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R. WHITEHILL.

SEWING-MACHINE.

No. 184,938. Patented Nov. 28, 1876.

Fig. 1.

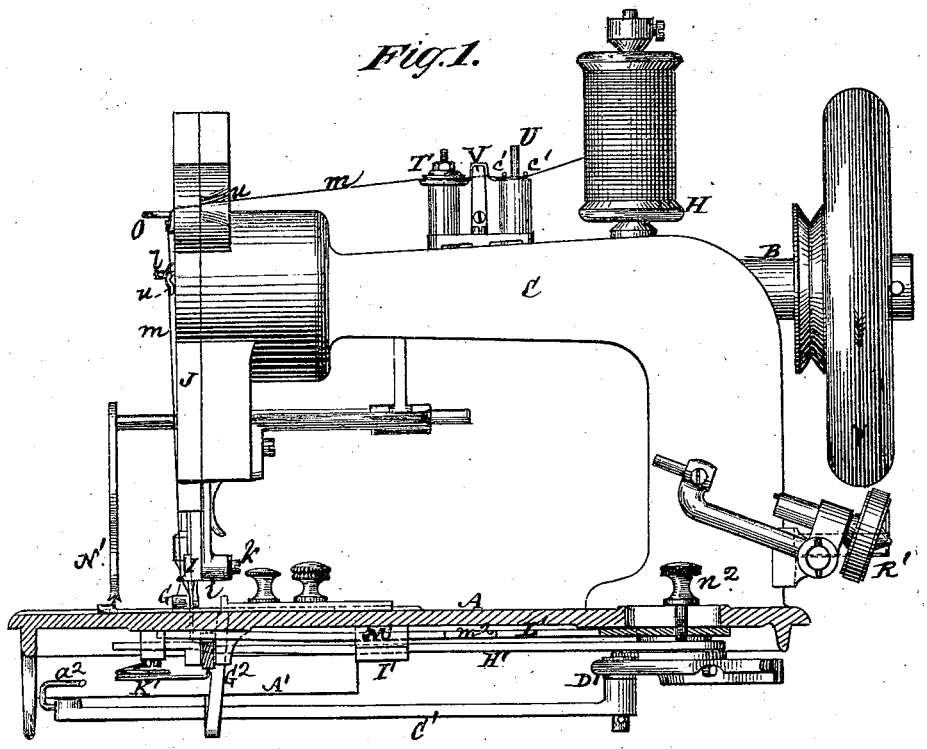
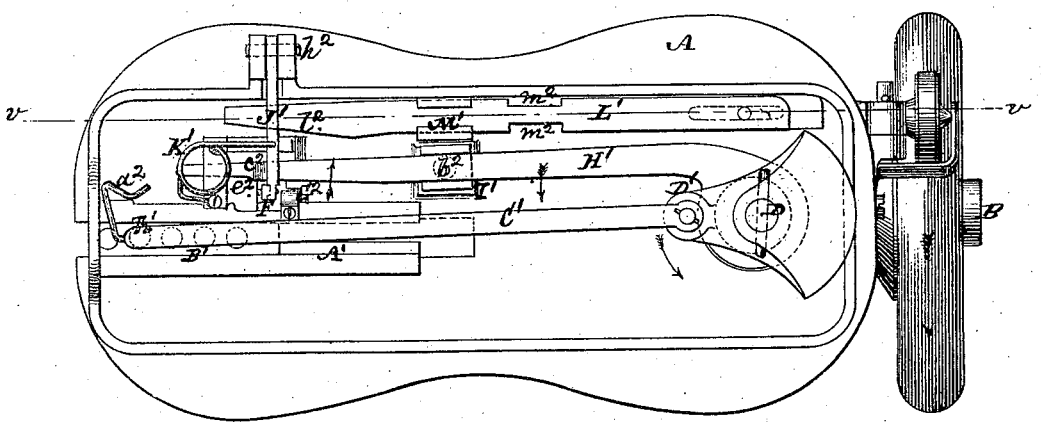


Fig. 2.



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SEWING-MACHINE.

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Fig. 3.

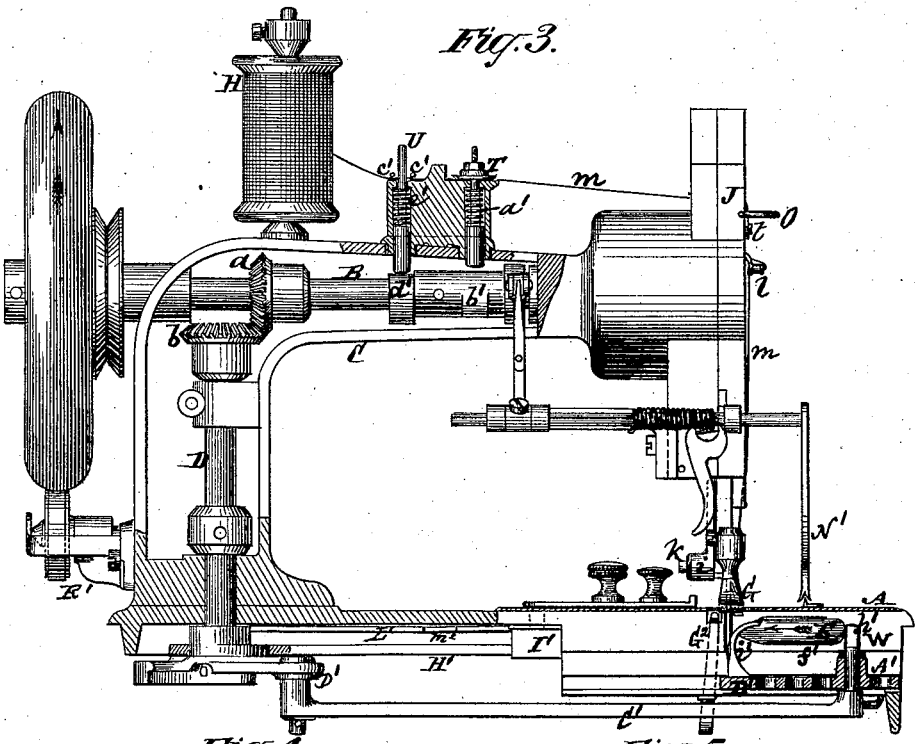

Fig. 4.

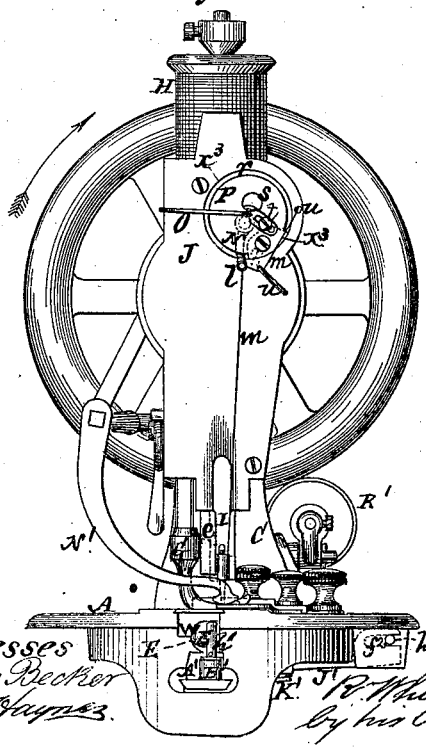

Fig. 5.

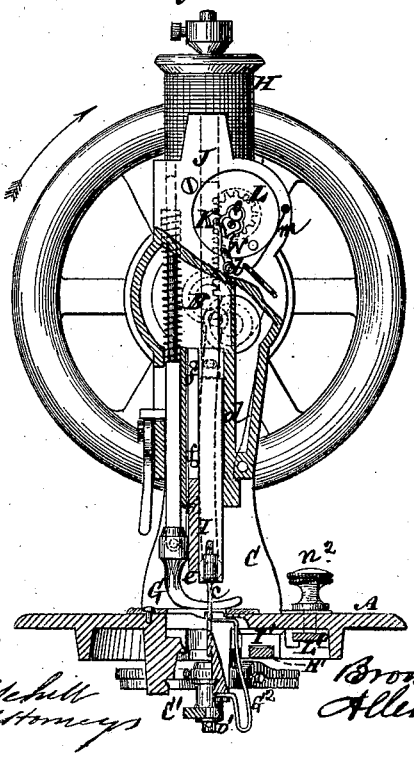

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Fig. 6.

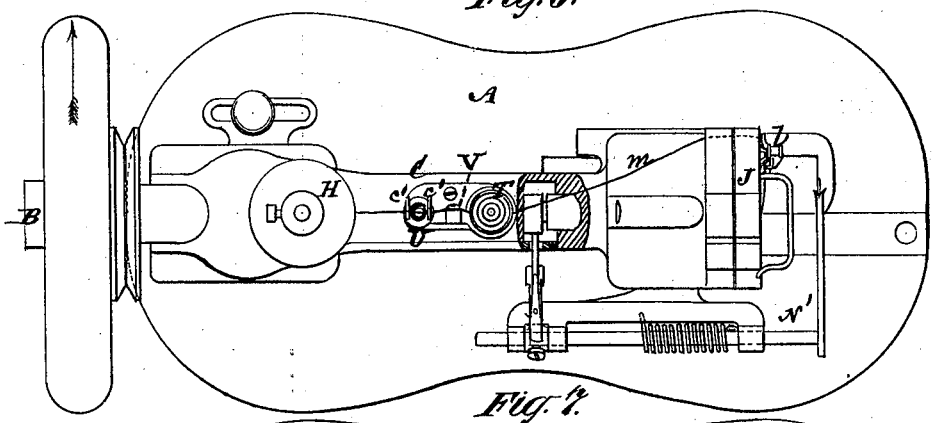

Fig. 7.

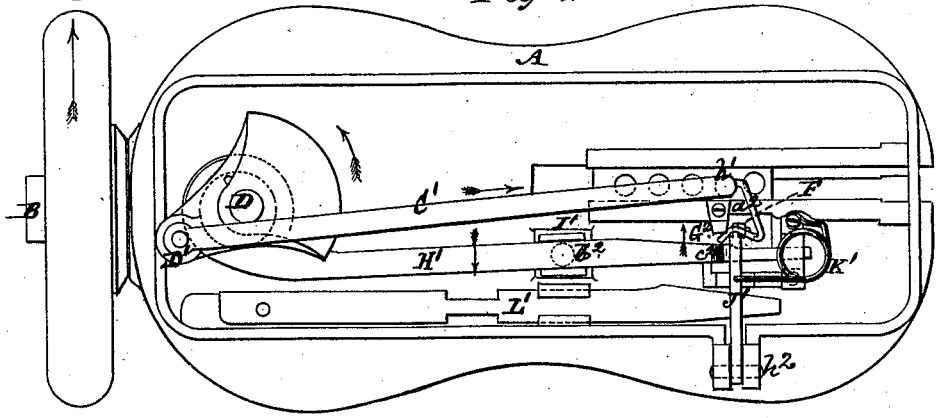

Fig. 8.

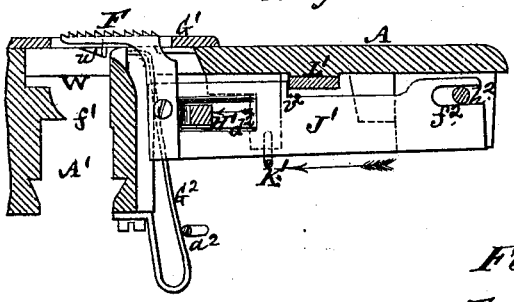

Fig. 9.

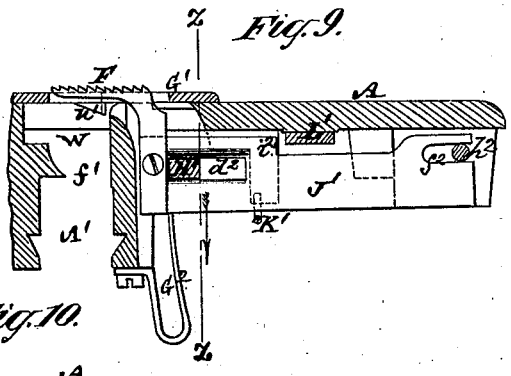

Fig. 10.

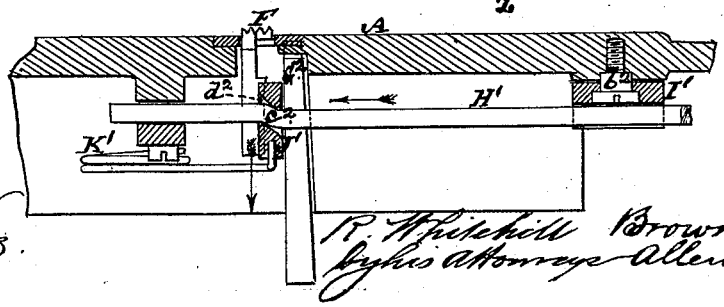

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Fig. 11.

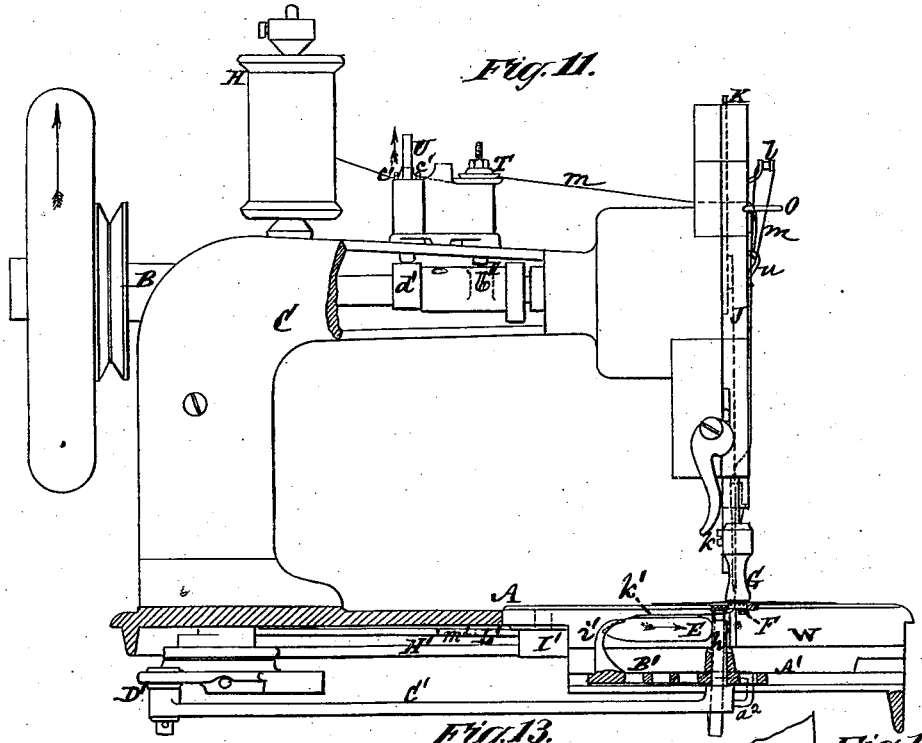

Fig. 12.

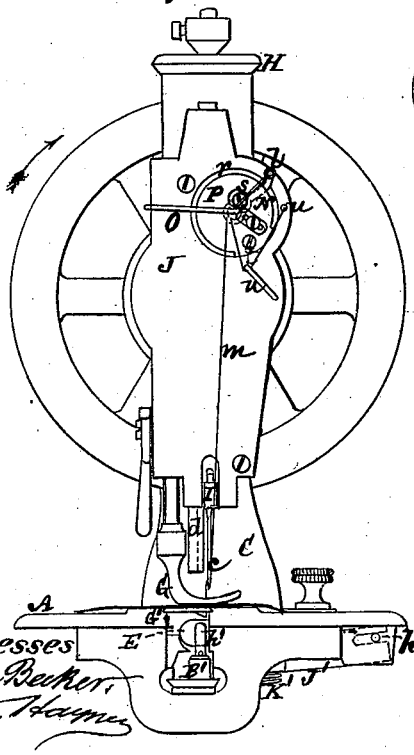

Fig. 13.

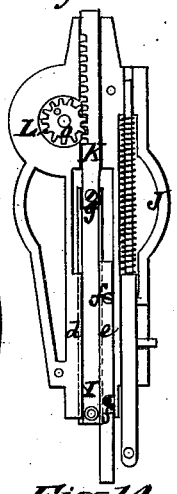

Fig. 14.

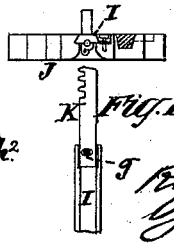

Fig. 15.

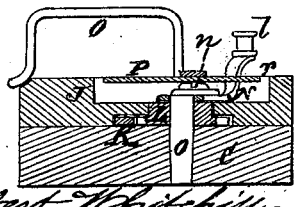

Fig. 16.

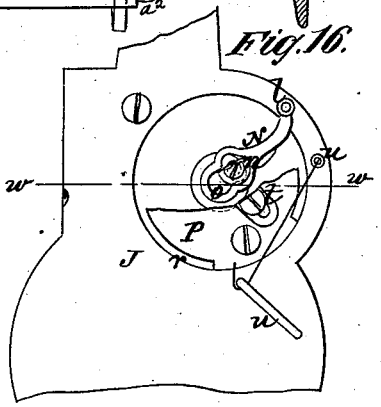

Fig. 17.

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R. WHITEHILL.

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Fig. 18.

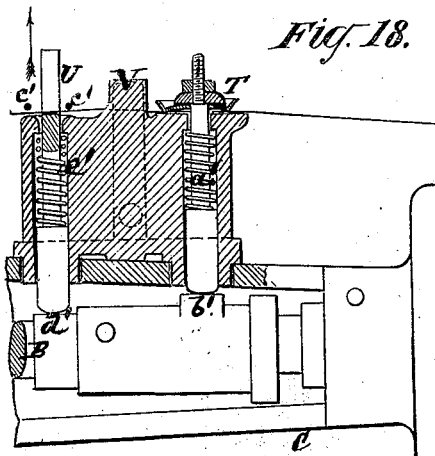

Fig. 19.

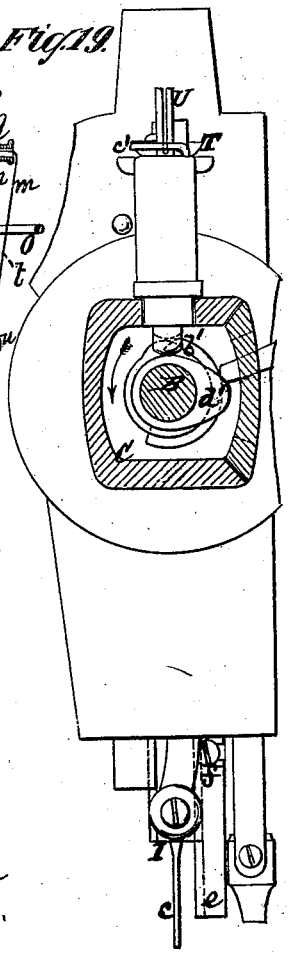

Fig. 27.

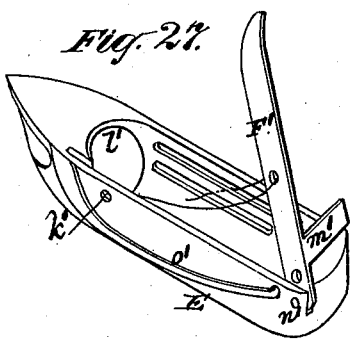

Fig. 20.

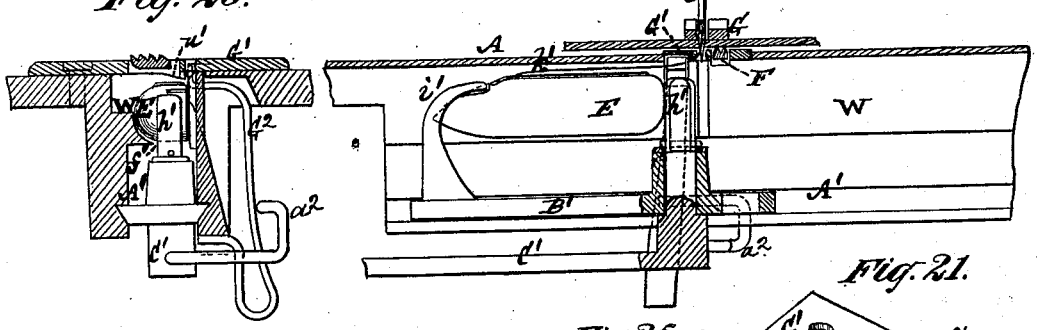

Fig. 21.

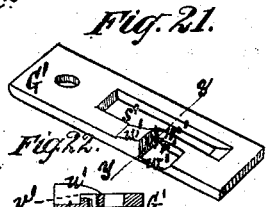

Fig. 23.

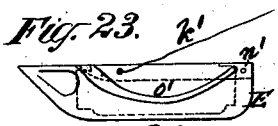

Fig. 25.

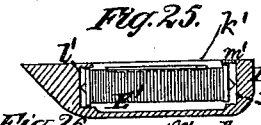

Fig. 22.

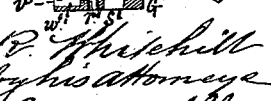

Fig. 24.

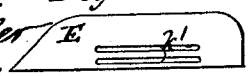

Fig. 26.

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UNITED STATES PATENT OFFICE.

ROBERT WHITEHILL, OF NEW YORK, N. Y.

IMPROVEMENT IN SEWING-MACHINES.

Specification forming part of Letters Patent No. **184,938**, dated November 28, 1876; application filed May 4, 1876.

To all whom it may concern:

Be it known that I, ROBERT WHITEHILL, of the city, county, and State of New York, have invented certain new and useful Improvements in Sewing-Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, which forms part of this specification.

This invention more particularly relates to double-thread or lock-stitch sewing-machines, although portions of the invention are applicable to machines which do not use a shuttle and work only a single thread.

The invention consists in a combination, with the take-up of a double-thread or lock-stitch sewing-machine, of an intermittently and positively operated clamp, serving to hold onto the needle-thread till the take-up has drawn thread from between the shuttle-driver and the shuttle; an intermittently and positively operated needle-thread supplier, drawing thread from the spool when the said clamp is closed; and a tension device arranged between the said clamp and needle-thread supplier, and serving to hold the thread while the said clamp is open, and thereby to prevent the take-up from pulling thread from the spool instead of drawing it through the cloth, and to prevent the take-up from drawing more thread than is necessary. It likewise consists in a novel construction of the shuttle-driver, whereby the pin of a connecting-rod used to actuate the shuttle, and operated by a crank, serves also as a turning or vibrating horn of the shuttle-driver, and assists in the liberation of the needle-thread from the shuttle, and whereby also the connection of the driver with the connecting-rod, through which it receives motion, and the horns through which it acts upon the shuttle, are all brought in, or nearly in, the same plane with the longitudinal axis of the shuttle, thus avoiding the racking of the parts in the quick running of the machine; likewise in a certain construction of the shuttle whereby female centers for its bobbin are dispensed with, also a longer bobbin may be used, and the shuttle-thread is prevented from passing over the head of the bobbin, and from hitching or catching on the shuttle-centers. The invention also consists in a peculiar combination, with the feed-bar, of an eccentric, a bent rod or lever operated by said eccentric, and a swiveling or rocking guide in which the said rod works, whereby the upward and downward and forward movements of a four-motion feed are obtained. The invention also consists in a feed-regulating bar of novel construction, whereby said bar, which partakes of the character of an elliptic spring, may be readily inserted or removed from its place in or under the bed of the machine, also may be drawn back and forth smoothly and evenly to effect the required adjustment, and be securely held in its place when set. Likewise the invention consists in a novel construction of the needle-thread take-up, to prevent the thread being soiled by oil used in lubricating the working parts of the take-up; also in further peculiarities in the construction of said take-up, whereby the needle thread is allowed to slacken so soon as the shuttle commences to recede, and increased facility is afforded for passing the needle-thread to the take-up; also, for adjusting the take-up without removing the plate that covers its operating mechanism. Furthermore, the invention consists in a novel construction of the means for guiding the needle-bar, whereby provision is made for adjustment of the same as against wear, free from binding or irregularity of the toothed connection or gear of the bar, with a pinion for operating the take-up.

In the accompanying drawing, Figure 1 represents a partly sectional side view, on the line *v v* of Fig. 2, of a shuttle sewing-machine constructed in accordance with the invention. Fig. 2 is an under view of the same. Fig. 3 is a partly sectional side view from the reverse side of the machine to that represented in Fig. 1. Fig. 4 is a front end view of the machine; and Fig. 5, a partially sectional similar view. Fig. 6 is a top view or plan of the same; and Fig. 7, an under view thereof, with the operating parts in a different position to that which they occupy in Fig. 2. Figs. 8 and 9 are sectional elevations through the front bed portion of the machine, showing the feeding and other parts in different positions, and Fig. 10 is a sectional view, at right angles to Figs. 8 and 9 of said portion of the machine,

on the line *z z* in Fig. 9. Fig. 11 is a partly sectional and broken side view, showing the needle-thread supplier as taking thread from the spool, and the shuttle as having commenced its back stroke, and the take-up as in the act of taking up the thread. Fig. 12 is a front view with the parts in the position represented for them in Fig. 11. Fig. 13 is a rear view of the front plate or box removed, together with the means used for guiding and adjusting the needle-bar, and for operating the take-up. Fig. 14 is an under view of said plate or box, and its pertaining devices. Fig. 15 is an elevation of the take-up operating-rack and needle-bar connection. Fig. 16 is a front view, on an enlarged scale, of the take-up with its face-plate or cover partly broken away; and Fig. 17, a section of the same on the line *w w*. Fig. 18 is a longitudinal sectional elevation of the machine, in part, on an enlarged scale; and Fig. 19, a rear view of the same in part. Fig. 20 is a longitudinal sectional elevation through the feeder, showing also the shuttle, the shuttle-driver, and the shuttle-thread holder. Fig. 21 is a view in perspective, from beneath, of the throat-plate; and Fig. 22, a transverse section of the same on the line *y y*. Fig. 23 is a side view of the shuttle from its one side. Fig. 24 is a view from the reverse side of the shuttle inverted; Fig. 25, a longitudinal section of the shuttle; and Fig. 26, a plan of the same. Fig. 27 is a perspective view, upon a larger scale, of the shuttle with its bobbin removed, and with its lever-catch as thrown up or open.

A is the cloth-bed of the machine; B, its operating-shaft, arranged to run lengthwise through the goose-neck C, and serving to give motion to the needle, and to the needle thread-clamp and supplier of said thread to the take-up, as hereinafter described. D is a vertical shaft within the rear portion of the goose-neck, deriving its motion by bevel-gears *a b*, from the shaft B, and serving to communicate motion to the shuttle E, and feeding-bar or dog F. G is the presser-foot; and H, the needle-thread spool.

I (see more particularly Figs. 13, 14, and 15) is the needle-bar, carrying the needle *c*, and arranged to reciprocate up and down within the front plate or box J, within and between a dovetailed fixed guiding-bar, *d*, and a dovetailed laterally-adjustable guiding-bar, *e*, which is slotted and fastened to the plate J by means of screws *f f*, to provide for wear of the needle-bar between its guides. The needle-bar I carries on its upper end a rack, K, which gears with the operating-pinion L of the take-up. Said rack, instead of being as heretofore a fixed portion of the needle-bar, is connected with the latter in a laterally-adjustable manner by means of a screw, *g*, entering an oblong slot in the rack, (see Fig. 15,) so that on slackening said screw, when setting up the adjustable guiding-bar *e*, the needle-bar may be moved laterally along with it up against the fixed guiding-bar *d*, without changing the relative positions of the rack K and pinion L, or causing them to bind, but providing for the rack always moving in the same straight line, and preserving the same depth of gear with the pinion.

The needle-bar I is reciprocated by means of a connecting-rod, M, which receives its motion in an ordinary manner from an eccentric-pin, *h*, on or connected with a planet-wheel carried by a hollow head on the front end of the operating-shaft B, and gearing with a stationary circular rack or wheel which is concentric with said shaft. The connecting-rod M (see Fig. 18) is attached to the needle-bar below by means of a tubular foot or socket, *i*, arranged to receive within it a stud, *j*, or roller surrounding the latter at the back of the bottom end of the needle-bar, and said rod when thus attached to the bar being secured thereto by a screw, *k*, which is extended to project through the stud *j* and into the needle-bar till its point rests against the needle *c*, thus making the connection between the needle-bar and the rod which operates the latter also serve as the needle-clamp.

The needle-thread take-up N is of the oscillating description, in which an arm having an eye, *l*, for the needle-thread *m* (see more particularly Figs. 16 and 17) is oscillated, and, in conjunction with a stationary bar or wire, O, operates to provide alike for the delivery of the thread at a proper time, and in suitable amount, without forming unnecessary slack, and for the tightening of the needle-thread when the stitch is formed. Such oscillating take-up, however, is here represented as of peculiar construction in several unimportant respects. Thus, its oscillating arm, which is fitted in an adjustable manner by means of a screw, *n*, on and around the arbor *o* of the operating pinion L, to adapt the take-up to different thicknesses of fabric, is almost entirely contained within a circular cavity, x^3, provided for its reception in the front of the face-plate J, which contains the bearing for the arbor *o* of the pinion L, the said cavity being concentric with the arbor of the said pinion and with the axis of oscillation of the take-up. All of the take-up which projects in front of the plate J is its thread-eye *l*, and the immediately adjacent part of its arm. This cavity is almost entirely covered up in front by a concentric covering-plate, P, of circular form, secured to the face-plate J, a narrow concentric opening, *r*, only being left between the said plate P and the sides of the said cavity x^3 for the passage of the take-up arm. By this mode of applying the take-up, not only its thread-eye *l*, but also its arm, is shut out from the gearing of the take-up and the needle-bar, which require oiling, and which are at the back of the face-plate J, and thus the take-up is protected from the oil, which might get on and soil the thread. The stationary bar or wire O, over which the needle-thread is bent during and after the tighten-

ing of the stitch, is attached to the front of the plate P.

To provide for adjusting the take-up arm on or around the arbor *o* without removing the plate P, said plate is made with a hole, *s*, in it, for the purpose of introducing a screw-driver through the plate to release the screw *n*, and, after the necessary adjustment of the take-up arm has been made, to subsequently tighten the same.

The bar or wire O of the take-up is made adjustable by a screw, *t*, and slot, at its inner or back end on the plate P, so that it can be set in or out, relatively to the working-center of the take-up N, to adjust the period of slackening the needle-thread, and so that it may be allowed to slacken the moment the shuttle commences to recede. Said bar or wire O is bent to form an elastic staple-like guard from its back or inner end, over which the thread is bent, to its outer end, which is free, but shuts down on the front plate J. This allows of the needle-thread being passed to its place under the opening or free end of the guard or bent wire O when threading the needle, thus admitting of the needle-thread being introduced laterally or at a point in its length within the guard or bent wire O, and not necessitating the passing of it from its sewing end therethrough. The thread is passed to the needle through suitable eyes or guides *u u*, and from thence through the eye *l* of the take-up to the needle. Fig. 4 represents the oscillating take-up in its lowest point of action, and Fig. 12 the same, as having passed its highest tightening-point of action, and as having bent or carried the thread over the back or inner end of the bar O.

Arranged between the take-up N and spool H is a clamp, T, (see more particularly Figs. 1, 3, 6, 11, and 18,) under or through which the needle-thread *m* is passed, and by which it is positively held, excepting when the take-up begins to draw fresh thread to form a succeeding stitch, at which period the clamp is released, or, at least, sufficiently relaxed, to allow of the take-up drawing new thread.

Said clamp may be variously constructed, but must be positively controlled by the machine to secure its opening and closing at the proper periods, and is here represented as having its clamping action on the thread effected by a spring, a^1, and its lifting or releasing action as effected by a toe or cam, b^1, on the shaft B, said toe or cam being suitably arranged to release the clamp when the take-up is drawing new thread. This opening of the clamp is in advance of the take-up N, reaching its extreme lift or highest point, after which it is closed, in order that the shuttle E, as it continues its forward movement, may draw the stitch tight, and the shuttle-thread is prevented from drawing it through the goods, causing the stitch to be perfectly formed on the under side of the latter. Said clamp, furthermore, continues closed by the spring a^1 during the return and thread-delivering action of the take-up, and remains closed during a limited portion of the next ascent of the latter, in order that the clamp may hold onto the needle-thread till the take-up has drawn thread from between the shuttle-driver and the shuttle.

Combined with the clamp T and take-up N is what I term a "needle-thread supplier," U, disposed between said clamp and the spool H, back of the take-up. This needle-thread supplier is constructed to lift upon the thread *m* between stationary eyes or guides c^1 c^1 at intervals, and, like the clamp T, is positively controlled by the machine, being lifted by a cam, d^1, on the shaft B, as against a closing or lowering spring, e^1. The thread *m* passes through the supplier U, which has a slot through it for that purpose. Said needle-thread supplier U is operated by the cam d^1 only when the clamp T is closed, so as to draw thread from the spool H for use or draft by the take-up after said clamp has been closed, so that, in forming the stitch, the turning of the spool is altogether independent of the take-up, and the necessary tension is not affected by the turning of the spool, the supplier U always drawing enough, or more than enough, of thread from the spool H, when the clamp T is closed, to form a stitch.

There is also combined with the clamp T a tension spring or device, V, for the needle-thread. The duty of this tension device, which is here arranged between the clamp T and needle-thread supplier U is to cause a slight hold upon the thread while the clamp T is open, so as to prevent the take-up N pulling thread from the spool instead of drawing it through the goods, and to prevent the take-up from drawing more thread than required to form the stitch, after which the clamp closes on the needle-thread. The tension device V also serves to hold up any superfluous or loose thread between the clamp T and the needle-thread supplier U.

W is the race or raceway of the shuttle E, and A′ the raceway of the shuttle-driver, said raceways being arranged one over the other, and in free communication with each other, by a longitudinal opening, f^1. This construction provides for the shuttle, as it wears, to drop down, and for clearance of dirt or extraneous matter from the shuttle-race. It also provides for the horns h^1 i^1 of the shuttle-driver B′ being extended to enter the shuttle-raceway, so that they will reach up to and come in line with the center of the shuttle, thereby giving a steadier and better driving action.

The one horn, h^1, of the shuttle-driver is also the pin by which the shuttle or its driver is actuated, said pin being attached to or forming part of the connecting-rod C′, by which motion is communicated to the driver. Said pin or horn h^1 is free to turn loosely within or through the shuttle-driver B′ as the rod C′ is vibrated laterally, as well as reciprocated longitudinally, by the action of a driving-crank,

D′, on the shaft D, to which the rod C′ is pivoted at its rear end. Thus the same connection h^1 not only serves to unite the rod C′ with the shuttle-driver B′, but also forms one of the horns of said driver, and, by the turning of it in or through the latter, the same constitutes a movable or slightly-turning horn, which aids the delivery of the thread from the shuttle.

By the arrangement, as described, of the shuttle-driver and its horns and driving-connections relatively to the shuttle, it will be seen that the whole shuttle-driver and its operating attachments are central with the longitudinal axis of the shuttle, the driving-horns projecting up into the center of the raceway, and acting on the shuttle near its center and the driving-line of the shuttle-driver B′ as the latter is operated by the rod C′ from the crank D′, being in the same plane or line with the points where the power is applied to the shuttle. Thus the entire action is central, and racking thereby obviated when running the machine at a high rate of speed.

E′ is the shuttle-bobbin, and k' the shuttle-thread. The male centers of said bobbin are not fitted to work in female centers within the shuttle, but simply come in contact with the square or plain interior ends of the shuttle, the one head of the bobbin being entered within a recess, l^1, at the nose or forward end of the shuttle, and the other head of the bobbin lying within an opposite end recess, l^2, and under a wing, m^1, of a lever-catch, F′, pivoted at n^1. This lever-catch is thrown up or open, as represented in Fig. 27, when it is required to insert or remove the bobbin, but is shut down and fastened by a spring-snap, o', when the bobbin is in its place within the shuttle.

By dispensing with female centers for the bobbin of the shuttle, a longer bobbin for a given length of shuttle may be used, and as the heads of the bobbin fit snugly within the shuttle, and are inclosed or shielded by the overlapping walls of the recesses l^1 l^2—the wing m^1 which hooks on or over the one head of the bobbin constituting one of said walls—the shuttle-thread is prevented from passing over the heads of the bobbin and from catching or hitching on its centers.

The throat-plate G¹, (shown on an enlarged scale, from the under side, in Figs. 21 and 22, and on a reduced scale in other figures of the drawing,) besides having the usual aperture r' for the sewing-needle and opening s' for the feeding dog or bar, is formed on its under side with a projection, w', and short groove v', cut to enter the needle-hole r' in line with the shuttle-thread as it is taken from the shuttle-bobbin, said groove connecting the needle-hole r' with a recess, w', in the under side of the throat-plate, and serving as a guide for the shuttle-thread.

G² is a shuttle-thread holder. (See more particularly Figs. 2, 3, 5, 11, 18 and 20.) This thread-holder, which may be a spring one, and be closed by a crook or wire, a^2, on the shuttle-driving connecting-rod C′, and which is altogether disconnected from the shuttle, remains open during the greater portion of the forward motion of the shuttle and return or back stroke thereof, but closes before the end of the forward stroke of the shuttle, to clamp the shuttle-thread when it and the needle-thread meet and lock with each other in the goods, said shuttle-thread holder being released when the shuttle returns. This forms the stitch independently of the shuttle-tension spring, which, consequently, needs no regulation, and remains always the same. The shuttle-thread holder G², when closing, enters the recess w' in the throat-plate, and holds said thread between it and the projection w', bearing on said thread both above and below it, as it were. When the crook or wire a^2 leaves the shuttle-thread holder G², the latter springs back or opens, but this in no way interferes with the proper guiding of the shuttle-thread into the groove v' when the shuttle moves forward again.

The feed, which is a four-motion one, is operated by a single eccentric-rod, H′, deriving its motion from an eccentric on the shaft D. This rod (shown on an enlarged scale in Figs. 8, 9, and 10, and on a smaller scale in other figures of the drawing) is fitted to slide intermediately of its length within or through a swiveling-guide, I′, having a vertical arbor, b^2. (See Figs. 2 and 10.) Said rod H′ is constructed near its forward end with a crook, c^2, which, as the rod is worked forward and backward, acts alternately against upper and lower inclined sides of a slot, d^2, in a lever, J¹, that has attached to its forward end the feeding dog or bar F, the said slot d^2 being of such width vertically as only to allow the rod H′ to work freely in it both longitudinally and laterally, and not to permit any lost motion vertically between the said rod and the said lever.

This crooked construction of the rod H′ gives the requisite up-and-down motions in a positive manner to the feed-bar F, which also is moved forward in a positive manner by said rod as an incline or jog, e^2, on its one edge, Figs. 2 and 7, comes in contact with and slides over or against the leg of the feed-bar F, or advance side edge of the lever J′, which latter, as shown in Figs. 8 and 9, is constructed with a slot, f^2, in its rear end to admit of its sliding in direction of its length, as well as of its rocking on its fulcrum h^2.

The back motion of the feed is effected by a spring, K′, arranged to act upon the sliding and rocking lever J′, the slots d^2 and f^2 being sufficiently long for this purpose and to admit of all necessary adjustments in the back stroke of the feed-bar, as the latter, or its lever H′, by a shoulder, i^2, comes in contact with a feed-regulating bar, L′. The up-and-forward motions and subsequent drop-and-back motions of the feed-bar F are the same, as regards timely relation with each other, as in other four-motion feeds; but, by the construction of

parts, as here shown and described, for operating the feeder, a single eccentric-rod serves to give three positive movements to the feed-bar F. The swiveling of the eccentric-rod H′ about the axis of the arbor b^2, or, in other words, about an axis which is at right angles to the longitudinal reciprocating travel of said rod, provides for a lateral movement at its feed-bar operating end in a reverse direction to the lateral movement of its opposite end or portion worked by the eccentric. This is necessary to secure the proper relative motions of the feed-bar, and might be attained otherwise than by the swiveling-guide I′.

The length of feed is adjusted by constructing the feed-regulating bar L′ with an inclined edge, l^2, Fig. 2, against which the shoulder i^2 of the lever J′ strikes in the back throw of the feed, and by sliding or setting said bar L′ longitudinally, so as to provide for its being struck earlier or later in the back throw of the feeder. Said feed-regulating bar (see Figs. 1 and 2) is constructed with recesses m^2 m^2 in its opposite edges to admit of the ready entry of the bar from beneath within a lip-shaped guide, M′, on the under side of the bed A, after which the bar is drawn or adjusted to its place longitudinally, and secured at its back end, when set to determine the feed, by a set-screw, n^2, fitting through a slot in the bed A. This feed-regulating bar L′ is bent to give it the form or character of an elliptic spring, causing it to bear at its opposite ends on the under side of the bed A, and intermediately of its length on the lipped guide M′, as shown in Fig. 1. This bent construction of said bar admits of the smooth and even adjustment of the latter.

There is also shown attached to the machine a tuck-creaser, N′, and a shuttle bobbin-winder, R′; but as such form the subjects of separate applications for patent, it is unnecessary to describe them here.

I claim—

1. The combination, with the take-up, of an intermittently and positively operated clamp, T, an intermittently and positively operated needle-thread supplier, U, and a tension device, V, all arranged between the take-up and the needle-thread spool, the said clamp being arranged next the take-up, the said needle-thread supplier being arranged next the said spool, and the tension device being arranged between the said clamp and needle-thread supplier, all as herein described.

2. The combination, with the shuttle-driver B′ and the connecting-rod C′, which operates it, of the pin h^1, rigidly attached to the said rod, and extending through and turning in the shuttle-driver, whereby it not only performs the two functions of transmitting motion to the shuttle-driver and serving as one of the driving-horns, but, by its turning motion, aids to carry the needle-thread over the shuttle, substantially as herein described.

3. The combination, with the shuttle, the shuttle raceway W, the shuttle-driver raceway A′, provided with the communicating opening f^1 between the said raceways, the shuttle-driver B′, and its horns, and the connection of the shuttle-driver with the rod which imparts motion to it, all being constructed and arranged as specified, whereby the said connection and the horns are all brought into the same vertical plane, or thereabout, with the longitudinal axis of the shuttle, as herein described.

4. The shuttle-body E, having interior plain ends for the bobbin-centers, and constructed with end recesses l^1 l^2 for the heads of the bobbin E, in combination with the lever-catch F′, formed with a wing, m^1, constituting one of the walls of the recess l^2, and arranged to close down on one head of the bobbin, substantially as specified.

5. The combination of the slotted feed-bar J′, rod H′, having a crook, c^2, and working in the slot d^2 of the feed-bar without any vertical lost motion, the swiveling-guide I′, through which the said rod slides and with which it oscillates, and the eccentric on the shaft D, for operating the said rod, whereby a positive rising, falling, and forward motion is imparted to the feed, as and for the purpose herein set forth.

6. The feed-regulating bar L′, of bowed or elliptic form, and constructed with recesses m^2 m^2 in its edges, in combination with the guide M′, through which the bar moves when being adjusted, substantially as specified.

7. The combination, with the oscillating take-up N, of the face-plate J, constructed with a cavity in its front face for containing the arm of said take-up, and the covering-plate P, between which and the sides of the said cavity there is a circular opening, r, all substantially as and for the purpose herein set forth.

8. The combination, with the oscillating take-up N, and its covering-plate P, of the bar or wire O, adjustably attached at one end to the said plate, but free at its opposite end, substantially as and for the purpose herein described.

9. The combination, with the adjustable take-up N and the screw n, by which it is secured when adjusted, of the covering-plate P, provided with a hole, s, arranged in the same eccentric relation as the screw n to the arbor o of the take-up, essentially as and for the purpose herein set forth.

10. The combination, with the needle-bar I, of the fixed guide d, the laterally-adjustable guide-bar e, and the rack K in adjustable connection with the needle-bar, to compensate for lateral adjustment of the needle-bar, without interfering with the uniform gear of the rack with the pinion L of the take-up, essentially as described.

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Witnesses:
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