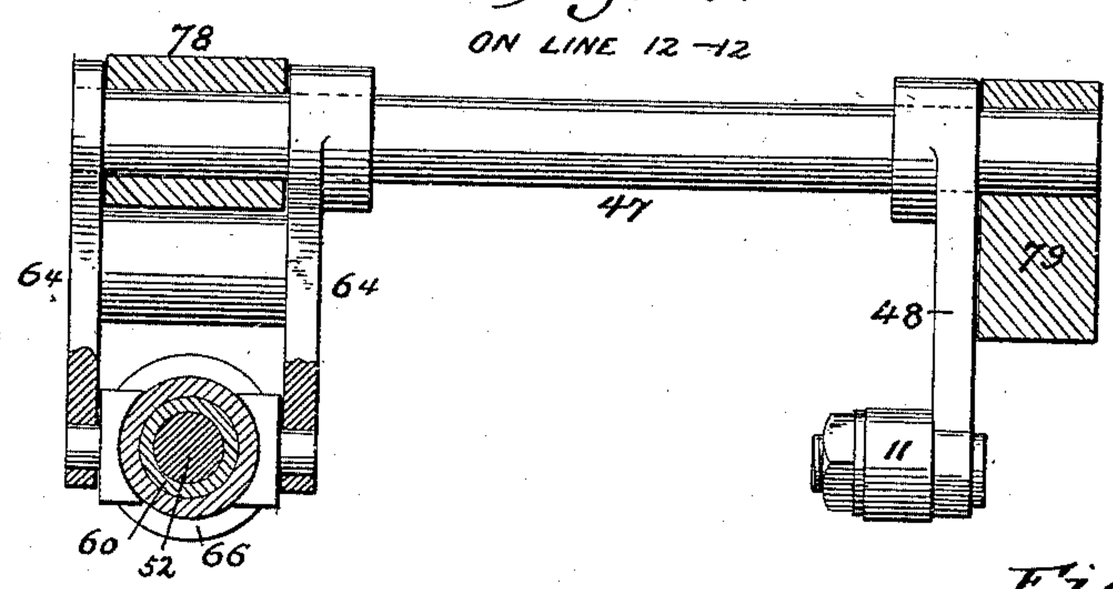


Fig. 13.

ON LINE 13–13

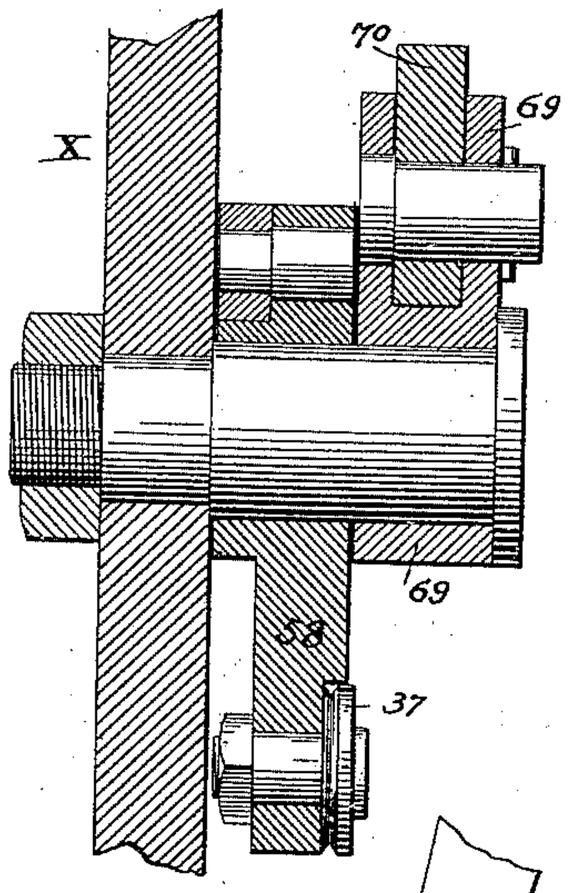


Fig. 14.

ON LINE 14–14

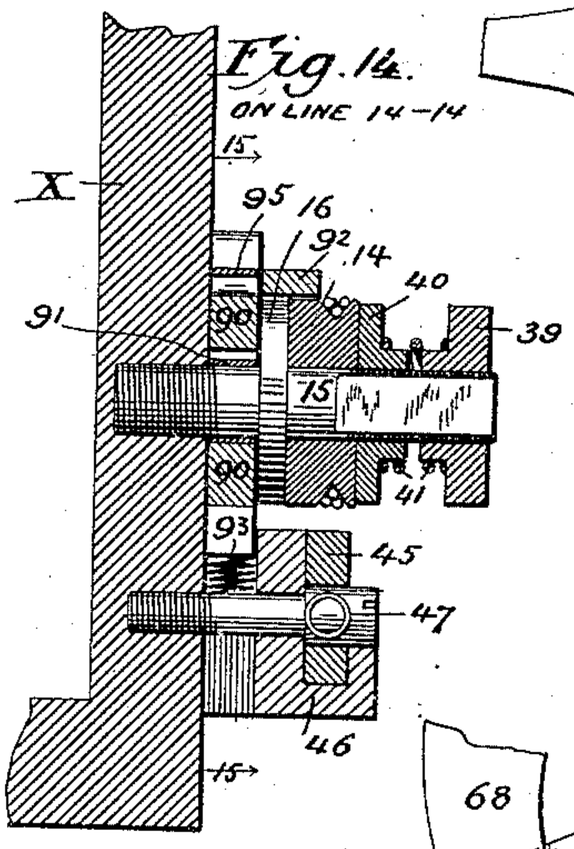


Fig. 15

ON LINE 15–15

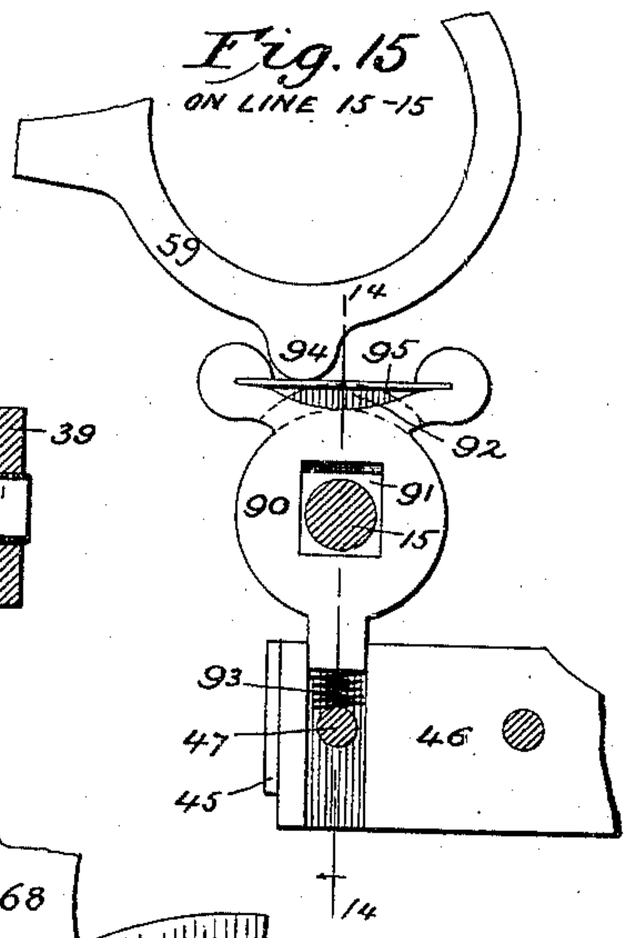


Fig. 16

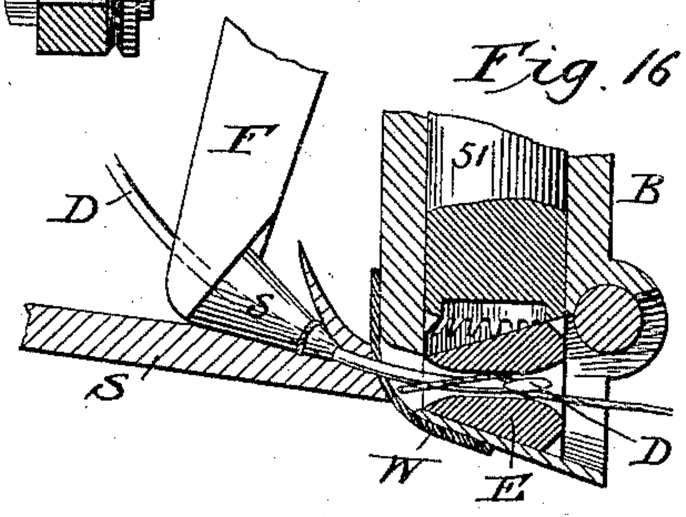


Fig. 18.

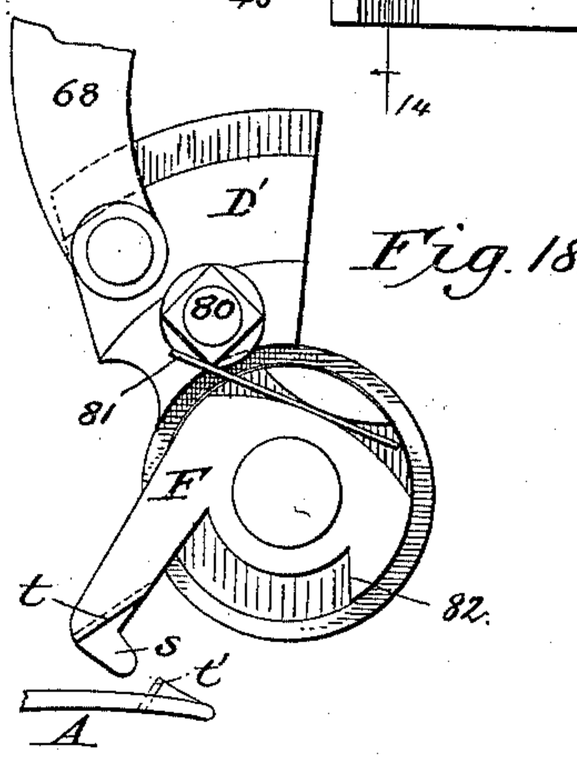
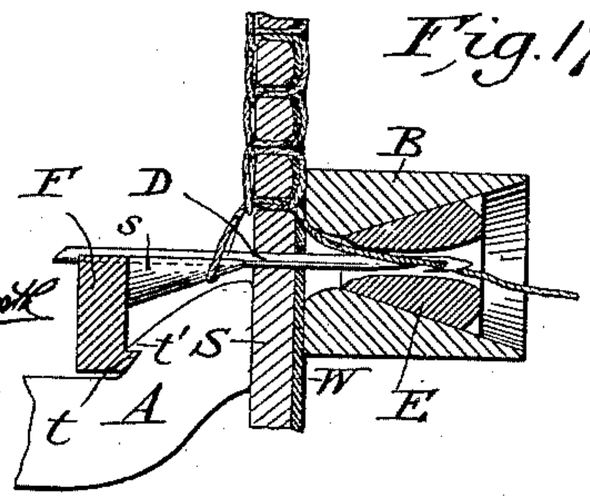


Fig. 17.



Attest.

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(No Model.)

6 Sheets—Sheet 6.

F. CHASE.

SEWING MACHINE.

No. 445,924. Patented Feb. 3, 1891.

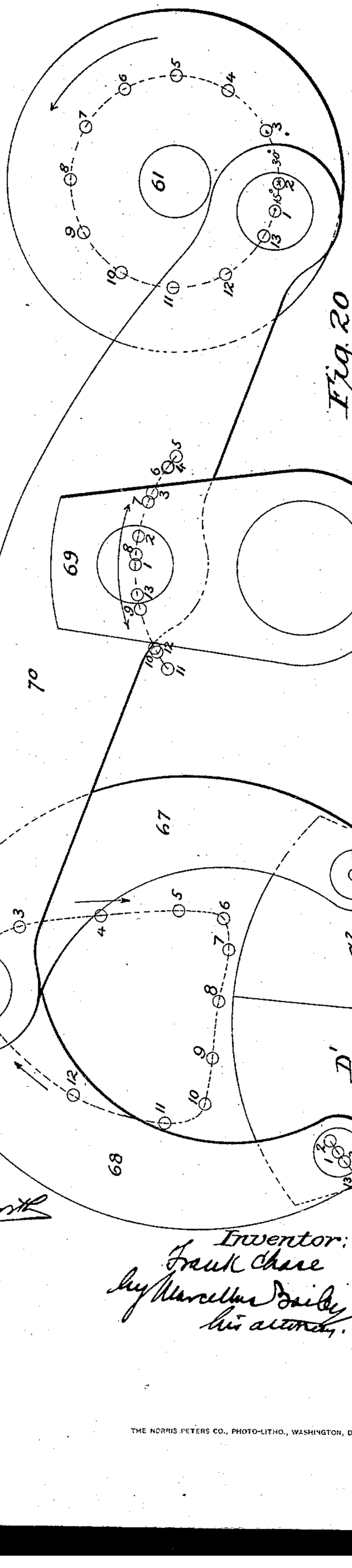

Fig. 19.

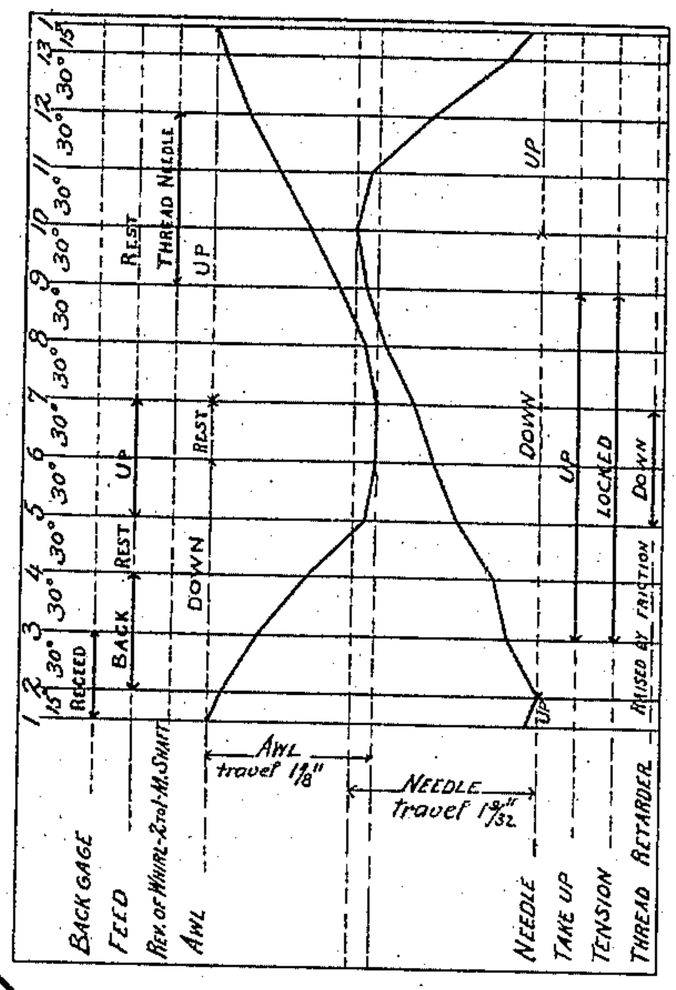

Fig. 20

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Inventor:

Frank Chase

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his attorney.

UNITED STATES PATENT OFFICE.

FRANK CHASE, OF BOSTON, MASSACHUSETTS.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 445,924, dated February 3, 1891.

Application filed September 9, 1890. Serial No. 364,452. (No model.)

To all whom it may concern:

Be it known that I, FRANK CHASE, of Boston, in the State of Massachusetts, have invented certain new and useful Improvements in Sewing-Machines, of which the following is a specification.

These improvements, while applicable to some extent to sewing-machines generally, have been devised by me with more particular reference to the production of a boot and shoe sewing machine, and it is in this connection that I shall describe them.

The machine is one which has an awl-feed, and which is designed more especially for sewing welted work.

My improvements themselves can best be explained and understood by reference to the accompanying drawings, in which I have represented a machine embodying them in their preferred form.

In the drawings, Figure 1 is a side elevation of the machine. Fig. 2 is a plan, and Fig. 3 is a front elevation, of the same. Figs. 4 to 18, inclusive, are detail views and sections of the several members of the sewing, feed, and take-up mechanisms, which will be hereinafter more particularly referred to. Fig. 19 is a representation, diagrammatic in great measure, of the mechanism for actuating the awl and needle carriers. Fig. 20 is a table indicating the movements of and positions assumed by the several parts during one complete revolution of the main driving-shaft of the machine.

The leading members of the mechanisms which make up the machine are the channel-gage A, the back gage B, between which and the channel-gage the work is pressed at certain times, the awl C, the needle D, the whirl E, which serves alternately as a looper for the needle and as a support for the awl at the times the latter feeds the work along, the take-up, the tension, and the thread-retarder F, which performs to some extent the functions of a cast-off. Of these members the channel-gage is motionless. The others are movable, and by suitable instrumentalities are actuated to move at appropriate times, as hereinafter indicated.

In the side of the frame X of the machine is fixed the sleeve 71, which forms the common center and support of all the movable parts carried upon or contained in it. This sleeve, together with the parts in its immediate vicinity, is best seen in Figs. 5 and 6. Fig. 5 is a section on line 5 5, Fig. 1, and Fig. 6 is a section on line 5 6, Fig. 1. The lower portions of both of these sectional views are the same. Above the longitudinal axis of the sleeve the section-lines diverge, so that they may pass the one through the needle-carrier and the other through the awl carrier and driver. Within this sleeve fits the tubular and longitudinally-sliding shaft 76, on the front end of which is fixed or formed the awl-carrier C′. A front elevation of this tubular shaft is shown in Fig. 7.

Within shaft 76 is a second tubular shaft 60, which I will term the "back-gage shaft," said shaft being capable of a rocking movement independently of shaft 76 and carrying on its outer end the back-gage arm or back gage proper B. (Shown in side elevation in Fig. 1 and in section in Figs. 5, 6, and 4, the section in the figure last named being on line 4 4, Fig. 5.) This back-gage arm also carries the whirl E, and for this reason it is tubular, and communicates with the interior of shaft 60, so as to provide a convenient passage for the whirl-actuating shafting hereinafter described.

The shaft 60 is held from end-play in shaft 76, and has on its rear end, beyond the rear end of shaft 76, a peripherally-grooved hub 66, which is engaged by the forked end of the actuating arm or lever by which longitudinal movement is imparted to the shaft 76, this longitudinal movement being of course partaken also by the awl-carrier, as well as by the back-gage shaft and back gage.

Upon the neck of the sleeve 71, between its front flange and the frame of the machine, are mounted the oscillatory awl-driver C^2 and the needle-carrier D′, the outer edges of these devices being overlapped by a suitable annular guide-flange Y, which steadies them during their movements. The awl-driver and the needle-carrier are shown in front elevation in Figs. 8 and 9, respectively.

The engagement of the awl-driver with the carrier is effected by a pin C^3, Fig. 6, which is fixed to the carrier and extends back into an elongated socket C^4 in the driver, in which socket it can slide during the longitudinal or

feed movement of the awl-carrier shaft 76. This awl-driver and needle-carrier are oscillated, and receive this movement from the main shaft 61 of the machine through the intermediary of arms 67 and 68, which at their lower ends are pinned or jointed, the one to the awl-driver and the other to the needle-carrier, and at their upper ends are pivoted to the forward end of a walking-beam lever 70, which at its rear end is jointed to a crank-pin on main shaft 61, and at about its center is pivoted to a rocker-arm 69, journaled at its lower end in the main frame. This mechanical arrangement I find convenient and effective to impart to the needle and awl the movements which hereinafter will be explained more fully by reference to diagram Fig. 19.

The conical whirl E fits and is capable of revolution in a socket in the lower end of the back-gage arm. It is pierced from front to rear and is in line with the awl and needle, which are placed on opposite sides of the whirl and enter or pass through the same alternately.

The sewing mechanism is for sewing with a single thread with a barbed needle. The whirl, which has a positive movement of revolution, acts as a looper to throw the thread around the needle. The friction of the thread as it is drawn laterally against one side of the passage through the whirl will suffice for this; but, if desired, a separate eccentric passage for the thread can be formed in the whirl, as illustrated in Fig. 4ª, which represents in longitudinal axial section and in rear end elevation a whirl wherein *e* is the separate thread-passage.

In order to insure the certain action of the whirl so far as its looper functions are concerned, I drive it at such a rate that it shall make two revolutions for every one revolution of the main shaft.

The whirl-actuating mechanism is as follows, reference being had to Figs. 2, 3, 5, 6, and 10: In the tubular back-gage shaft 60 is supported the shaft 52, having on its projecting outer end a long spur-gear, which meshes with a spur-gear supported in a bracket 78, in which latter is an opening below spur-gear 53 for the passage of the long spur-gear of shaft 52. This shaft reciprocates with or partakes of the longitudinal movement of the awl-carrier and back-gage shaft, and its long spur-gear is for the purpose of insuring its continued engagement with the intermediate gear 53 during this movement. On the front end of shaft 52 is a beveled pinion, which engages a like pinion on the upper end of an upright shaft 51, contained in the tubular back-gage arm B, and shaft 51 at its lower end has beveled gear-teeth to mesh with a pinion on the large end of the whirl E. Returning to intermediate spur-gear 53, this gear, as seen in Figs. 5 and 6, is provided with a beveled pinion meshing with a like pinion on the lower end of inclined shaft 55, having at its upper end a pinion 57, driven from pinion 56 on main shaft 61. The gearing, as hereinbefore said, should be so proportioned that the whirl will make two revolutions for one of the main shaft. As indicated in Fig. 10, (which is a sectional elevation of the lower portion of the shaft,) I prefer to place the bottom pinion of this shaft upon a stem 54, (which can be removed without renewing the whole shaft,) fitting in a socket in the lower end of shaft 55, where it is held by a cross-pin, as indicated. This stem is provided with a collar which is held between the lower end of the shaft 55 and the face of the bearing in bracket 78, which is entered by that part of the stem below the collar.

The awl-feed movement is obtained from main shaft 61 as follows, reference being had more particularly to Figs. 2, 3, 4, 5, 6, 11, and 12: Fig. 11 is a sectional view on line 11 11, Fig. 3, of the sectional adjustable shaft which is one of the intermediate devices by which longitudinal motion is communicated from the main shaft 61 to the awl-carrier shaft. Fig. 12 is a section on line 12 12, Figs. 2 and 3. On the main shaft is fixed a peripherally-grooved cam 80. The groove of this cam is entered by a roller-stud 5, attached to the upper end of a lever 77, which between its ends is pivoted to bracket 79, the latter being fixed to or formed in one with the main frame of the machine. In the lower portion of this lever is a curved guideway 23 for the square head of a bolt 7, which passes through the eye 12 of one end of a sectional adjustable connecting-rod R, the other end of which is connected through a suitable eye 11 to the lower end of an arm 48 by means of a bolt or pin passing from the arm 48 through said eye 11. Arm 48 is fixed to a horizontal rock-shaft journaled in brackets 78 and 79, and carrying at or near its front end an arm or lever 64, the lower forked end of which is provided (like a shipper-arm) with pins or studs which enter the peripheral groove of hub 66, which is fast to the shaft 60. It will thus be seen that rock-shaft 47 is operated from cam 80, and by reason of its connection (through the forked arm 64) with the grooved hub 66 of shaft 60 imparts lengthwise reciprocation to the shafts 60 and 76 and parts connected thereto which have thus far been described—viz., the awl-carrier, back-gage arm, and whirl carried by said back-gage arm. The feed movement of course takes place while the awl is in the work, and consequently while its front end is projected through the whirl, and consequently at this time it has the support of the whirl and back-gage arm in which the whirl is journaled. The sectional adjustable rod R, as seen in Fig. 11, is composed of two parts having their meeting ends screw-threaded—one right hand and the other left hand—these screw-threaded ends being united by a right and left hand nut 27, held in adjusted position by check-nuts 26 and 28. The curve of the guideway 23 in the lever 77 is in the arc of a circle

struck from the pivot which unites arm 48 and sectional shaft R as a center, with a radius equal to the distance between that pivot and the opposite pivot 7, when the rod is of such length that it will bring the awl into the plane of oscillation of the needle at the time the stud 5 is in the straight portion of cam 80. These conditions having been observed, the length of reciprocation of the awl-carrier shaft, and consequently the length of feed, can be regulated by adjusting the square head of nut 7 in the guideway 23 nearer to or farther from the axis of oscillation of lever 77. The nearer the stud 7 approaches to the axis of oscillation of the lever the shorter will be the feed. This is the awl-feed movement.

I come now to that device which I have hereinbefore termed the "thread-retarder" F, and which by covering at stated intervals the barb of the needle acts in a measure as a cast-off. This device and its mode of operation will be readily understood by reference to Figs. 1, 5, 6, 16, 17, and 18. Fig. 16 is a side elevation on an enlarged scale of the lower portion of the retarder and the parts immediately adjacent thereto, representing it in the position it assumes when it has descended to form a shield or guard for the barb of the needle, which has taken a fresh loop, leaving the old loop on the thread-retarder, the point of which extends into the channels of the shoe-sole S. W represents the welt, which at this time is pressed up against the sole by the back gage. Fig. 17 is a horizontal section of the same parts as in Fig. 16. It will be noted that, as shown more particularly in these figures, the thread-retarder has a tapering lower end *s*, which is between the channel-gage and the needle and lies closely up against the needle, which, indeed, is partly received in a groove formed for that purpose in the face of the part *s* next to it, the hook of the needle being on the side next to the retarder. On the shank of the retarder is formed a lip *t*, which when the retarder is down engages a like lip or detent *t'* on the fixed channel-gage A, as seen in Fig. 17, the result being that any tendency of the retarder to deflect under the lateral pull exerted on it by the loop of thread which is upon it is resisted by the fact of the engagement at this time of the lip *t* with the lip *t'* of the rigid channel-gage. The retarder F is mounted loosely on the end of back-gage shaft 60, in front of the back-gage arm. It is held on by a screw 84, which screws into the front end of the shaft 60, and interposed between the head of this screw and the hub of the retarder is a spring 83, which presses the latter with yielding pressure against the oscillatory awl-carrier. The consequence of this arrangement is that the moment the awl begins to descend the retarder (by frictional contact with the awl-carrier) will rise or recede from the work until its shoulder 82 brings up against the back-gage arm, after which the awl-carrier completes its downward movement without further actuating the retarder. This is the upward movement of the retarder. Its advance or downward movement is effected by means of a stud 80 on the needle-carrier, which when the latter descends strikes a projecting strip or cam 81 on the hub of the retarder, and thus carries the latter down into place, at which time the stud 80 will wipe by strip 81 and the needle will complete the rest of its stroke without affecting the retarder.

In operation, assuming the needle and retarder to be raised and a loop of thread to be on the needle, then when the needle descends it at the proper time carries along with it the retarder, the pointed end of which enters the loose loop, and then seats itself in the work, as seen in Fig. 16. In this position it remains during the taking up of the loop, and while the needle after having taken a fresh loop recedes and draws this loop through that held by the retarder, and until, in fact, the awl-carrier begins to descend, at which time the retarder will be raised by frictional contact therewith.

It remains to describe the take-up and the tension. They can best be explained by reference to Figs. 1, 13, and 14, which latter are sections on lines 13 13 and 14 14, respectively, of Fig. 1. The thread passes from the needle back under grooved rotatory disk or truck 35, thence up over the same, under around and over truck 37, back to and two or three times around tension-truck 38, and thence to the spool. The trucks 35 37 form what I term a "multiple-purchase take-up." The truck 37, which is the more prominent member of the take-up device, is journaled or pivoted to the lower end of a vibratory lever 58, which for convenience' sake is mounted loosely on the journal of rocker-arm 69 and is actuated from an eccentric on shaft 61 by an eccentric strap and rod 59, jointed to the upper end of lever 58, as indicated by dotted lines in Fig. 1 and as shown in full lines in Fig. 13.

So far as mere take-up action is concerned, the truck 35 might be mounted on a fixed axis; but for the purpose of causing it to act upon the back-gage arm in such manner as to press the latter positively and forcibly toward the work at the time the take-up is operating to set the stitch I mount or hang it in a strap 29, which at the opposite end is jointed to the back gage. The truck 35 bears against the curved face of a forwardly spring-pressed sliding bed 45, supported and adapted to move longitudinally in a grooved guide-piece 46, attached to the main frame by a screw or pin 47, which passes through a longitudinal slot in the bed, as seen in Fig. 1, and also in Fig. 14. The truck 35 fits in the groove of the piece 46 and bears peripherally against the curved face of bed 45, the curve of this face being struck on a circle having the axis of truck 37 as its center. Truck 37 is a little in advance of and above truck 35, but not so far above but that the truck 35 will be in the path of rearward movement of the

truck 37, so that when the latter moves back in the act of giving up thread it will bear against truck 35 and force it back against yielding bed 45, thus pulling back the back gage from the work, this being at the time the feed takes place. The forward or take-up movement of the truck 37 will, as above explained, have the effect of positively forcing the back gage up against the work. The spring-bed 45 acts to hold the back gage with yielding pressure against the work at such times as the gage is not under the positive control of the take-up.

The tension-truck is a grooved wheel 14, mounted loosely on a stem 15, fast to the main frame, and is held against a flange or face-plate 16 on said stem by spring-pressure, brought about in this instance by disk 40, which fits on the squared or flattened front end of stem 15, and is pressed against the tension-truck by a spring 41, which, by nut 39, can be made to exert such pressure as may be desired for the tension. When the take-up is acting to take up the thread, the latter must at some point between the take-up and the spool be clamped sufficiently to insure the desired tightness of stitch. For this purpose I make use of a clamping-plate 90, having in it a square hole in which fits a square block 91, of somewhat less height than the hole, so as to give the clamping-plate slight vertical play. The block 91 is mounted on stem 15 back of face-plate 16. The clamp-plate 90 has on its upper edge a curved clamping or brake ledge 92, which projects to the front, so as to overhang the tension-truck 14 and to act as a brake thereon when the clamp-plate is depressed. The clamp-plate is normally held in raised position by a spring 93. It is depressed by the action of a cam or projection 94 on the periphery of the eccentric-strap 59, which bears upon a spring-strip 95 on the clamp-plate at the time the take-up is acting to take up the thread.

The manner in which the several parts operate together will be readily understood with but little further explanation. Their actuating mechanisms are of course so constructed as to impart appropriate movement to them, and in order to enable the skilled mechanic to more readily construct the same, as well as to afford a better understanding of the mode of operation of the machine, I have made, as shown in Fig. 20 of the drawings, a table indicating the position and movement of the several parts during one complete revolution of the driving shaft 60, the three hundred and sixty degrees constituting one complete revolution, being subdivided into columns of thirty degrees each, save the first and last columns, which are fifteen degrees each. In the several lines, reading from left to right, are indicated the movements of and positions assumed by the respective parts. The numbered small circles in Fig. 19 show the position assumed by the several moving axes or pivots of the needle and awl actuating devices, these numbers corresponding to the numbers at the top of the columns in Fig. 20.

The relative movements of the awl and needle are represented graphically by the irregular lines in Fig. 20. It will be noted that the descent of the awl is quite rapid as compared with that of the needle, this being for the reason that it must pierce the work before the needle reaches it. The full downward stroke of the awl is accomplished within the first one hundred and thirty-five degrees. It then rests during thirty degrees and recedes slowly during the remaining one hundred and ninety-five degrees. The descent of the needle, on the contrary, is slow, occupying eight columns or two hundred and forty degrees, and its ascent is rapid, this being accomplished during one hundred and twenty degrees. During a part of the time, that covered by the columns between numbers 7 and 10, the awl and needle move substantially in unison, this being at the time the needle is passing into and through and the awl is withdrawing from the work. During the down movement of the awl the "back feed" takes place—that is to say, the shaft 60 moves back to position where it is ready to feed. The back gage during this movement is drawn back from the work by the action of truck 37 on truck 35 and the retarder is raised by friction. The forward feed starts while the awl is still slightly moving down and is accomplished during that portion of the revolution included between 5 and 7. The whirl casts the thread over the barbed point of the needle between 9 and 11, and then the needle recedes swiftly to the point from which it started. The thread-retarder is forced down by the descending needle carried between 5 and 7, and the take-up is in action to take up the thread between 3 and 9, and consequently the tension is clamped during a corresponding period.

It will be remarked that the needle, at the time the take-up is operating to set the stitch, is received at its front end or point in a support which enables it to effectively act in some sort as a dowel to uphold the work against the tendency of the back gage to thrust the latter downward and to sustain and resist without injury to itself the strain which such downward thrusts may exert upon it. This feature is not here claimed *per se*, but forms the subject of a separate application in my name for Letters Patent filed December 23, 1890, and bearing Serial No. 375,582.

Having now described my invention and the manner in which the same is or may be carried into effect, what I claim herein as new, and desire to secure by Letters Patent, is—

1. The combination, with the stitch-forming mechanism, the channel-gage, and the take-up, of the movable back gage connected to and operated by the take-up, substantially in the manner described, so that said back gage shall

be thrust toward the channel-gage at the time the take-up is operating to set the stitch, substantially as and for the purposes hereinbefore set forth.

2. The combination, with the channel-gage, the stitch-forming mechanism, and the movable back gage, of the multiple-purchase take-up consisting of the truck 37 and its vibratory support, the truck 35, and the strap 29, carrying at one end the truck 35 and jointed at the other end to the back gage, substantially as and for the purposes hereinbefore set forth.

3. The combination, substantially as hereinbefore set forth, of the channel-gage, the stitch-forming mechanism, the multiple-purchase take-up, the spring-bed 45, and the movable back gage connected to and operated by the take-up at the time and in the manner substantially as described.

4. The combination, with the oppositely-placed and oscillating needle and awl, of the intermediate whirl placed in the common path of movement of said needle and awl, so that it shall be entered by the same alternately, substantially as and for the purposes hereinbefore set forth.

5. The combination, with the oscillatory needle, its carrier, and actuating mechanism therefor, of the awl, the awl-carrier capable of both oscillatory movement and feed movement in the direction of its axis of oscillation, mechanism for imparting said movements to the awl-carrier, a power-driven whirl, and a whirl-support capable of movement in the same direction with that of the feed movement of the awl, whereby the whirl serves alternately to engage the thread with the needle and to support and stiffen the awl during its feed movement, substantially as and for the purposes hereinbefore set forth.

6. The combination, with the oscillatory needle and awl-carriers having a common center of oscillation, of the driving-lever fulcrumed in a rocking arm intermediate of its ends, the driving-crank connected to one of the ends of said lever, and the two arms jointed to the other end of the said lever and connected each to its appropriate carrier under the arrangement and for joint operation substantially as hereinbefore set forth.

7. The combination of the oscillatory needle, the channel-gage provided with a projection, and the oscillatory loop holder or retarder provided with a projection to engage the projection on the channel-gage at the time the said holder is in its lowest position in order to prevent said holder or retarder from being deflected laterally, substantially as and for the purposes hereinbefore set forth.

In testimony whereof I have hereunto set my hand this 28th day of April, 1890.

FRANK CHASE.

Witnesses:
EWELL A. DICK,
M. BAILEY.