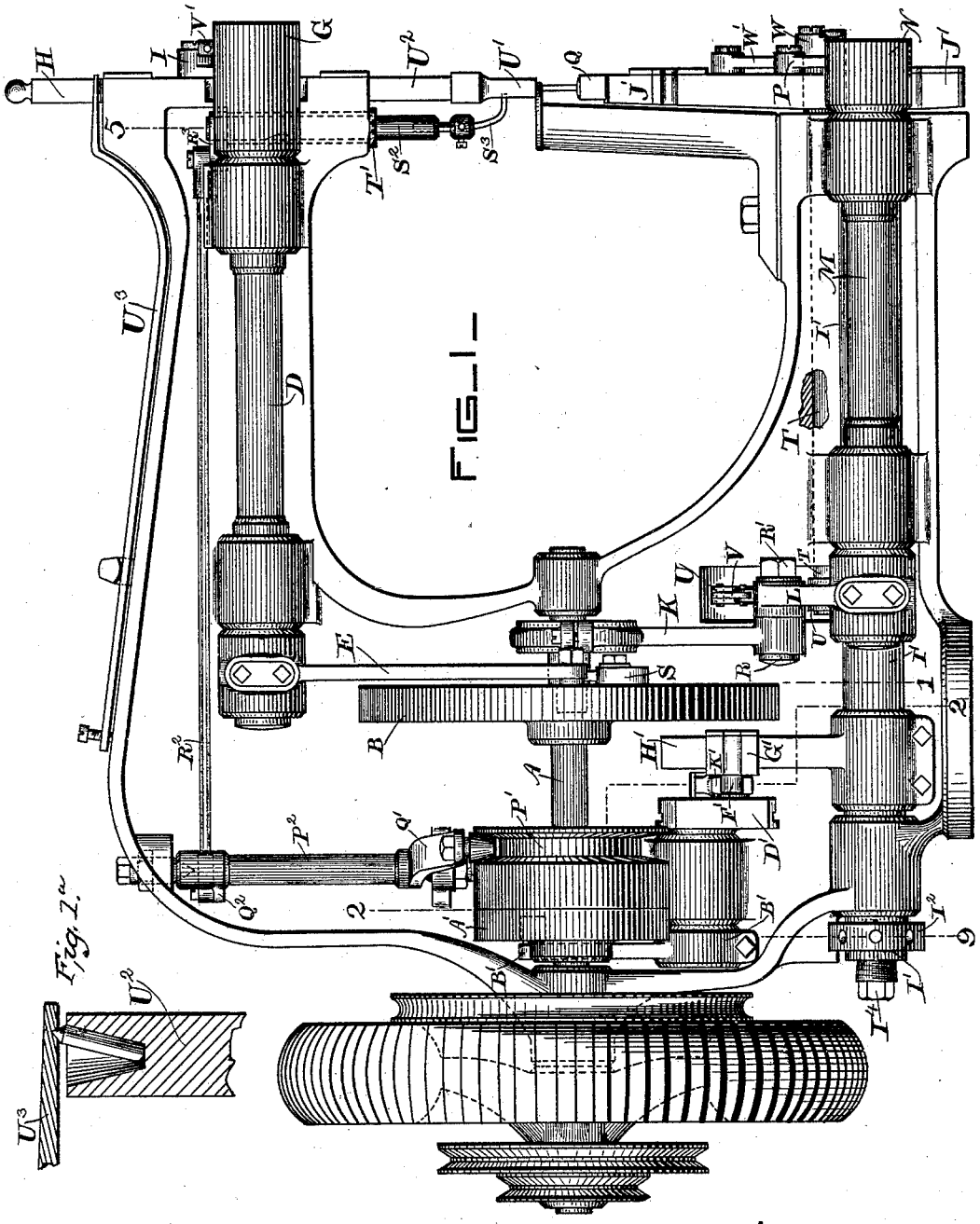
(No Model.) 6 Sheets—Sheet 1.

P. HARLOW.

WAX THREAD SEWING MACHINE.

No. 422,210. Patented Feb. 25, 1890.



WITNESSES

A. C. Arne

Ralph W. E. Hopper.

INVENTOR

Philander Harlow

per Eugene Humphrey

his atty.

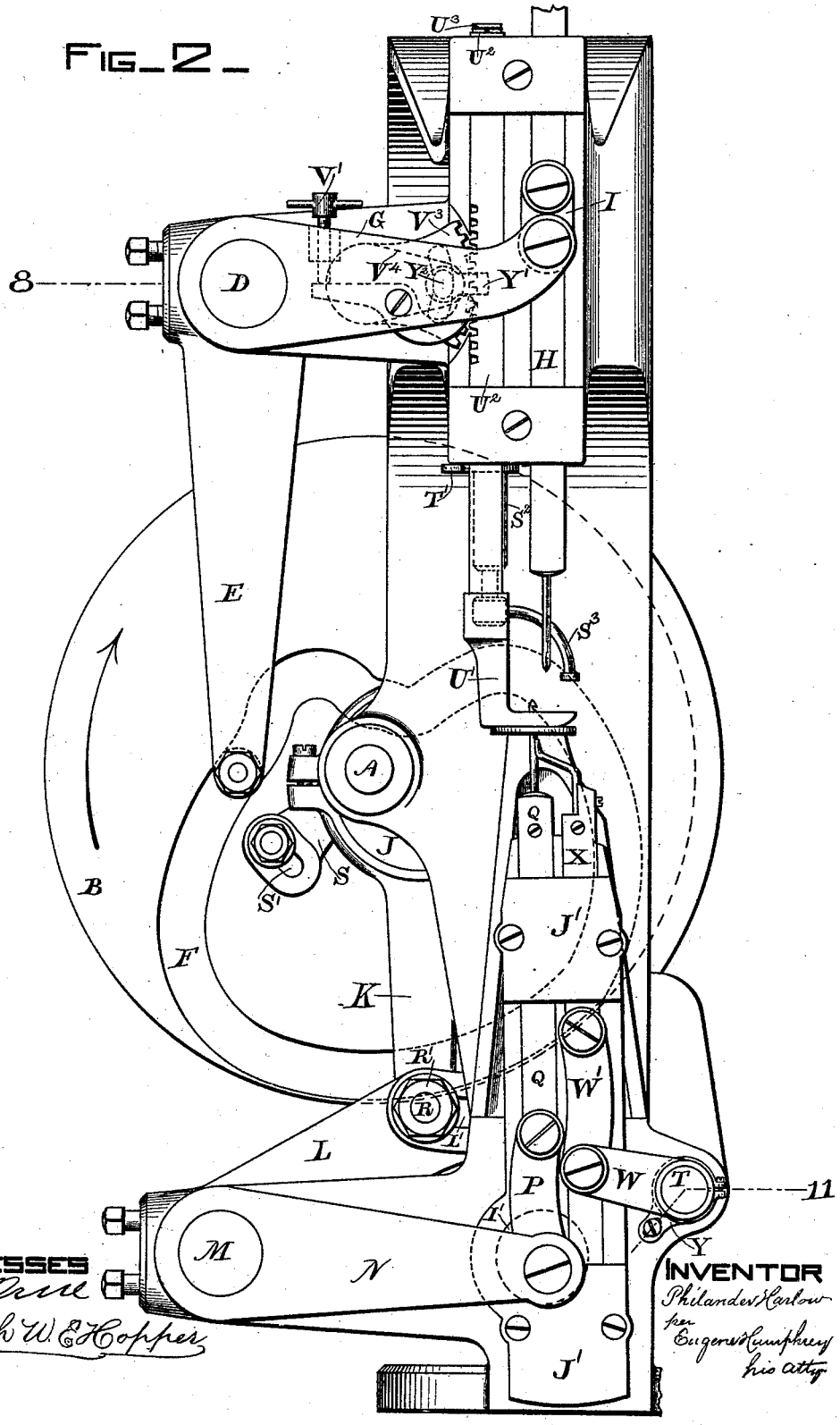
(No Model.) 6 Sheets—Sheet 2.

P. HARLOW.

WAX THREAD SEWING MACHINE.

No. 422,210. Patented Feb. 25, 1890.

FIG. 2.



WITNESSES
Ralph W. E. Hopper

INVENTOR
Philander Harlow
per Eugene Humphrey
his atty

(No Model.) 6 Sheets—Sheet 3.

P. HARLOW.

WAX THREAD SEWING MACHINE.

No. 422,210. Patented Feb. 25, 1890.

FIG. 3.

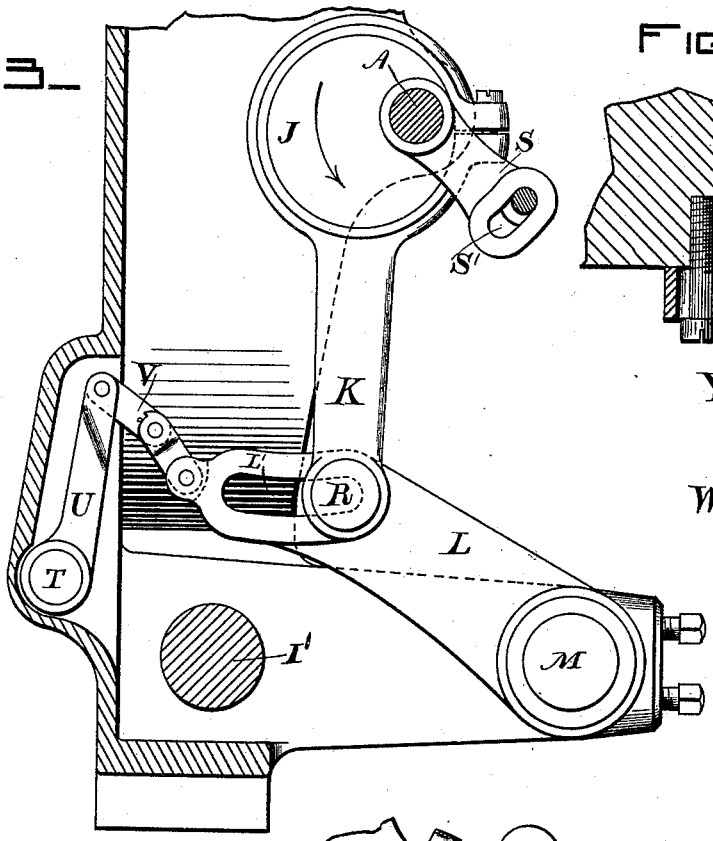


FIG. 5.

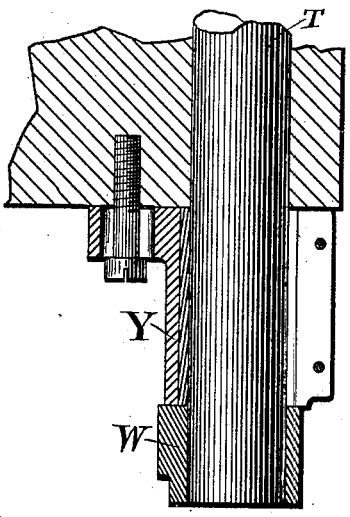


FIG. 4.

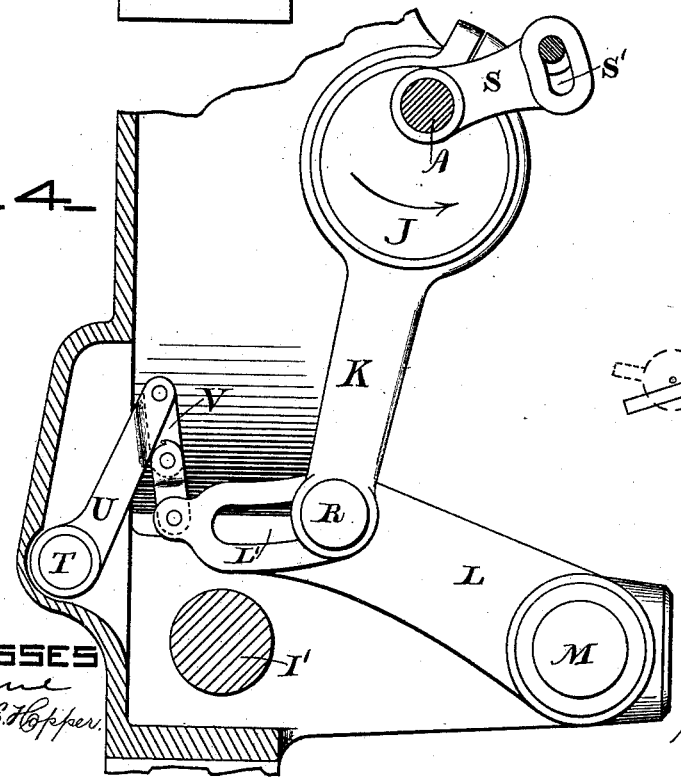
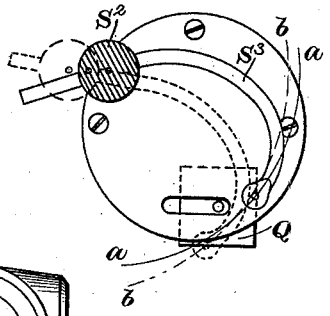


FIG. 6.



WITNESSES

A. A. Lane

Ralph W. E. Hopper.

INVENTOR

Philander Harlow

per Eugene Humphrey

his Atty.

(No Model.) 6 Sheets—Sheet 4.

P. HARLOW.

WAX THREAD SEWING MACHINE.

No. 422,210. Patented Feb. 25, 1890.

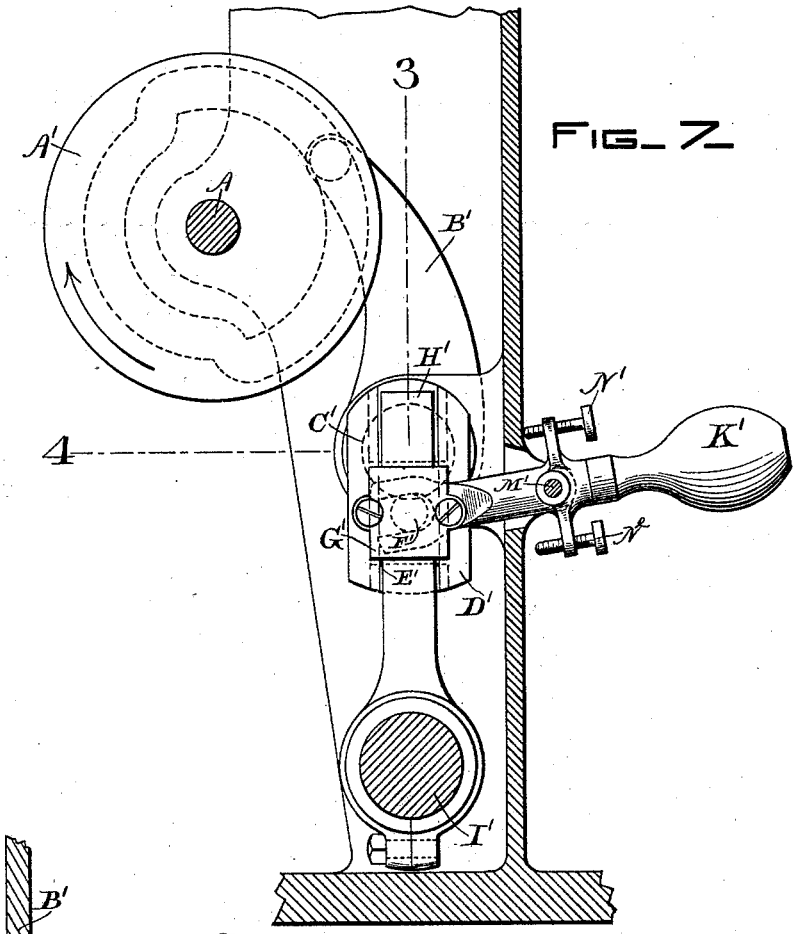


FIG. 7.

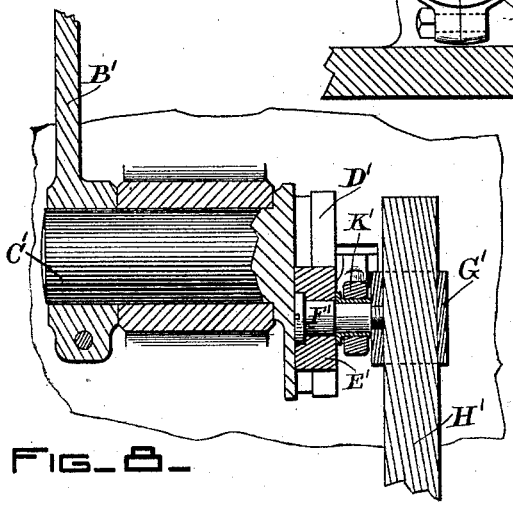


FIG. 8.

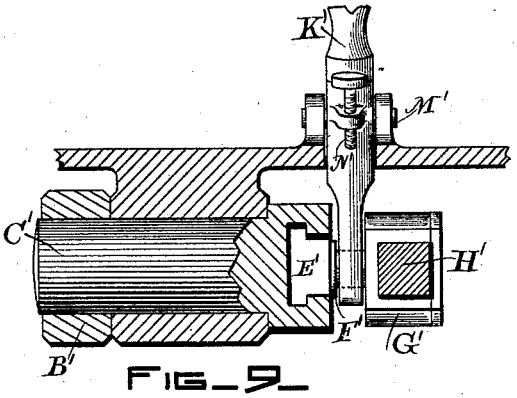


FIG. 9.

WITNESSES

Ralph W. E. Hopper

INVENTOR

Philander Harlow

per Eugene Humphrey

his attf.

(No Model.) 6 Sheets—Sheet 5.

P. HARLOW.

WAX THREAD SEWING MACHINE.

No. 422,210. Patented Feb. 25, 1890.

FIG. 10.

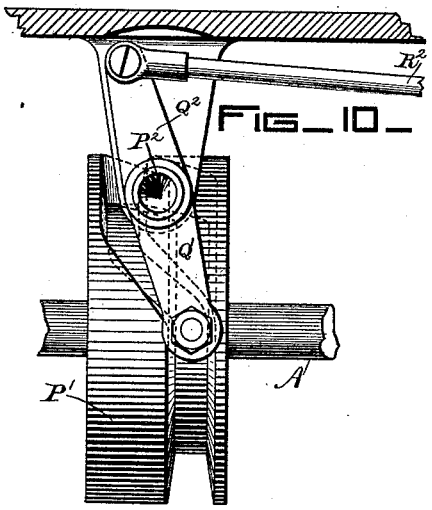


FIG. 11.

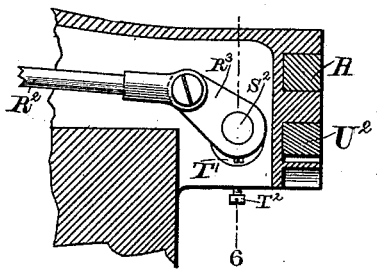


FIG. 12.

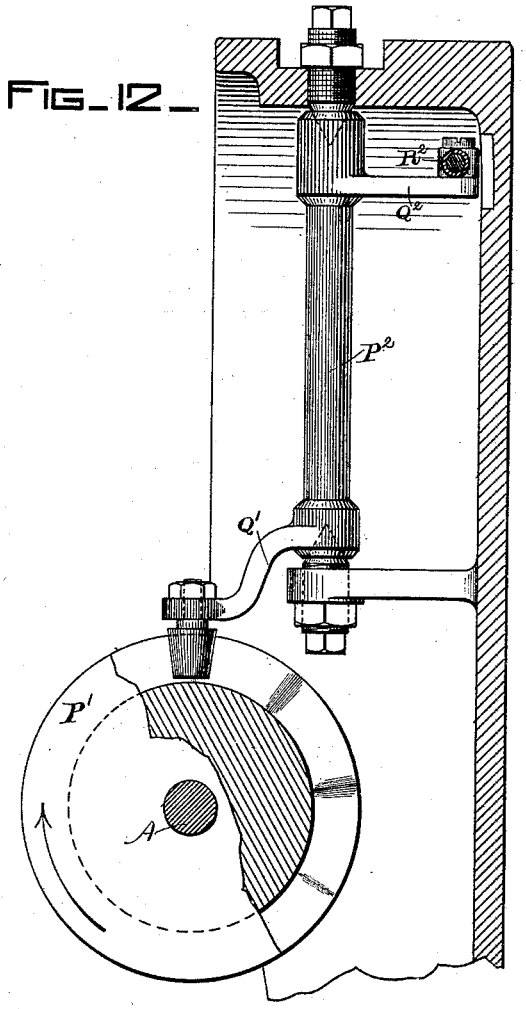


FIG. 13.

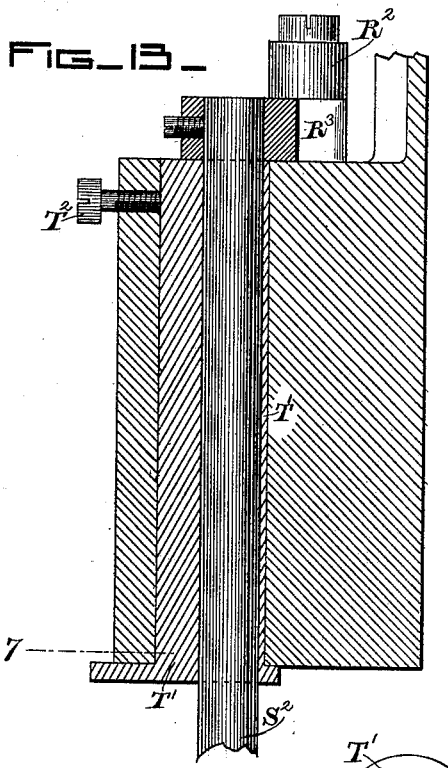
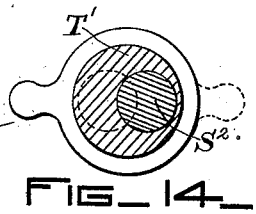


FIG. 14.



WITNESSES

Ralph W. E. Hopper.

INVENTOR

Philander Harlow

per Eugene Humphrey

his atty.

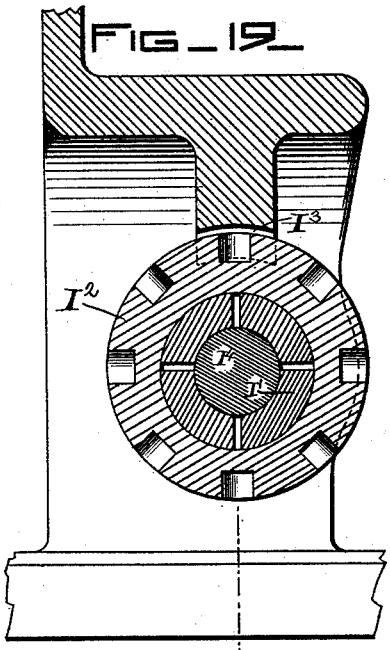
(No Model.) 6 Sheets—Sheet 6.

P. HARLOW.

WAX THREAD SEWING MACHINE.

No. 422,210. Patented Feb. 25, 1890.

FIG. 19.



10

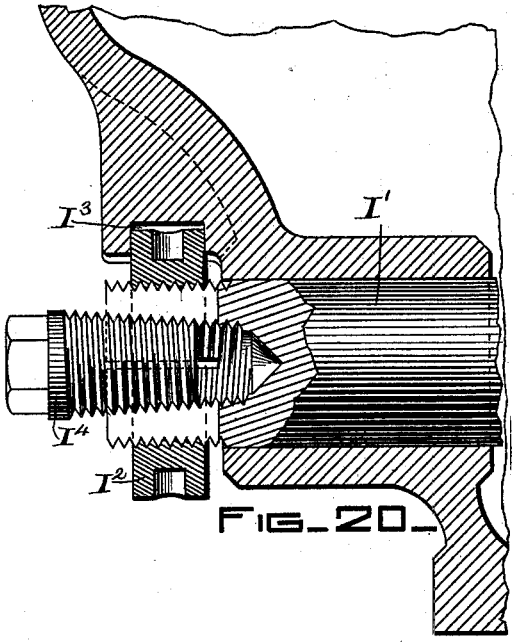
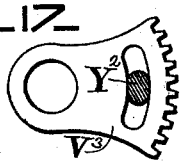


FIG. 20.

FIG. 17.



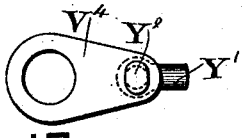


FIG. 18.

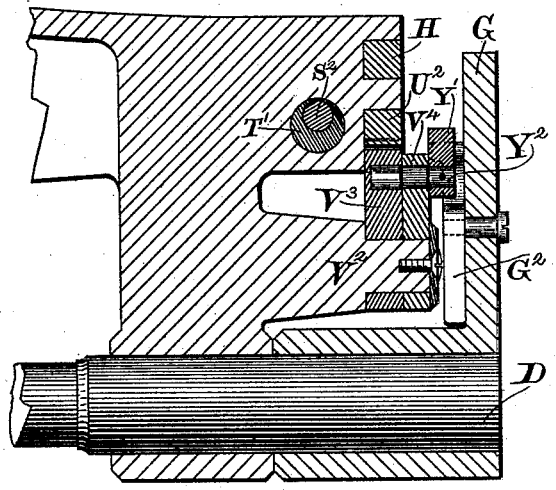


FIG. 15.

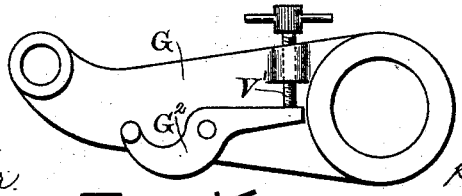


FIG. 16.

WITNESSES
Ralph W. Hopper.

INVENTOR
Philander Harlow
per Eugene Humphrey
his Atty.

UNITED STATES PATENT OFFICE.

PHILANDER HARLOW, OF HYDE PARK, MASSACHUSETTS.

WAX-THREAD SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 422,210, dated February 25, 1890.

Application filed September 2, 1889. Serial No. 322,682. (No model.)

To all whom it may concern:

Be it known that I, PHILANDER HARLOW, of Hyde Park, in the county of Norfolk and State of Massachusetts, have invented a new and useful Improvement in Wax-Thread Sewing-Machines, which will, in connection with the accompanying drawings, be hereinafter fully described, and specifically defined in the appended claims.

In the accompanying six sheets of drawings, Figure 1 is a side elevation of a machine embodying my invention, and the detail marked Fig. 1ª on the same sheet is an enlarged vertical section of a detached portion of the presser-foot bar and pressure-spring, showing the spring as resting upon the upper end of a pointed pin, which is loosely supported at its lower end in a tapering hole in the top of the presser-foot bar, so that the pin readily yields laterally according to the movement of the spring. Fig. 2 is a front end view of the same as seen from the right of Fig. 1. Fig. 3 is a view of the devices for adjusting the throw of the needle as seen from the left of section-line 1 in Fig. 1. Fig. 4 is a like view, but showing the parts in different relative positions. Fig. 5 is an enlarged horizontal section taken as on an irregular line 11, Fig. 2, showing a portion of the cast-off shaft and a section of the friction-clamp which operates on the same. Fig. 6 is a plan showing the different paths in which the thread-guide moves relatively to the needle, accordingly as the axis of its vertical shaft is adjusted with reference to the path of the needle. Fig. 7 is a view of the operative devices of the feed movement as seen from the right of the irregular section-line 2 in Fig. 1. Fig. 8 is a vertical section of a portion of Fig. 7 as taken on section-line 3 in said figure. Fig. 9 is a horizontal section as taken on line 4 in Fig. 7. Figs. 10, 11, and 12 are details of the thread-guide mechanism. Fig. 13 is an enlarged vertical section through the thread-guide shaft as on line 5 in Fig. 1 and line 6 in Fig. 11, and as seen from the right of said Fig. 1. Fig. 14 is a horizontal section on line 7 in Fig. 13 as seen from above said section-line, and shows by solid and broken lines the thread-guide shaft in the two positions in which it may be placed by a half-turn of the sleeve in which it is eccentrically held. Fig. 15 is a horizontal section of the devices for lifting the presser-foot, taken as on line 8, Fig. 2, and as viewed from above and from the left of said figure. Figs. 16, 17, and 18 are details of the mechanism shown in Fig. 15. Fig. 19 is a vertical cross-section on line 9, Fig. 1, of the devices for longitudinally adjusting the needle-shaft. Fig. 20 is a vertical longitudinal section of the same as on line 10, Fig. 19.

The principal points of novelty in my present invention consist, first, in new devices for adjusting both the throw of the needle and cast-off; second, in new devices for adjusting the feed movement; third, in new devices for adjusting the movement of the thread-guide; fourth, in new devices for automatically lifting the presser-foot, and, fifth, in new devices for lineally adjusting the needle-shaft; and for convenience and clearness I will describe the several prominent features of my invention in the order above named.

The general construction of the machine shown in the drawings in Figs. 1 and 2 as to frame-work, arrangement of awl-and-needle mechanism, its main actuating-shafts, &c., is not essentially different from well-known wax-thread sewing-machines now in public use, and therefore it is not deemed necessary to particularly describe such well-known features.

Upon the rotary shaft A, Fig. 1, is fixed a cam B. On the side of the overhanging arm is journaled in proper bearings a rock-shaft D, from one end of which there extends downward an arm E, which carries a stud and trundle at its lower end, the trundle operating in groove F, Fig. 2, of the cam in the usual manner. At the opposite end of rock-shaft D another arm G extends horizontally, and its outer end connects with the awl-bar H by means of a short link I, secured to the bar and arm by screw-studs in the usual manner. The rotation of cam B with shaft A imparts, through the connections described, the requisite vertical movements to the awl-bar and awl, the cam B being set and secured on shaft A to properly limit the range of movement of the awl, which is governed by the groove F. There is also mounted upon the rotary shaft A an eccentric disk J, to which is attached a connecting strap or arm K, that

is connected at its opposite end with arm L on rock-shaft M, while on the forward end of the rock-shaft M another lever N extends therefrom and is connected by a link P with the needle-bar Q. Through these connections vertical movement is imparted to the needle by rotating shaft A. It is desirable to be able to limit and adjust the downward pull of the hooked needle according to the thickness of the goods being stitched, so that when thin work is being sewed an unnecessarily long or large loop may not be drawn down, thus avoiding wear on the thread by diminishing the amount pulled through the hook and goods in setting the stitch. To accomplish this conveniently, arm L is made with a curved slot L′, as shown in Figs. 3 and 4, through which slot the arms K and L are connected by bolt R, which may be secured in any desired position along the line of the slot by its nut R′. Thus the extent of the movement of arm L may be varied according to the position of the bolt R in its slot, the curve of the slot being such that the variation of movement is all in one direction, and the consequent effect upon the action of the needle is to vary the extent of its movement downward only, its upward throw being always the same. The vertical movement of the awl being uniform in its extent, as before stated, while the movement of the needle is adjustable, as just described, it is therefore necessary to provide some convenient means for timing the movement of the needle to the awl, so that whatever extent of downward throw the needle may be adjusted to it will always move upward in the same relation to the awl. To effect this result, I attach to the eccentric disk J to rotate therewith a slotted arm S, the outer end of which is adjustably secured to the awl-cam by a screw stud and nut through the slot S′, as shown. When by a change of position of bolt R in the slot of arm L, as before stated, a change of the extent of downward movement of the needle is effected, and thus the relations of the needle and awl are changed as to their distance apart when they move upward, their proper relation may be restored without affecting the throw of the needle by turning the eccentric disk by means of arm S, and securing it in the required relation to the awl-cam by means of the stud and nut in slot S′, the range of said slot being sufficient to effect the desired adjustment. When the throw or movement of the needle is thus adjusted, it is necessary to correspondingly adjust the movement of the cast-off.

A rock-shaft T is supported in suitable bearings on the front side of the machine, as shown in Figs. 1 and 2. An arm U is attached to this shaft at its rear end, as shown in Figs. 1, 3, and 4, and is connected by a jointed link V to the slotted arm L, through which the needle is operated, as clearly shown in Figs. 3 and 4. Upon the opposite or front end of rock-shaft T is secured another arm W, which is attached by a link W′ to the cast-off bar X, the link being secured to the bar by screw-studs in the usual manner, as shown.

To the frame of the machine, on its front end, is attached a friction device Y, secured to the frame by a screw, as shown, and which nearly encircles the rock-shaft T and is constructed and arranged to be clamped or pinched upon the same by means of screws, as shown in elevation in Fig. 2 and by enlarged section in Fig. 5.

When the several parts which operate the awl, needle, and cast-off have been properly adjusted to each other, so that their respective movements take place at the required time, then any adjustment of the needle—such as has been described, and by the means specified—will also effect a corresponding adjustment of the cast-off at the same time, for the movement of lever L effects, through link V and the other connection and to the requisite extent, the movement of the cast-off; but by means of the jointed link V and the friction-clamp Y the movement of the cast-off is rendered properly intermittent to time it to the action of the needle, as the link V can overcome the resistance of friction-clamp Y only when the link is drawn nearly straight, as in Fig. 4, while at other times it bends on its middle joint, as in Fig. 3, thus allowing the needle-arm L to move without imparting any movement to the arm U of the cast-off. Consequently the cast-off rests at times while the needle moves, and at such times as a rest of the cast-off is required in the proper and usual operations of the two, yet the movements of the two in unison, and their proper relations to each other when the cast-off is at rest are not disturbed by the adjustment of the needle movement, as and for the purposes described, as the same means of adjustment which effects the needle movement correspondingly effects the movement of the cast-off.

The needle and cast-off bars are fitted to slide vertically in an oscillating head in a well-known manner, and the needle is employed to feed the work along upon the work-plate. It moves forward, when feeding, always into line with the path of the awl; but its backward movement may be regulated according to the length of the stitch required, and two different lengths of stitches may be had, as is sometimes desirable on different parts of the work, without stopping the machine, by means of the devices for regulating the spacing of the stitches, which I will now describe.

Upon shaft A is fixed a cam A′, Figs. 1 and 7, which serves to impart the required movement through arm B′ to a short rock-shaft C′, upon the opposite end of which is formed a grooved extension D′, in the T-shaped groove of which a slide E′ is adjustably held. Through this slide a screw-stud F′ is threaded into a sliding piece G′, made in two parts screwed together and fitted to slide on an arm H′, secured to rock-shaft I′. To this shaft I′

the head J′, in which the needle and cast-off bars are fitted to slide, is secured and rocks therewith, and such rocking action imparts the feeding movement to the needle, and the extent of such movement is governed by the position of the slide G′ upon the arm H′. To adjust this position and be able to change it instantly without stopping the machine, a forked handle K′, pivoted to the frame on the front side of the machine, is employed. The stud F′ is held in the fork of handle K′, so that when the handle is rocked on its pivot M′ the slide G′ will be moved up or down on arm H′ accordingly, and the extent of the horizontal movement of the needle will, through the intermediate connections, be regulated accordingly; and to graduate this change of movement I employ the adjusting-screws N′ N^2, threaded through the side pieces on handle K′ and arranged to alternately bear at their ends against the frame of the machine. Thus the extent of the movement of handle K′ on its pivot M′ may be regulated by the screws, and consequently, through the intermediate connections, the extent of the needle movement in one direction may be regulated thereby to give the required spaces between the stitches. When handle K′ is thrown upward, it will lengthen the stitch (more or less) according to the adjustment of screw N′, and when the handle is pulled down it will shorten the stitch (more or less) according to the adjustment of screw N^2. Having adjusted the screws N′ and N^2 to give the desired length of stitches, a change from the shorter to the longer, and vice versa, may be instantly made, at the will of the operator, by manipulating the handle K′ and without stopping the machine. All the directly-connecting parts from and including cam A′ to and including the needle-carrying head are so adjusted relatively to each other that the changes of the feed movement by means of handle K′ effect the horizontal throw or movement of the needle only in one direction—that is, it gives the needle a longer or shorter movement away from the path of the awl when it feeds the goods forward, but always returns it to the same position in line with the vertical movement of the awl.

Upon rotary shaft A, Fig. 1, is another cam P′ for operating the thread-guide. A vertical rock-shaft P^2 turns on adjustable centers threaded in projections on the frame, as more clearly shown in the enlarged view, Fig. 12. From an arm Q′ on the lower end of shaft P^2 a tapered trundle projects downward into a corresponding groove in cam P′. From the upper end of shaft P^2 another arm Q^2 extends outward, to which is pivoted a rod R^2, which at its opposite end is pivoted to an arm R^3, attached to the top of the thread-guide shaft S^2. In the lower end of shaft S^2 is secured in the usual manner the thread-guide S^3, Figs. 1 and 2. Rotation of cam P′ imparts, through the connections named, the requisite movements to the thread-guide and at the proper times. The novelty of this device consists, mainly, in the construction shown by which the position of the axis of the thread-guide shaft S^2 may be readily changed, for a purpose which will be explained. Machines of this kind as hitherto constructed when employed for what is known as "fair stitching" around the edge of a boot or shoe sole require to be changed so as to prevent the thread-guide from swinging into contact with the upper, and to prevent such striking of the upper it has been customary to alter the machine by filling up the hole in which the thread-guide shaft operates and drilling a new one, so as to change the position of the shaft, and consequently the swing of the guide. Such alteration is inconvenient and expensive and makes a permanent change in the machine, which is not desirable for other kinds of work. I overcome this difficulty by placing my thread-guide shaft S^2 in a sleeve T′, as clearly shown in the enlarged view, Fig. 13, a plan of the lower end of which is shown in Fig. 14, which figure also shows the position of the shaft S^2 when the sleeve T′ is as shown in Fig. 13, and in broken lines, the position of the shaft when the sleeve is turned half-round. The sleeve is secured in place by a set-screw T^2, as shown in Fig. 13.

In Fig. 6 a plan of the work-plate is presented, showing the needle-slot and the position of the needle therein when the thread-guide operates to place the thread in the hook of the needle. This illustrative figure also shows in section the position of the thread-guide shaft relatively to the needle and as in Fig. 14. It also shows in solid lines the thread-guide S^3 and the path *a* in which its eye travels when its shaft is partially rotated in the position shown, and in broken lines the path *b* in which it travels when the position of the axis of its shaft S^2 has been changed by turning the sleeve T′ half-round, as described. This ready change of movement without permanent alteration adapts the machine to fair stitching around a boot, and prevents the hammering of the upper with the thread-guide on any part.

Otherwise than as above explained the operations of the thread-guide are the usual and customary operations of that device.

The presser-foot U′, attached to its bar U^2, is forced down upon the work resting upon the work-plate by the pressure of spring U^3 in the usual manner, and will rest upon the work at an elevation above the work-plate according to the thickness of the goods being stitched, and from such elevation, whatever it may be, it will be automatically raised at the proper time to allow the feed movement to take place by the means which I will now describe. Upon the back side of the arm G, through which the awl-bar is operated, as shown in Figs. 2 and 15, is pivoted a small curved lever G^2. One end of this lever is arranged to strike against an adjusting-screw V′, Fig. 2, threaded in an ear on the back of arm G, as shown in

Fig. 16. Upon the projecting arm of the frame which supports arm G and its rock-shaft there is a hub V^2, Fig. 15, and on said hub is placed a segmental gear V^3, which turns on the hub, and a short arm or lever V^4, which also turns on the hub. The segmental gear V^3 has a curved slot formed therein, as shown in Fig. 17, and its teeth engage the teeth in bar U^2, as shown in Fig. 2. The arm V^4 is drilled through its outer end and serves as a movable fulcrum for a short lever Y′, fastened to a stem Y^2, which extends loosely through arm V^4 into the slot in the segmental gear V^3, where the form of the stem in its cross-section is oblong, as shown in Fig. 17. Consequently when the stem is turned on its axis it will cramp and bind in said slot, so that it will become fixed and immovable therein. The practical operation of these devices in raising the presser-foot is as follows: When arm G is moved upward to raise the awl, it carries lever G^2 with one end in contact with screw V′ into contact with the under side of lever Y′. This contact with lever Y′ turns the lever-stem in its fulcrum-arm V^4, in which it turns freely, and also slightly turns the oblong part of the stem in the slot of the segmental gear V^3, wherein it binds tightly, thus locking the parts together by such binding, so that as the arm G continues to rise lever Y′, arm V^4, and gear V^3 move in unison on hub V^2, and the teeth of the latter being engaged with the teeth of bar U^2 the bar is raised, together with its presser-foot, to the extent of such movement and against the force of spring U^3, and when arm G moves downward again and releases the end of lever Y′ from the lift of lever G^2, then the force of spring U^3, acting through the toothed bar U^2 upon gear V^3, at once returns the presser-foot to the goods and carries down the segmental gear therewith and to the extent of the downward movement of the bar, and when so released the free end of arm V^4 and lever Y′, supported thereon, drop by gravitation, or may be aided, if necessary, by a light depressing-spring applied to the arm.

The rising of the presser-foot takes place at the moment of rigid contact between levers G^2 and Y′, and the time of such contact relatively to the movement of the carrying-arm G may be regulated by screw V′. If said screw is turned so as to move downward against the inner end of the lever, such contact with the outer end of the lever will take place earlier, and consequently the presser-foot, through the intermediate connections described, will be acted upon longer and raised higher by the upward movement of arm G; but if the screw V′ is retracted, so that its lower end moves upward and away from the inner end of lever G^2, then such rigid contact with lever Y′ will take place later in the upward movement of arm G, and consequently less of such upward movement will be utilized for the purpose, and the presser-foot will not be raised so high above the work. By this means of adjustment if there are but slight inequalities of thickness in the work being stitched the foot may be lifted accordingly, and thus avoid an undue jarring and hammering upon the goods and unnecessary wear and tear of the machine by the rising and falling of the foot. By means of the screw V′ the lifting devices may be adjusted to raise the foot automatically to any practical height desired and according to the nature of the surface of the work being operated upon. It is desirable to have in this class of machine a convenient means of linearly adjusting the needle-shaft and through it the needle-carrying head, so as to be able to readily bring the needle laterally into line with the awl. I accomplish this purpose by drilling, slitting, and cutting a thread on the rear end of the rock-shaft I′, as shown in Figs. 19 and 20, to the forward end of which the head J′, carrying the needle and cast-off, is attached. I screw upon the threaded end of the shaft I′ a wheel I^2, having holes in its rim to facilitate turning it with a wire or wrench, as shown in Fig. 19. I place a portion of the rim of this wheel in a notch I^8, formed in the machine-frame, before inserting the shaft in the wheel. Then by turning the wheel upon the shaft while its rim is held in notch I^8 the threads upon the shaft thus engaged with the threads within the wheel will cause the shaft to move lineally forward or backward accordingly as the wheel is turned in one direction or the other. Thus the shaft with its attached head J′ may be nicely brought into the position required to properly adjust the needle to the awl, and when so adjusted may be secured in position by the tapering screw I^4, provided for that purpose, which being screwed into the slit end of the shaft, as shown, will expand the same and firmly set the external threads thereon in the internal threads of wheel I^2, and thus secure the shaft against accidental displacement.

I claim—

1. In combination with the needle and awl, the described means for adjusting the relative movements thereof, consisting of the combination of the awl-actuating cam B and eccentric disk J, both mounted upon the rotary shaft A, the slotted arm S, secured to an eccentric hub on disk J and through its slotted end adjustably connected with cam B, the eccentric-strap K, and the slotted arm L, secured to the needle-shaft M, all operating together as and for the purposes specified.

2. In combination with the needle, awl, and cast-off, the described means for adjusting the relative movements thereof, consisting of the combination of cam B and eccentric disk J, both mounted upon rotary shaft A, slotted arm S, secured to an eccentric hub on disk J and through its slotted end adjustably secured to cam B, eccentric-strap K, slotted arm L, secured to rock-shaft M, and jointed link V′, connecting arm L with arm U on the

cast-off shaft T, all operating together as and for the purposes specified.

3. The described means for regulating the feed movement of the needle, consisting of the combination of cam A′, mounted upon shaft A, arm B′, secured to rock-shaft C′, shaft C′, provided with a grooved extension D′, slide E′, and means for adjustably holding it in said groove and connecting it with slide G′ on arm H′, arm H′, shaft I′, and the needle-carrying head J′, all operating together as and for the purposes specified.

4. A feed mechanism embodying the combination of cam A′, rock-shaft C′ and its connecting-arm B′, shaft I′ and its arm H′, needle-head Q, and the hooked needle arranged to move in with the head, all substantially as described, with the feed regulating and varying devices consisting of the slides E′ and G′, the handle K′, pivoted to the frame of the machine, as at M, and arranged to move said slides up and down when rocked upon its pivot, and screws N′ and N^2, attached to handle K′ and rocked therewith, and arranged to adjustably limit the extreme movements of the handle in opposite directions by their alternate contact with the frame of the machine, all as and for the purposes specified.

5. In combination with the hooked needle, mechanism for carrying the thread into the hook of the needle, comprising an eccentric sleeve T′, rotatively adjustable in the head of the machine, and a thread-guide shaft S^2, arranged within said sleeve so as to be turned therewith to adjust the position of its axis, and also having an independent rotary reciprocating movement within the sleeve, whereby the movement of its thread-guide relatively to the path of the needle may be varied, as and for the purposes specified.

6. The described mechanism for adjustably raising the presser-foot, consisting of the combination of the rocking arm G, carrying a pivoted arm G^2 and adjusting-screw V′, the slotted segmental gear V^3, mounted upon a hub V^2 and having its teeth engaged with teeth in the bar U^2, the bar U^2, arm V^4, also turning upon hub V^2, lever Y′, having its fulcrum in arm V^4 and its stem Y^2 extending through said arm and into the slot in gear V^3 and formed to bind in said slot when turned therein, all operating together as and for the purposes specified.

7. The combination of shaft I′, carrying the needle-head J′ on its front end, and a wheel threaded onto its rear end, the wheel I^2, arranged to turn in a slot I^3 in the frame of the machine, and the tapering screw I^4, threaded into the center of the shaft and arranged to expand the same and tighten it in wheel I^2, as and for the purposes specified.

PHILANDER HARLOW.

Witnesses:
EUGENE HUMPHREY,
RALPH W. E. HOPPER.