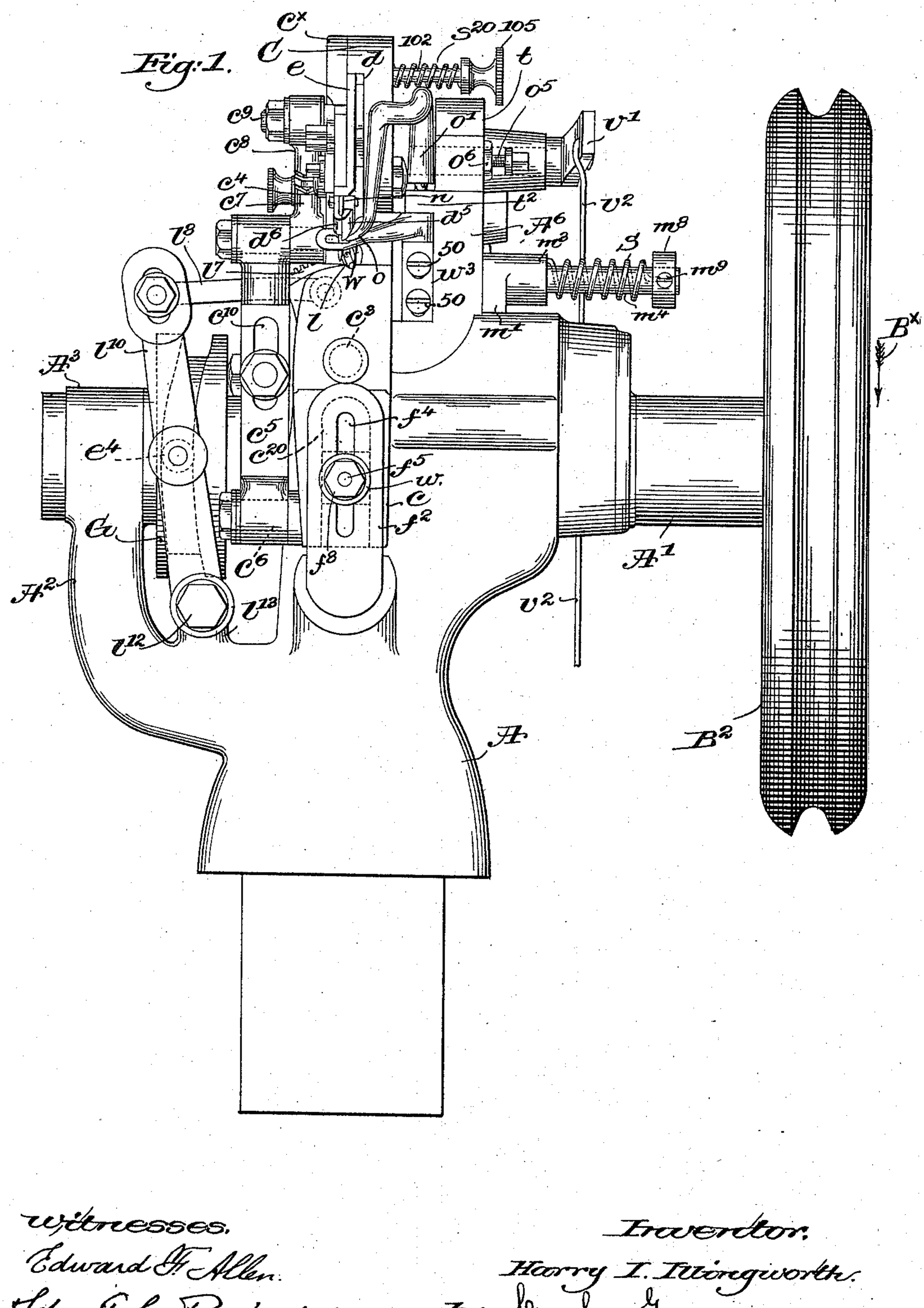
(No Model.) 7 Sheets—Sheet 1.

H. I. ILLINGWORTH.

SEWING MACHINE.

No. 573,880. Patented Dec. 29, 1896.

Fig. 1.



Witnesses.
Edward H. Allen.
John F. C. Breinkerhoff

Inventor.
Harry I. Illingworth.
by Crosby & Gregory.
Attys.

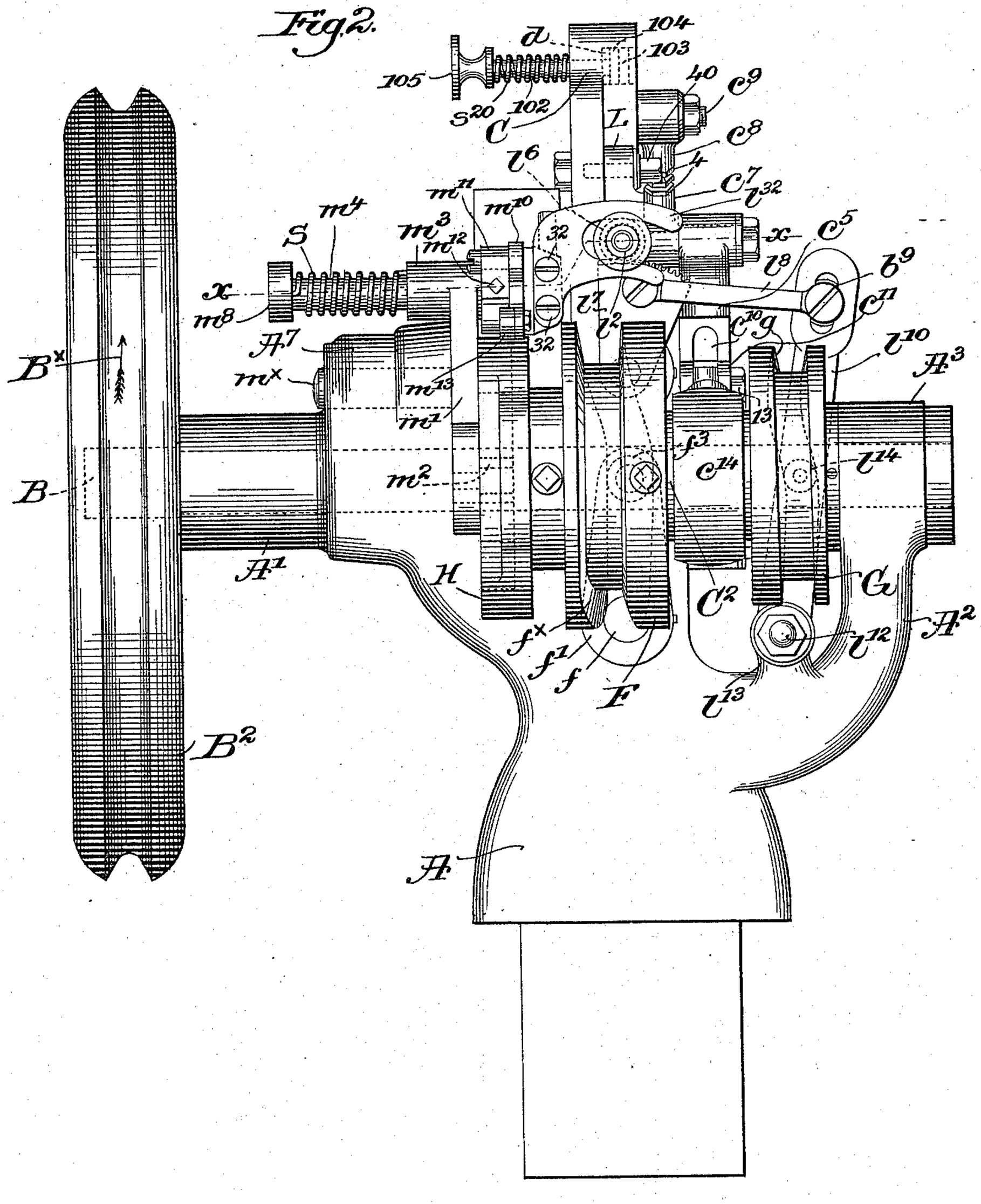
(No Model.) 7 Sheets—Sheet 2.

H. I. ILLINGWORTH.

SEWING MACHINE.

No. 573,880. Patented Dec. 29, 1896.

Fig. 2.



Witnesses.
Edward F. Allen
John P. C. Breinkerk

Inventor:
Harry I. Illingworth.
by Crosby & Gregory, Attys.

(No Model.) 7 Sheets—Sheet 3.

H. I. ILLINGWORTH.

SEWING MACHINE.

No. 573,880. Patented Dec. 29, 1896.

Fig. 3.

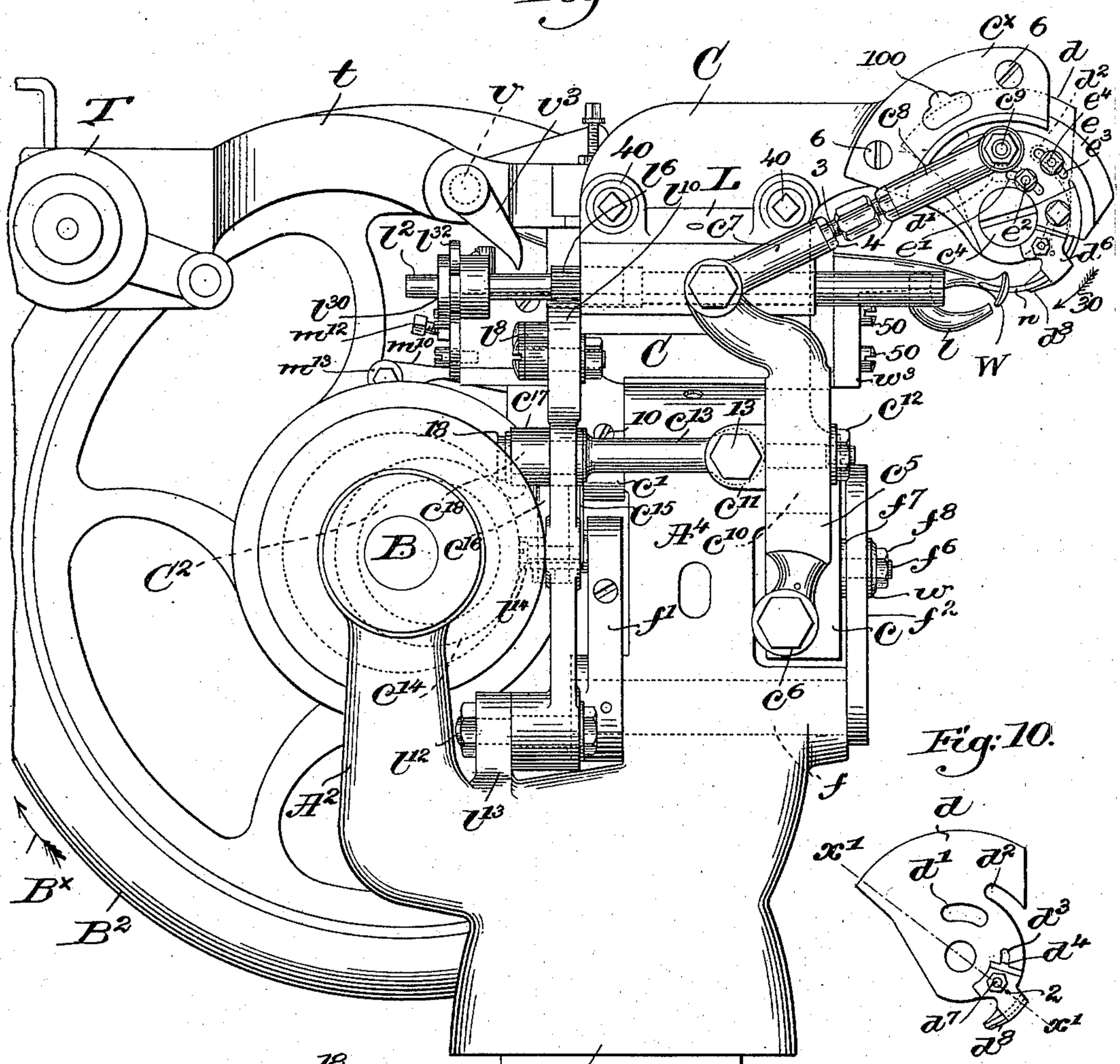


Fig. 10.

Fig. 12.

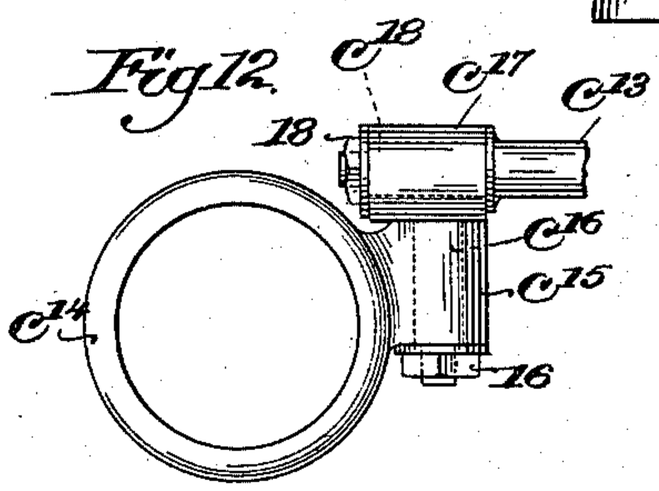
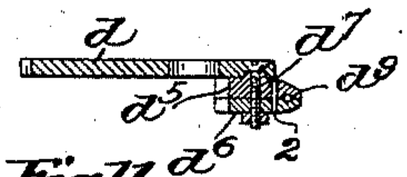


Fig. 11.



Witnesses.
Edward F. Allen.
John F. C. Perkinkerf

Inventor:
Harry I. Illingworth.
by Crosby & Gregory.
Attys.

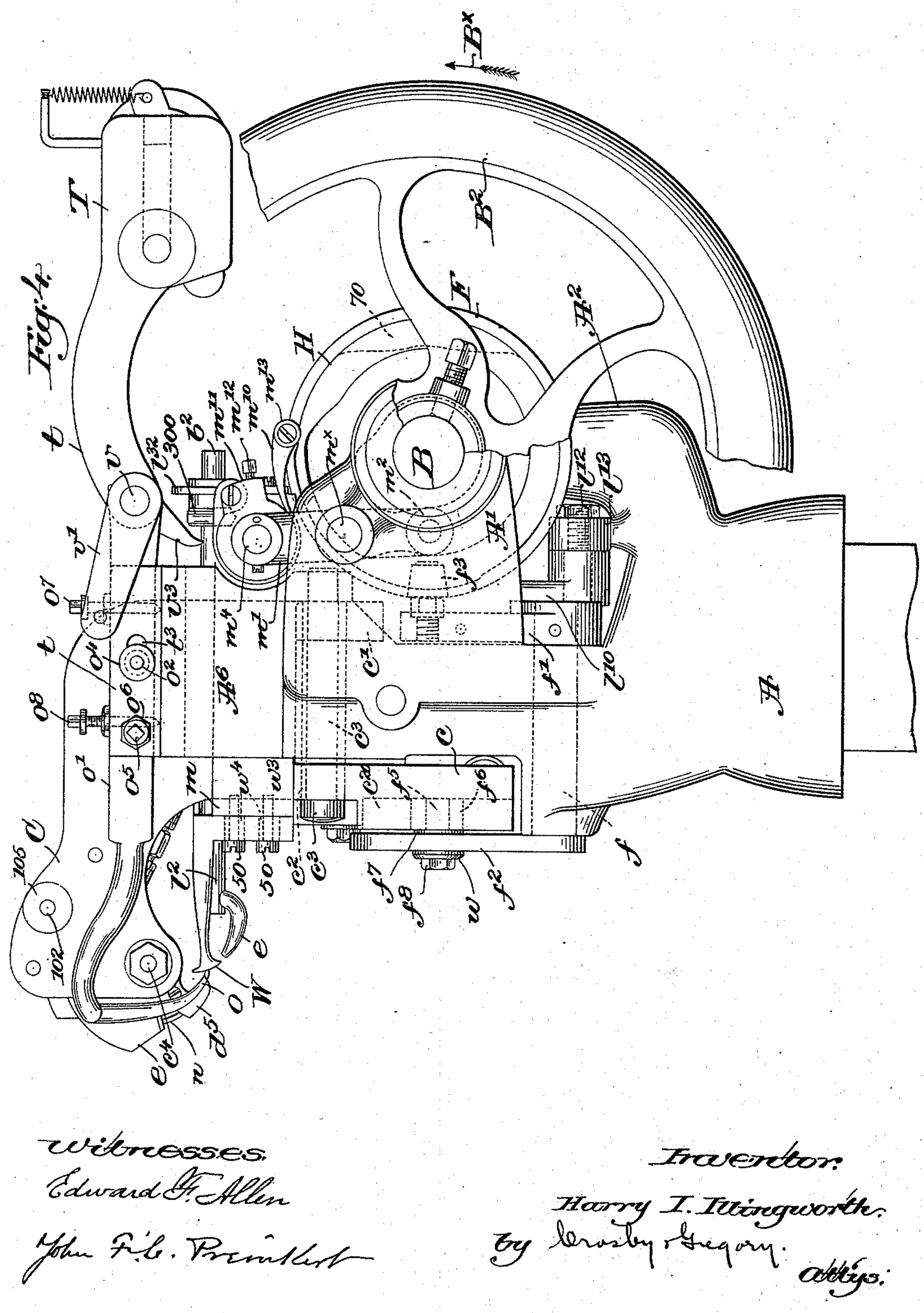
(No Model.) 7 Sheets—Sheet 4.

H. I. ILLINGWORTH.

SEWING MACHINE.

No. 573,880. Patented Dec. 29, 1896.

Fig. 4.



Witnesses.
Edward F. Allen
John F. C. Brinkerhoff

Inventor.
Harry I. Illingworth.
by Crosby & Gregory.
Attys.

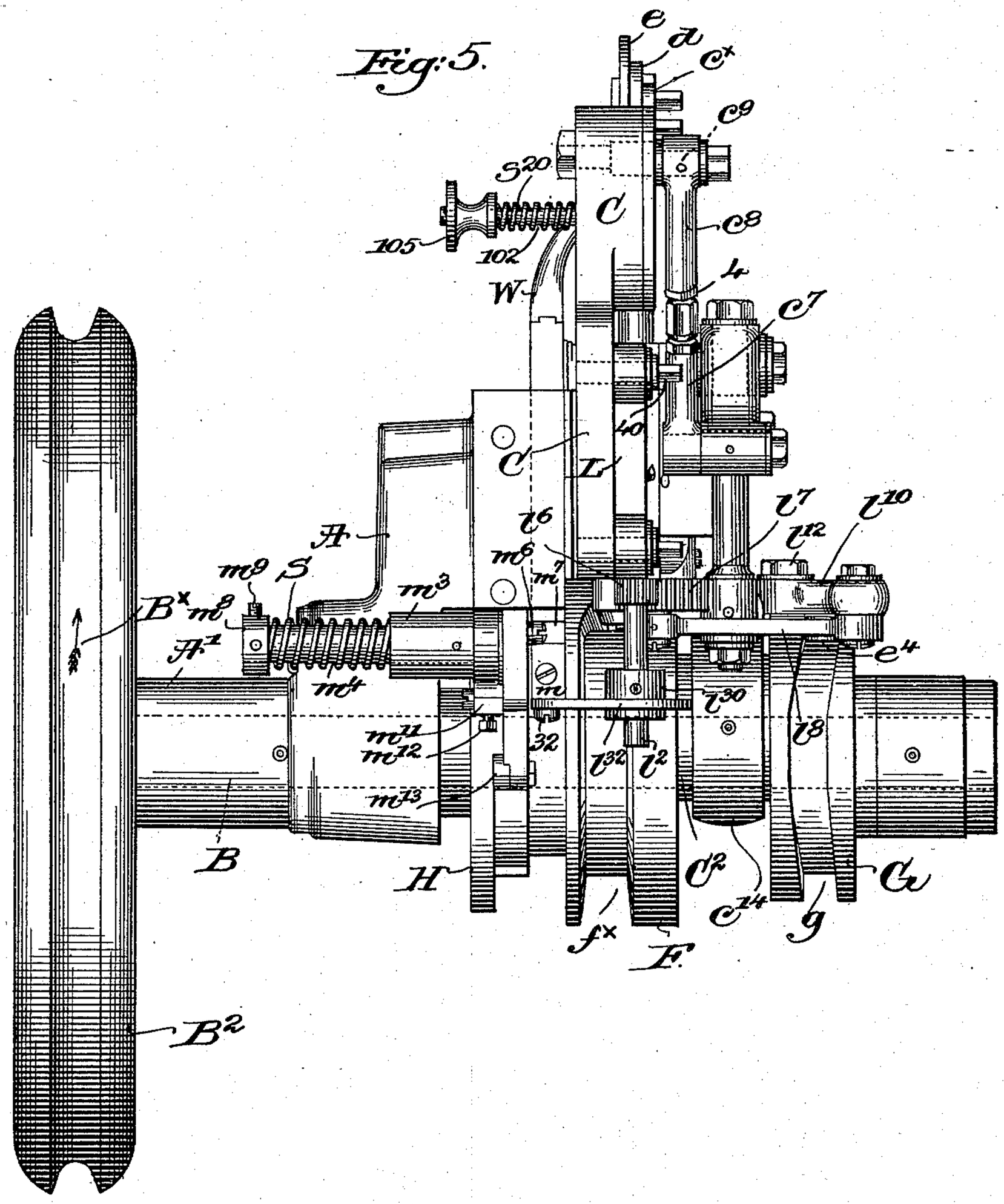
(No Model.) 7 Sheets—Sheet 5.

H. I. ILLINGWORTH.

SEWING MACHINE.

No. 573,880. Patented Dec. 29, 1896.

Fig. 5.



Witnesses:
Edward F. Allen
John F. C. Breinkert

Inventor:
Harry I. Illingworth.
By Crosby & Gregory.
Attys.

(No Model.) 7 Sheets—Sheet 6.

H. I. ILLINGWORTH.

SEWING MACHINE.

No. 573,880. Patented Dec. 29, 1896.

Fig. 6.

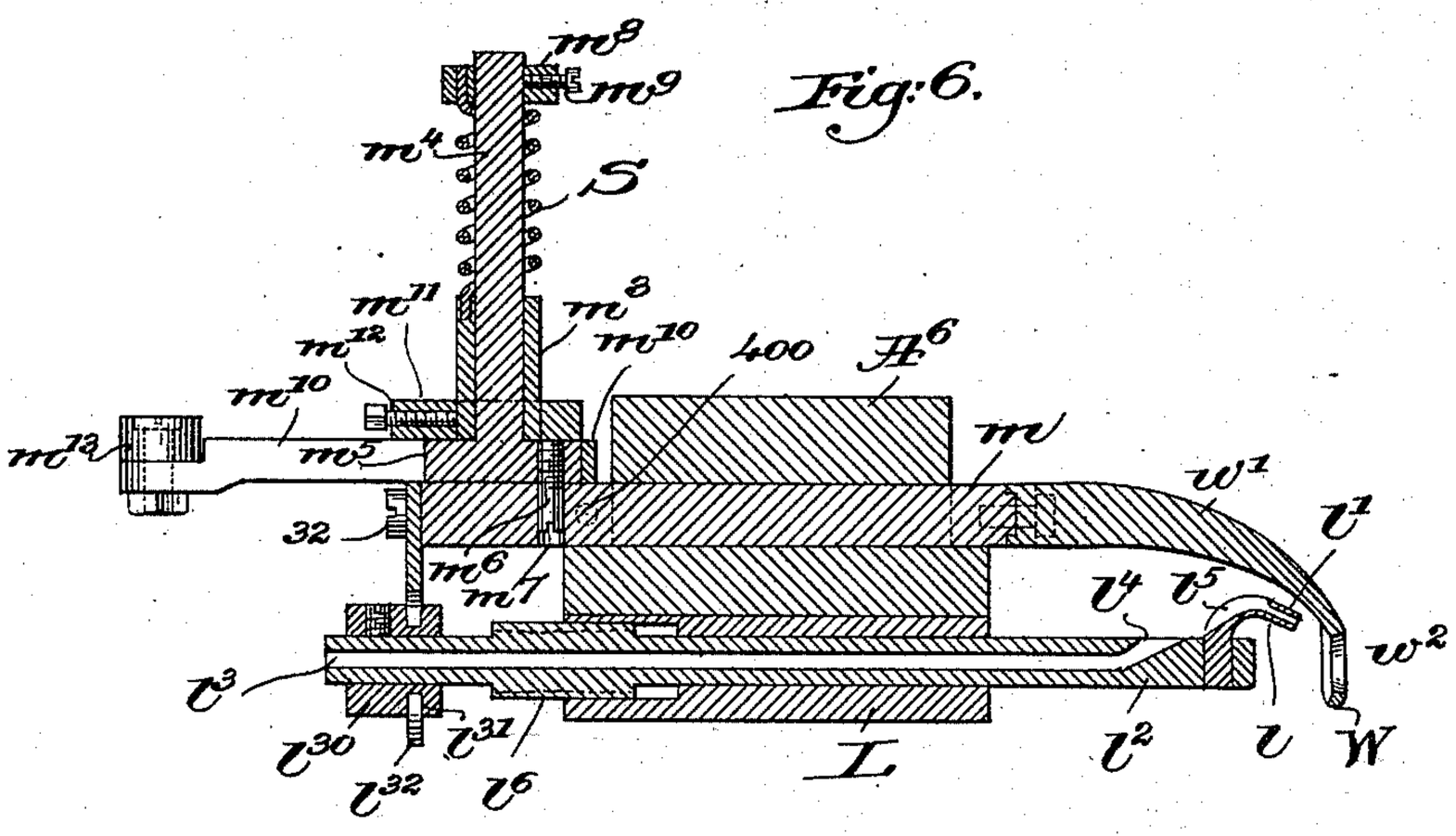
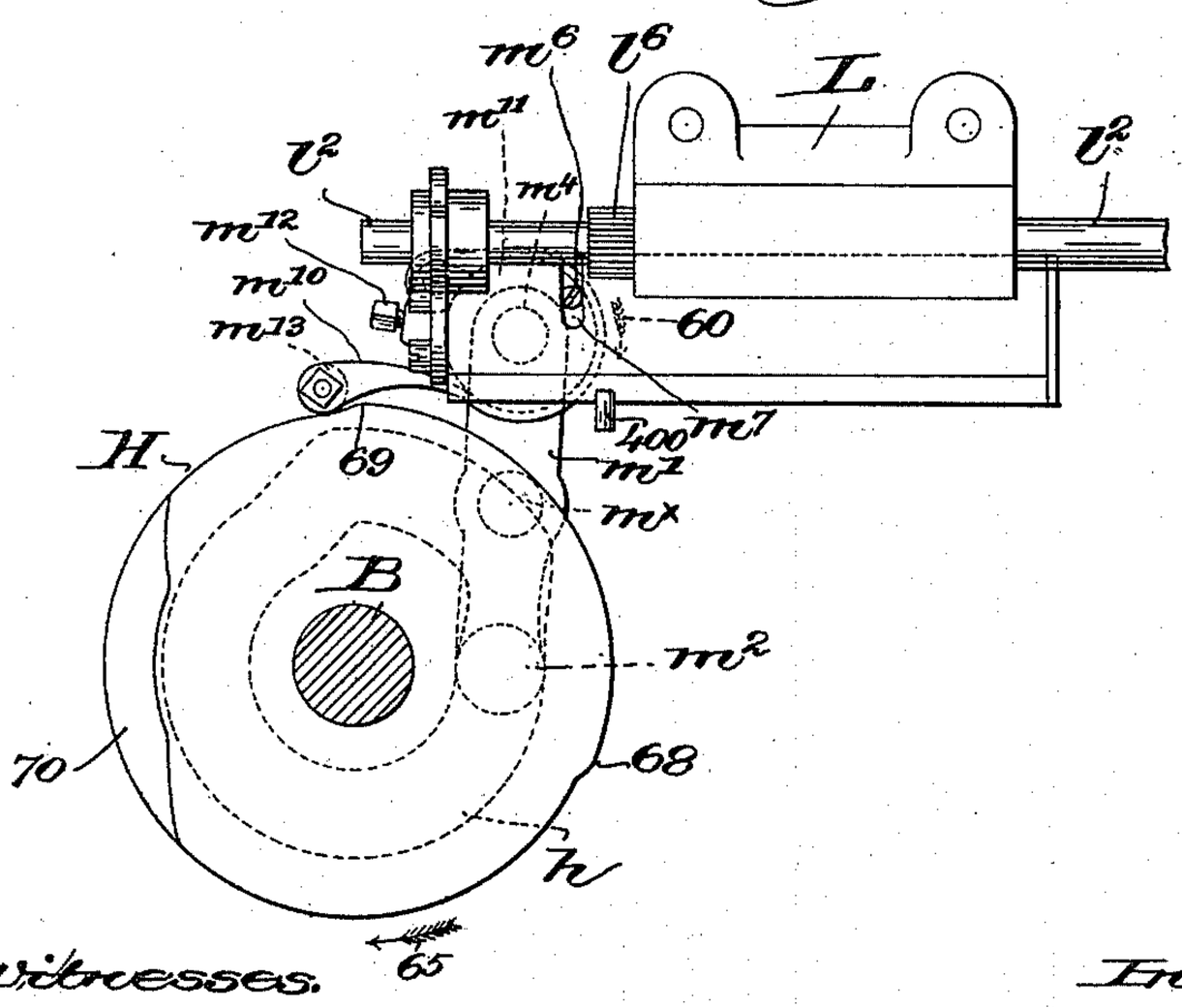


Fig. 7.



Witnesses.
Edward F. Allen.
John F. C., Washington

Inventor:
Harry I. Illingworth.
by Crosby & Gregory.
Attys.

(No Model.) 7 Sheets—Sheet 7.

H. I. ILLINGWORTH.

SEWING MACHINE.

No. 573,880. Patented Dec. 29, 1896.

Fig: 8.

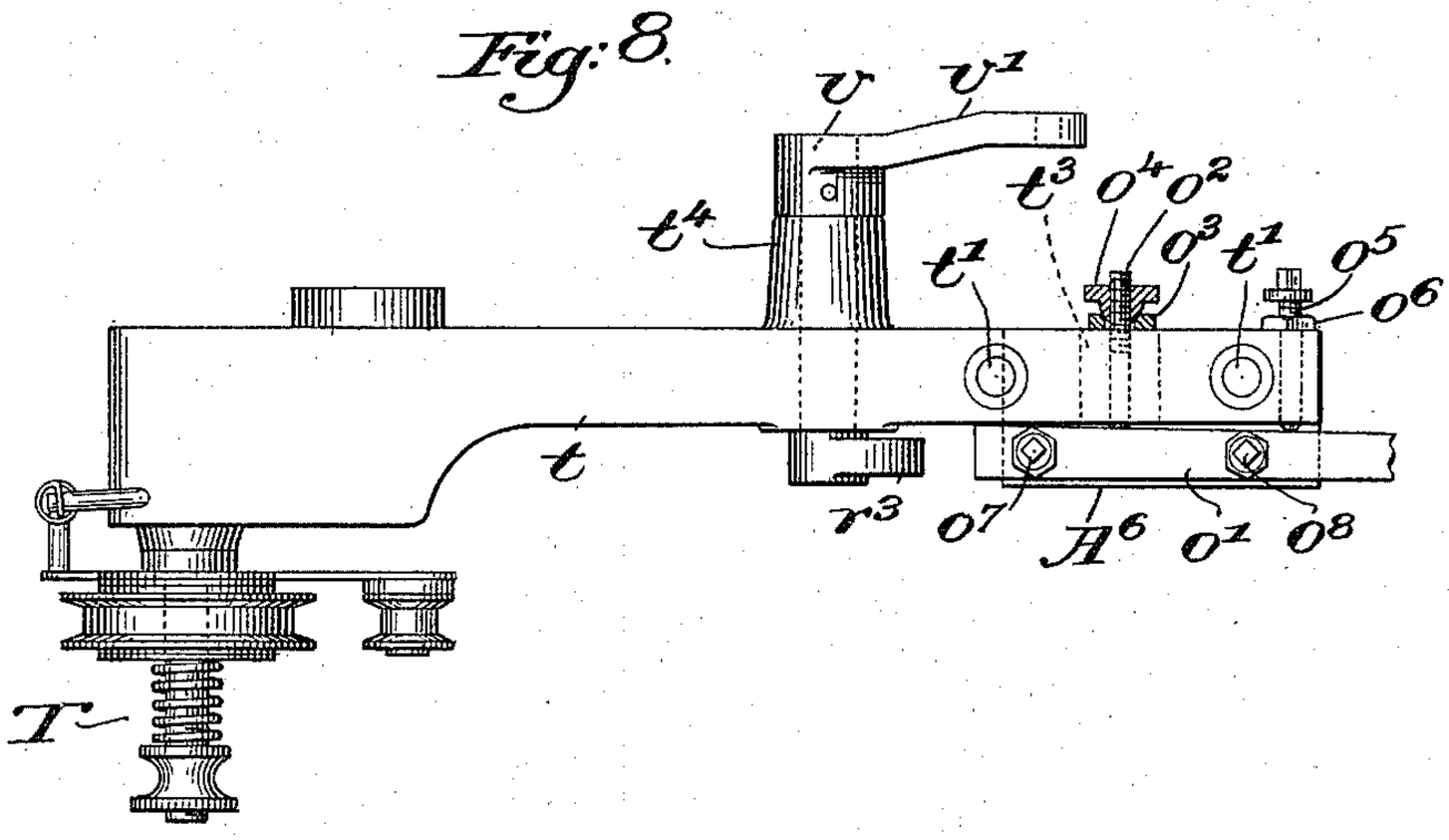
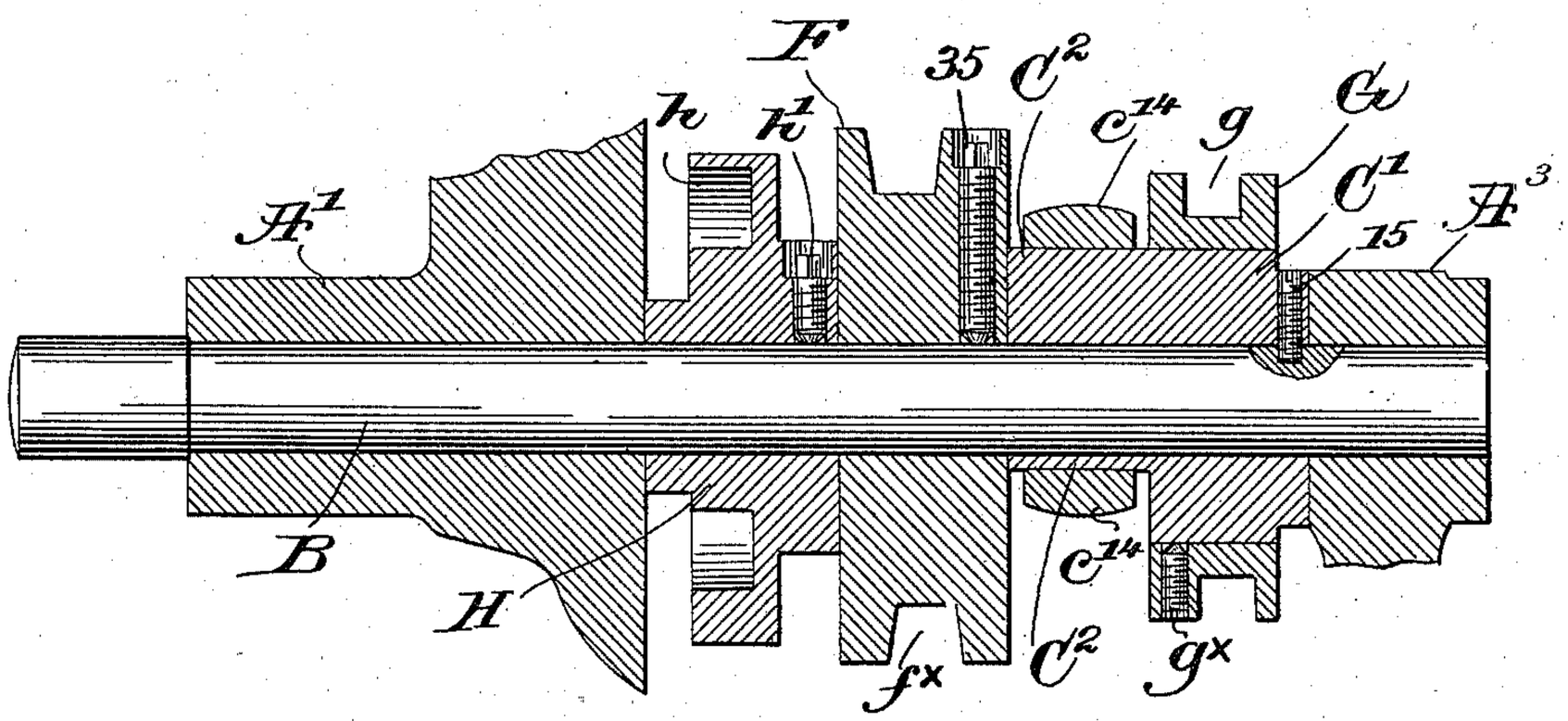


Fig: 9.



Witnesses.
Edward F. Allen.
John F. C. Breinkert

Inventor:
Harry I. Illingworth.
by Crosby & Gregory. Attys.

UNITED STATES PATENT OFFICE.

HARRY I. ILLINGWORTH, OF LYNN, MASSACHUSETTS, ASSIGNOR TO CHARLES E. RILEY, OF NEWTON, MASSACHUSETTS.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 573,880, dated December 29, 1896.

Application filed September 3, 1895. Serial No. 561,281. (No model.)

To all whom it may concern:

Be it known that I, HARRY I. ILLINGWORTH, of Lynn, county of Essex, State of Massachusetts, have invented an Improvement in Shoe-Sewing Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object the production of a strong, simple, and efficient machine for sewing channeled shoes, the stitch-forming mechanism being mounted upon a swinging head, which has imparted to it motion to feed the shoe over the work-support, a curved hooked needle entering the work and holding it as the head is swung to accomplish the feed. The stitch-forming mechanism is operated in a direct and positive manner, a combined needle-guide and cast-off supporting the needle while in the work during the feeding movement. Means are also provided for moving the work-support against the work in a yielding manner to accommodate it to the thickness of the work, after which the work-support is automatically locked in place relative to a channel-guide which enters the channel of the sole.

The working parts of the apparatus are operated from a single shaft by suitable mechanism, which will be hereinafter described, means being provided for adjusting the parts to vary the length of stitch and throw of the needle.

Figure 1 is a front elevation of a shoe-sewing machine embodying my invention, the needle being shown in the position it would occupy after entering the work. Fig. 2 is a rear elevation of the machine shown in Fig. 1. Fig. 3 is a side elevation of the machine, looking to the right, Fig. 1. Fig. 4 represents in elevation the opposite side of the machine, the fly-wheel being partly broken away. Fig. 5 is a top or plan view of the machine, the stitch-forming mechanism being shown as farthest from the observer and the tension mechanism and supporting-standard omitted. Fig. 6 is a sectional detail view of the work-support and looper and a portion of the controlling mechanism therefor, taken on the irregular line $x\,x$, Fig. 2. Fig. 7, in side elevation, represents a portion of the mechanism shown in Fig. 6, with the actuating and locking cam in addition. Fig. 8 is a plan view of the tension-supporting standard, and also showing the mode of attachment and adjustment of the channel-guide thereto. Fig. 9 is a sectional view of the actuating-cams in position on the main shaft, the bearings of the latter being also shown in section. Fig. 10 is a detached view of the cast-off and its carrier. Fig. 11 is a sectional view thereof on the line $x'\,x'$, Fig. 10; and Fig. 12 is a detail in elevation of the eccentric-strap and a portion of the link connecting it with the needle-segment-actuating mechanism.

The main frame A of the machine, of suitable shape to support the operating parts, is provided with a long bearing A′ for one end of the main driving or cam shaft B, while an upturned portion A^2 of the frame provides a bearing A^3 for the opposite end of the main shaft, which is prevented from longitudinal movement in the bearings by an eccentric cam C′ thereon, adjacent the bearing A^3, and by a suitable driving or band wheel B^2, secured to the shaft at the outer end of the bearing A′.

The front portion of the main frame is upwardly extended, as at A^4, and is straddled by the downturned portions c and c' of a swinging head C, which supports the stitch-forming mechanism, a sleeve c^2, (see dotted lines, Fig. 4,) extending through a horizontal bearing in the part A^4 of the frame, entering the downturned portions c and c' of the head, to which it is secured in any suitable manner, as by a set-screw 10, (see Fig. 3,) and forming a fulcrum about which the head may rock, a headed stud c^3 being loosely extended through the sleeve and projecting beyond its inner end, for a purpose to be described.

The head C at its upper end and at the front of the machine is recessed to receive therein a cast-off carrier d, shown separately in Figs. 10 and 11, and mounted to rock upon a bearing-stud c^4, upon which stud is also mounted the needle-segment e, between the cast-off carrier and a cover-plate $c^\times$, secured to the head by suitable screws 6, the recess in the head being shaped to conform with the circular portion of the periphery of the cast-

off carrier, and the cover-plate being cut away to permit the free movement of the needle-segment-actuating devices.

The cast-off carrier d has a curved slot d' therein concentric to its center, and also a concentric open slot d^2, whereby intermittent oscillation is imparted to the carrier, as will be hereinafter described, the carrier being grooved or slotted at d^3 to receive the fin d^4 of one member d^5 of the combined cast-off and needle-guide, the other member d^6 being secured to it and to the carrier by a suitable screw, as d^7, a dowel-pin 2 preventing relative movement of the members of the cast-off and needle-guide. By loosening the screw d^7 the cast-off may be adjusted upon its carrier, as desired, to properly time it to the movement of the curved hooked needle n, secured to the needle-segment e in any usual manner. The member d^5 of the cast-off and guide is provided with a forwardly-projecting lip d^8, and the two members are grooved upon their inner faces to form a needle-hole d^9, the groove in the member d^5 being carried to the extremity of the lip d^8, the needle passing through and being guided by the said grooves.

A rocker-arm c^5 is pivoted at c^6 on the lower portion of the part c of the head, and is connected by an adjustable link c^7 c^8 to the needle-segment e at c^9, as best shown in Fig. 3, a right and left hand screw 3 connecting the two parts of the link, rotation of the screw in one or the other direction varying the effective length of the link to alter the terminals of the needle-path relative to the work-support, check-nuts 4 maintaining the link in adjusted length.

The rocker-arm c^5 is longitudinally slotted at c^{10} to receive therethrough a bolt provided with ears c^{11} and held in adjusted position on the rocker-arm by means of a suitable check-nut c^{12}, one end of a connecting-rod c^{13} being pivotally mounted in said ears on a fulcrum-stud 13.

Referring now to Fig. 9, a hub C′ is secured to the shaft by means of a suitable set-screw 15, and is extended at one end to form an eccentric C^2, which is surrounded by a strap c^{14}, (shown separately in Fig. 12,) and having an enlargement c^{15}, provided with a vertical bearing to receive a stud c^{16}, rigidly secured to or forming part of a sleeve c^{17}, into the horizontal bore of which is extended the reduced end c^{18} of the connecting-rod c^{13}, the stud and connecting-rod being held in their respective bearings by suitable washers and nuts 18 and 16, respectively.

By the devices hereinbefore described rotation of the main shaft B will, through the connecting-rod, rock the arm c^5, and thereby oscillate the needle-segment to cause the needle n to move into and out of the work in the formation of the stitch, and as the rocker-arm c^5 is mounted upon the head it will swing with the latter, the swiveled connection between the rod c^{13} and the eccentric-strap c^{14} forming a species of universal joint, whereby all binding of the parts is prevented, and by adjusting the point of attachment of the connecting-rod c^{13} to the rocker-arm its throw will be varied to vary the needle-stroke.

The needle-segment e is slotted at e' to receive therethrough a stud e^2, adjustable on the segment, and which enters the slot d' in the cast-off carrier d, said stud e^2 acting upon the outer end of the slot d' to move the needle-guide and cast-off in the direction of the arrow 30, Fig. 3, at the proper time, in unison with the needle, such movement carrying the lip d^8 of the needle-guide against the work, or toward it. A second slot e^3 in the needle-segment has extended therethrough a stud e^4, which projects into the open slot d^2 of the cast-off carrier, the stud being adjustable in the slot e^3, and when the needle-segment e is retracted or moved in the direction opposite to the arrow 30, Fig. 3, the stud e^4 will, when it comes in contact with the inner end of the slot d^2, move the carrier d in unison with the needle. The slot d' is of such length and so located that the needle will pass into the work and complete its movement just as the cast-off and guide are brought against the work, and as the needle is withdrawn it carries the loop of thread up into the needle-guide before the stud e^4 reaches the inner end of the slot d^2, and by adjusting the stud e^4 the movement of the needle-guide is regulated to accord with the movement of the needle, the guide thereby retaining the loop properly on the hooked end of the needle, and when the needle moves forward to take the next loop its end will pass out of the guide and the loop will be freed before the hooked end of the needle again enters the work.

Before describing the looper mechanism the devices which rock the swinging head C to feed the material will be described, inasmuch as the feeding movement takes place while the needle is in the work.

A rock-shaft f is supported in a bearing in the main frame below the pivotal support of the swinging head C and parallel thereto, to the projecting ends of which rock-shaft are secured arms f' and f^2, the arm f' having thereon a roller or other suitable stud f^3 (see dotted lines, Figs. 2 and 4) to enter the groove $f^\times$ in the periphery of the cam F, shown in Fig. 9 as secured to the shaft B by a suitable set-screw 35, the shape of the cam-groove being well shown in Fig. 2 in full and dotted lines and of such shape as to oscillate the rock-shaft f and the arms f' f^2. The arm f^2 extends upwardly in front of the downturned portion c of the head C, and it is longitudinally slotted at f^4 (see Fig. 1) to receive a stud f^5, which loosely enters a block f^6, adapted to be moved in the longitudinal groove or recess c^{20} in the face of the part c. The stud f^5 has an annular enlargement f^7, Figs. 3 and 4, which bears against the inner side of the arm f^2, the end of the stud projecting beyond said

enlargement through the slot f^4 in the arm, a washer w and nut f^8, screwed onto the threaded projecting end of the stud, firmly securing the latter to the arm in adjusted position toward or away from the center of movement of the latter. When the shaft f is rocked, as has been described, the arm f^2 will, through the stud f^5 and block f^6, rock the swinging head C and the parts supported thereby to impart an intermittent feeding motion to the material.

When the needle enters the material, the feed takes place, the feed-actuating mechanism being shown as in position to begin the feed. By adjusting the stud f^5 in the slotted arm f^2 the length of feed may be adjusted to suit the nature of the work, it being remembered that while the feed takes place the needle-guide bears against or approaches the work, the extended lip d^8 thereof supporting the needle adjacent the work as the feed takes place. As the forward feed movement of the head is completed and before the needle is withdrawn a loop of thread is thrown about the hooked end of the needle n by means of the looper l.

Referring now to Figs. 3, 6, and 7, the looper l is shown as a bent arm having at its extremity a thread-eye l' (shown only in Fig. 6) and mounted in the outer end of a spindle l^2, supported in a bracket L, shown in Fig. 3 as secured to the head C by suitable bolts 40, the looper-spindle being rotatable and longitudinally movable in the said bracket, said spindle having extended therethrough a thread guide or passage l^3 axially for the greater part of its length and upturned at l^4 adjacent the looper, the thread passing from the upturned portion of the thread-guide along a recess or slot l^5, formed in the looper, and thence through the thread-eye l' to be laid about the needle. The looper is located behind the work-rest W, to be described, and when its spindle l^2 is rotated the looper will describe a curved path about the hooked end of the needle to lay the thread therein.

A long gear l^6, secured to or forming a part of the looper-spindle, is engaged by the teeth of a segment-gear l^7, (see Fig. 2,) rigidly secured to the projecting end of the long stud c^3 at the back of the head, the segment-gear being rocked on its fulcrum by means of a link l^8, adjustably connected at l^9 to the slotted end of a lever l^{10}, pivoted at l^{12} to an ear l^{13} on the main frame and provided with a roller or other stud l^{14}, in engagement with the peripheral groove g in a cam G, secured to the hub C′ by a set-screw $g^\times$, (see Fig. 9,) adjustment of the link varying the segment-stroke. As the segment-gear l^7 is moved in one direction rotative movement will be imparted to the looper-spindle l^2 to cause the looper to carry the thread about the hooked end of the needle n, and after the needle has been withdrawn from the work the segment-gear is returned to its normal position, thereby moving the looper in a reverse direction ready to lay the new loop about the needle for the next stitch.

The channel-guide o, hereinafter described, is attached to a fixed part of the machine, means being provided for its adjustment relative to the work-support W, the latter being mounted upon a part of the main frame.

In using the machine the channel-guide is inserted in the channel of the sole and the work-support bears against the opposite side of the sole, and inasmuch as the work varies in thickness means must be provided for regulating the position of the work-support relative to the channel-guide according to the thickness of the work held therebetween, and I have herein provided means whereby the work-support is moved forward in a yielding manner until it impinges against the work, after which the work-support is locked in place while the needle enters the work and unlocked during the feeding movement in order that the needle then in the work may readily move the latter along into position to be entered by the needle at the formation of the next stitch.

The work-support W is shown as forming part of an arm w', bent over in front of the path of the looper and having a needle-opening w^2 therein, the base of the arm w' being downturned, as at w^3, Fig. 4, and slotted at w^4 to receive retaining-screws 50, which enter a slide-bar m, longitudinally movable in the upper part A^6 of the main frame.

As the distance between the work-support and the looper must remain constant, the looper-spindle l^2, as shown, is provided with a collar l^{30} at its inner end, provided with an annular groove l^{31} to receive therein a forked arm l^{32}, secured in suitable manner, as by a screw 32, to the slide-bar m, the bifurcation in the arm l^{32} being long enough to permit the movement of the looper-spindle toward and from the slide-bar m, as the head C is swung or rocked, without disengagement from the grooved collar l^{30}, and the length of the gear or pinion l^6 is such that it will always remain in engagement with the segment-gear l^7 throughout the longitudinal movement of the looper-spindle.

A lever m' (see Figs. 2, 4, and 7) is secured to a fulcrum pin or stud $m^\times$, mounted to rock in a suitable bearing A^7 in the main frame, a suitable roller or other stud m^2 on the lower end of the lever entering the groove h in the side of the cam-disk H, secured to the main shaft by a suitable set-screw h', the shape of the cam-groove h (best shown by dotted lines in Fig. 7) being such that for the greater part of the rotation of the shaft the lever will remain stationary and will then be quickly rocked, first in one and then in the other direction, to move the work-support W, as will be described.

The upper end of the lever m' is provided with a boss m^3, through which is extended a shaft m^4, having at its inner end a circular

head m^5, adjacent the side of the slide-bar m, said head having therein a wrist-pin m^6, which enters a transverse slot m^7 in the slide-bar, as clearly shown in Figs. 6 and 7, a spring S surrounding the shaft m^4 between the boss m^3 and a collar m^8, rigidly held on the shaft by a set-screw m^9, the ends of the spring entering holes in the collar and boss, respectively, as clearly shown in Fig. 6, to normally tend to rotate the shaft m^4 in the direction of the arrow 60, Fig. 7.

As the lever m' is rocked to move its upper end toward the needle the slide-bar m and work-support W attached thereto will be moved forward through the pin-and-slot connection m^6 m^7 until the work-support bears against the work, the spring S permitting the shaft m^4 to be rotated in a retrograde direction when the work-rest bears against the work before the lever m' has completed its forward movement, such stoppage of the work-rest taking place sooner or later, according to the thickness of the work.

The tendency of the spring S at all times is to throw the slide-bar m and work-rest forward, the wrist-pin in the slot of the slide-bar accomplishing this function and permitting the retrograde motion of the shaft m^4, as described.

In order to obviate the use of a very strong spring to hold the work-rest forward and yet allow it to accommodate itself to different thicknesses of material, I have provided devices for locking the work-rest in its proper position, determined by the thickness of the work, during a part of the rotation of the main shaft, the locking devices herein shown consisting of a friction strap or band m^{10}, secured at one end to a collar m^{11}, held in adjusted position on the boss m^3 by a set-screw m^{12}, the other end of the strap being preferably provided with a friction-roll m^{13}, adapted to bear on the irregular periphery of the cam-disk H.

In Fig. 7 the mechanism is shown in the position assumed just after the work-support has been unlocked, the cam-disk H moving in the direction of the arrow 65, the part of the periphery between the points 68 and 69 being higher than the remainder of the periphery and acting, when coöperating with the roll m^{13}, to draw the friction-strap m^{10} so tightly about the disk m^5 as to prevent any rotative movement, so that the work-rest is thus locked while the portion of the periphery between the points 68 and 69 is passing by the roll m^{13}, the needle at such time entering the work, and then the looper begins its movement to throw the loop of thread around the hooked end of the needle. When the point 69 of the cam passes the roll m^{13}, the latter moves onto the lower portion of the periphery, releasing the disk m^5, so that the torsion of the spring S then holds the work-rest against the work, and when a still further rotation of the cam is effected the roll m^{13} will, by the rocking of the lever m', enter the clearance-space 70, maintaining the strap practically free from the disk m^5, and as the upper end of the lever m' is swung to the left, Fig. 7, the work-rest will be drawn back, taking off the pressure, so that the work can be fed forward without binding between the channel-guide and work-rest W. By adjusting the collar m^{11} on the boss m^3 wear of the strap and disk may be compensated for. It will now be clear that the reciprocating motion of the slide-bar m and the work-rest is imparted to the looper-spindle l^2 by the previously-described connections, so that no matter what the movement of the work-rest toward or from the work the path of the looper will always be at a constant distance therefrom. A stop-pin 400 (see dotted lines, Fig. 6) on the slide-bar m limits the forward movement of the latter when there is no work in the machine.

The tension mechanism T (shown separately in Fig. 8) is mounted upon a standard t, secured rigidly to the main frame A^6 of the machine by suitable screws extended through holes t', and the channel-guide o is adjustably mounted for convenience on a portion of the standard t. The channel-guide o (shown very clearly in Figs. 1 and 4) is curved and bent upwardly and then back to form a supporting-shank o', which latter has secured thereto a stud o^2, which is extended through a slot t^3 in the standard t and passed loosely through a washer o^3, resting against the outer side of the standard and cupped to receive therein a ball-nut o^4, threaded onto the projecting end of the stud o^2, said stud and nut holding the channel-guide shank o' rigidly to the standard. An adjusting-screw o^5, provided with a suitable check-nut o^6, is extended through the standard, with its inner end bearing against the side of the shank o', so that by manipulating the screw o^5 and the stud o^2 the angle of the channel-guide shank relatively to the standard may be changed, to thereby adjust the channel-guide to the right or left, viewing Fig. 1. Set-screws o^7 o^8 are threaded into the shank and extend below it to bear upon the top of the main frame A^6, so that by turning the said screws in one or the other direction an equal amount the channel-guide will be raised or lowered, and by turning one screw more than the other the guide will be tilted, as it were, to provide for any desired adjustment thereof.

The hub t^4, shown for convenience as forming a part of the standard t, forms a bearing for a rock-shaft v, provided with a rocker-arm v', which may be attached to a treadle-link v^2 of any suitable construction, and which is partly shown in Fig. 1, the inner end of the rock-shaft having secured thereto a finger v^3, which normally occupies the position shown in Fig. 3, out of range of a pin 300 on the slide-bar m, but by depressing the treadle to turn the finger v^3 downwardly and toward the left, Fig. 3, the work-rest, and thereby the looper-

spindle, may be drawn away from the work at the will of the operator at such times as the work-support is not locked in position.

Referring now to the cast-off carrier *d*, it will be remembered that it is operated intermittently by the needle-segment and with some lost motion, and in order to prevent improper movement of the carrier, which might be caused by frictional contact with the needle-segment, I have provided a friction-pad to rest upon the cast-off carrier and to thus prevent any but a positive movement due to the needle-segment at the proper time.

The cover-plate $c^{\times}$ is cut out at 100 (see Fig. 3) in the shape of an elongated slot, with an offset portion at one side, and into the back of the head C is extended a stud 102, having a head 103 in shape corresponding to the shape of the opening 100 in the cover-plate, and between the head and cast-off carrier is interposed a piece of rawhide 104, (see dotted lines, Fig. 2,) which bears against the face of the carrier and is held there by the pressure of a spring s^{20}, surrounding the stud 102 between the swinging head and an adjustable nut 105, the latter adjusting the tension of the spring and thereby the amount of pressure to be exerted upon the cast-off carrier. The stud 102 is connected with its head 103 at its upper side and to the projecting portion which enters the offset of opening 100, so that the carrier is free to be oscillated beneath the shank.

While provision has been made for accommodating the movement of the needle-actuating devices to the swinging head, in order to avoid twisting or distortion of the intervening parts, there still remains a slight lateral movement of the rocker-arm c^5 relative to the position of the eccentric C^2, and for this purpose the cam is made somewhat wider than the strap, as clearly shown in Fig. 9, in order that the said strap may slide longitudinally upon the eccentric, to thus accommodate this lateral displacement of the rocker-arm.

The operation of the machine is as follows: The operator places the shoe between the work-rest and channel-guide, with the latter in the channel, and the machine being set in motion the work-rest is locked in proper position before the needle begins to enter the material. The needle-guide and cast-off are moved forward up to or nearly to the work as the needle passes through the latter, and, the work-rest having been unlocked, the head is swung to feed the work forward and bring it into position to be entered at the next entering stroke of the needle, the latter at the end of the feed stroke being withdrawn from the work with the loop of thread which has been laid around its hooked end by the looper. The loop is drawn up into the cast-off before the latter begins to move away from the work in unison with the needle, and does not release or cast off the loop until the needle begins its forward stroke for the next stitch, the needle having been moved back by the reverse swing of the head after withdrawal from the material, the work at such time being held between the work-rest and channel-guide. The needle is then moved forward through the previously-formed loop and into the work to receive the next loop of thread formed by the looper, and the second feed stroke takes place, the work-rest being again unlocked during its movement, and the operation described is repeated as the stitching progresses.

By the construction hereinbefore described a very compact and strong machine is attained and comparatively simple in its construction, the mechanism for actuating the various parts having a direct and positive action.

The direction of rotation of the main shaft is to be noted in some of the figures by the arrow $B^{\times}$.

I claim—

1. In a sewing-machine, an oscillating needle-segment, a curved needle carried thereby, a needle-guide, its oscillating carrier, said segment and carrier having a common fulcrum, independent adjustable connections between the segment and carrier, to rock the latter in opposite directions, and means to positively oscillate the needle-segment, substantially as described.

2. In a sewing-machine, an oscillating needle-segment, a needle-guide carrier adjacent thereto, said segment and carrier having a common fulcrum, a connection between the segment and carrier to engage positively, and move the latter in one direction, an independent connection to engage and move it positively in the opposite direction, the segment moving in advance of and thereafter with the carrier in each direction, and means to adjust said connections to regulate the stroke of the carrier, substantially as described.

3. In a sewing-machine, an oscillating needle-segment, its needle, a needle-guide, a carrier therefor adjacent and to be rocked by said segment, one of the oscillating parts having two slots therein, independently-adjustable studs on the other of said parts, to enter said slots, whereby the oscillation of the needle-segment will oscillate the needle-guide carrier through an adjustable stroke, and means to positively oscillate the needle-segment, substantially as described.

4. In a sewing-machine, a needle-guide carrier having two concentric slots therein, a friction-presser to bear upon and prevent accidental movement of the carrier, a needle-segment, means to oscillate it, two independently-adjustable studs thereon, to enter the slots in and positively engage the carrier and to rock the latter in opposite directions, adjustment of said studs determining the stroke of the carrier, and means to positively oscillate the needle-segment, substantially as described.

5. In a sewing-machine, a stationary frame, a swinging head mounted thereon, stitch-forming devices, including a needle-segment,

carried by said head, a rocker-arm fulcrumed on the head and connected to the needle-segment, to oscillate it, means supported in the stationary frame, to rock the rocker-arm, and adjusting devices for said means to vary the needle stroke, substantially as described.

6. In a sewing-machine, a stationary frame, a swinging head mounted thereon, an oscillating needle-segment and a carrier supported by said head, a combined cast-off and needle-guide on said carrier, adjustable connections between the segment and carrier, to operate the latter, and a rocker-arm fulcrumed on the head and connected to the needle-segment, combined with a main shaft supported in the frame, an eccentric thereon, and connections between it and the rocker-arm, to rock the latter, substantially as described.

7. In a sewing-machine, a stationary channel-opener, a work-rest, means to move it toward the work yieldingly and thereafter to lock it, a swinging head, an oscillating needle-segment mounted thereon, its needle, a coöperating cast-off, a looper rotatable and longitudinally movable in the head, a rocker-arm on the head, an adjustable link connecting it with the needle-segment, and means carried by the main frame to rock the arm, substantially as described.

8. In a sewing-machine, a stationary frame, a channel-guide having an extended supporting-shank, means to attach the guide-shank to the frame, independent adjusting-screws to positively adjust said guide vertically, and means to bodily adjust the said guide laterally in the direction of the line of feed, substantially as described.

9. In a sewing-machine, stitch-forming devices, a longitudinally-movable work-rest, an oscillating lever, connections between it and the work-rest to move the latter, including a normally spring-controlled disk having a wrist-pin in engagement with the work-rest, a friction-brake to at times prevent the spring from operating the disk, and means to oscillate said lever and to control the brake, substantially as described.

10. In a sewing-machine, a longitudinally-movable slide-bar, a work-rest attached thereto, an oscillating lever, a disk pivotally mounted thereon and eccentrically connected to the slide-bar, a spring to normally act upon the disk and thereby move the slide-bar outwardly relatively to said lever, and means to at times prevent such relative movement of the disk and lever, whereby the oscillating lever will hold the slide-bar positively at such times, substantially as described.

11. In a sewing-machine, a longitudinally-movable slide-bar, an oscillating lever, a disk mounted rotatively thereon and pivotally connected to the slide-bar, a spring intermediate said disk and lever, to cause rotation of the disk and permit a yielding movement of the slide-bar, a friction-brake to lock the disk against the operation of the spring, and independent cams to oscillate the lever and control the brake respectively, substantially as described.

12. In a sewing-machine, stitch-forming devices, a stationary channel-guide, a work-rest movable toward and from said guide, an oscillating lever, a normally spring-controlled shaft supported by said lever, a disk on said shaft provided with a wrist-pin, to yieldingly move the work-rest, a brake for said disk, to at times lock it against the spring, and means to oscillate said lever and means to control the brake movement of the lever when the disk is locked carrying the work-rest positively therewith, substantially as described.

13. In a sewing-machine, a looper-spindle having secured thereto a pinion, means to move said spindle longitudinally in its bearings, an actuating segment-gear to engage the pinion and rotate the looper-spindle first in one and then in the other direction, a cam having a uniform rotative movement, and adjustable connections between said cam and segment-gear, to alter the amplitude of oscillation of the looper-spindle, substantially as described.

14. In a sewing-machine, a looper-spindle provided with a pinion, a segment-gear in engagement with said pinion, a rock-shaft having a rocker-arm, means to rock said shaft uniformly, a link connecting said segment-gear and rocker-arm, and means to adjust the link on the arm, to thereby vary the amplitude of oscillation of the looper-spindle, substantially as described.

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

HARRY I. ILLINGWORTH.

Witnesses:

JOHN C. EDWARDS,

AUGUSTA E. DEAN.