2 Sheets—Sheet 1.

A. WARTH.

Sewing Machine.

No. 73,063. Patented Jan'y 7, 1868.

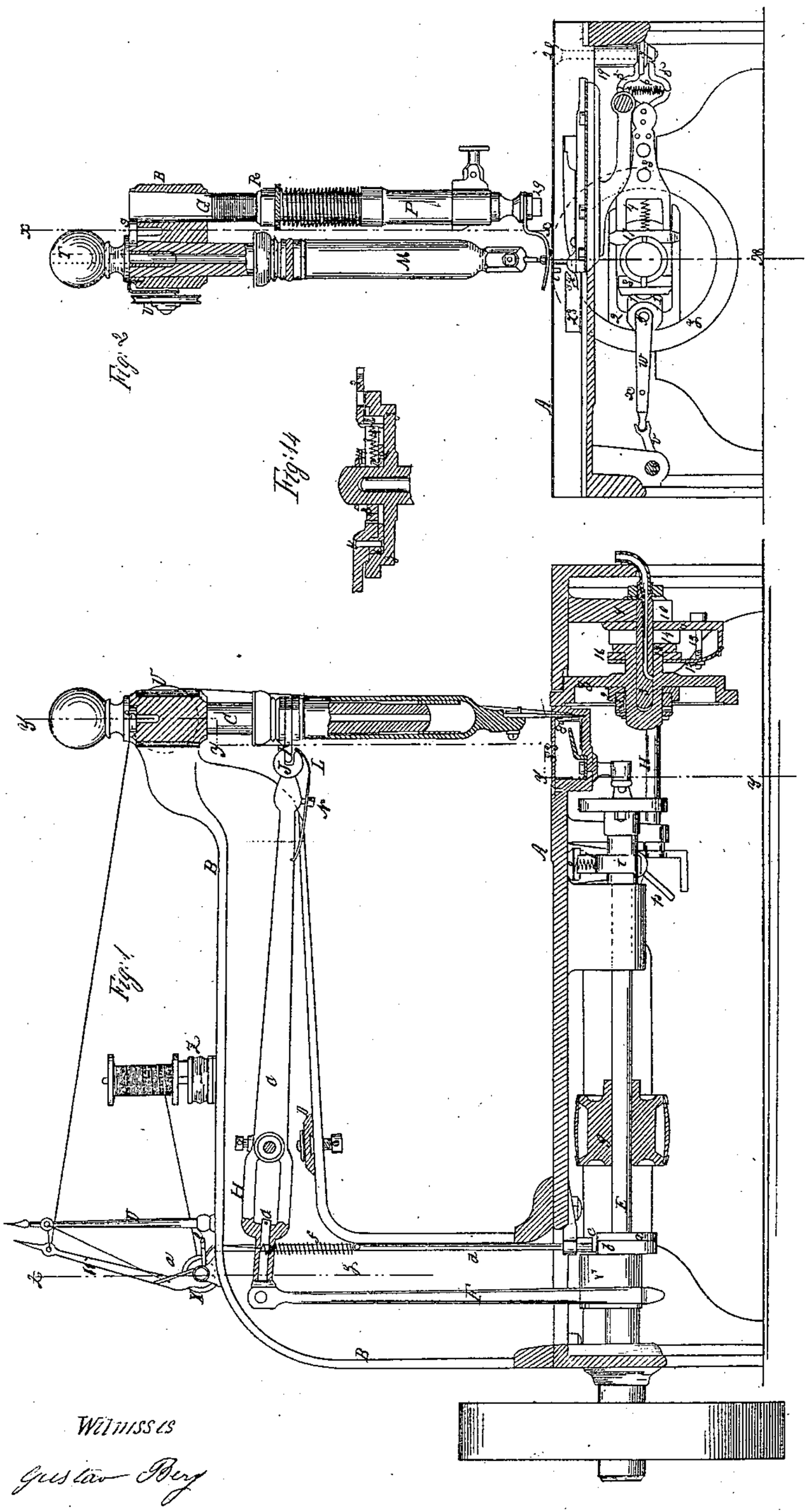

Fig. 2

Fig. 14

Fig. 3

Fig. 1

Fig. 4

Fig. 5

Witnesses

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per

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Albo

2 Sheets—Sheet 2.

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Fig. 4

Fig. 1

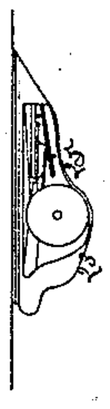


Fig. 10

Fig. 3.

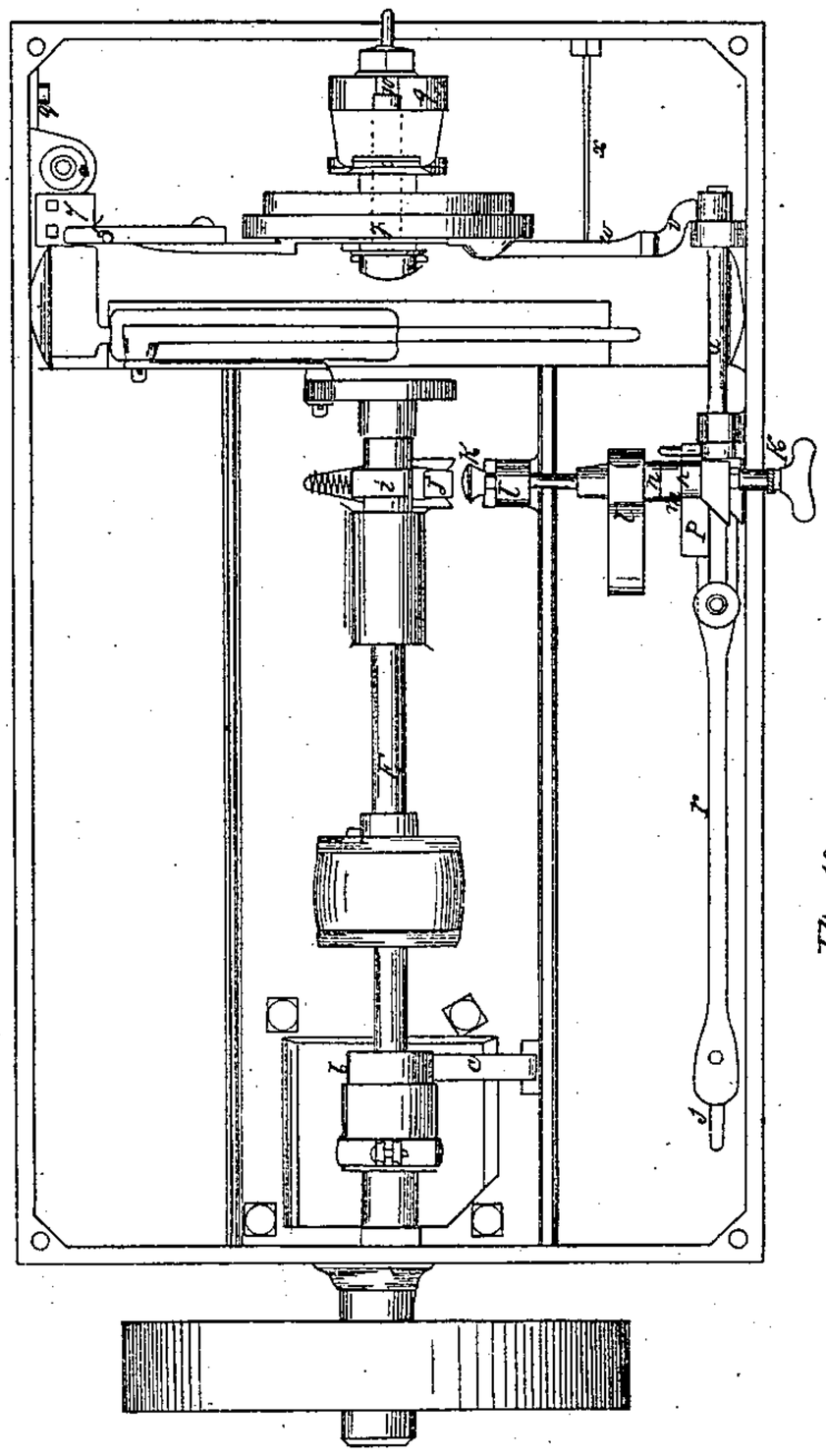


Fig. 9

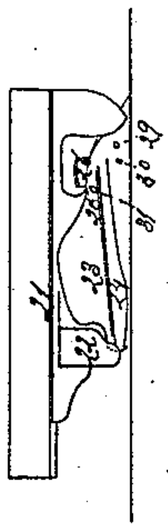


Fig. 12

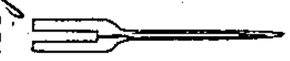
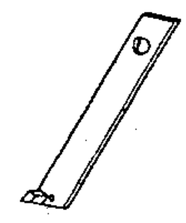


Fig. 13.



Witnesses
Gustav Berg

Inventor
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United States Patent Office.

ALBIN WARTH, OF STAPLETON, NEW YORK.

Letters Patent No. 73,063, *dated January* 7, 1868.

IMPROVEMENT IN SEWING-MACHINES.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, ALBIN WARTH, of Stapleton, in the county of Richmond, and in the State of New York, have invented a new and useful Improvement in Sewing-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable those skilled in the art to make and use the same, reference being had to the accompanying drawing, forming part of this specification, in which drawing—

Figure 1 represents a longitudinal vertical section of a sewing-machine made according to this invention, the line *x x*, fig. 2, indicating the plane of section.

Figure 2 is a transverse vertical section of the same, the plane of section being indicated by the line *y y*, fig. 1.

Figure 3 is an inverted plan of the same.

Figure 4 is a transverse section of the take-up and tension-device, the line *z z*, fig. 1, indicating the plane of section.

The remaining figures are details, which will be referred to as the description progresses.

Similar letters indicate corresponding parts.

The letter A designates the sewing-machine table, having a depression across it to form a shuttle-race. B is the needle-arm, in which the needle-lever C is supported adjustably, in the following manner, to wit: The axis on which said needle-lever C vibrates, rests at one end in a bearing provided for it in the side of said arm, B, and at its other end in the vertical part of a bearing formed by a right-angled piece, D, whose horizontal part rests and slides in ways formed for it on the bottom of the horizontal portion of said arm, and is fixed in any position by a set-screw. Each end of the said axis can be oiled through holes provided for that purpose in the arm B, and in the top of the adjustable bearing.

The needle-lever derives its motions from the main shaft E, through an eccentric, r^7, on said shaft, which is embraced by a strap formed at the lower end of the upright, connecting rod F, whose upper end is connected to the needle-lever C by means of a round pin, G, which is hinged to the top of the rod by a horizontal pin, I, and extends from the rod through the solid end of the needle-lever into the loop H, which is formed in the said needle-lever behind its axis. The end of the pin projects into the loop far enough to receive a pin which secures it to the said lever. By this arrangement and construction I form a joint, which allows an up-and-down motion of the connecting-rod and needle-lever, and also an oscillating motion of the connecting-rod on the pin G, imparted to it by the eccentric r^7.

The needle-lever C is connected to the needle-slide M by a jaw, J, which embraces the end of an arm, K, that projects inwardly from the needle-slide. The arm K is not fastened rigidly in said jaw, but merely projects therein so that in the vibrations of the needle-lever the arm will be alternately raised and lowered.

The arm K of the needle-slide is held up against the top of the jaw J by a spring, L, fastened to the under side of the needle-lever, to prevent play of the needle-slide when, in its reciprocations, its motion is changed from a downward to an upward direction. By this means, the needle-slide arm K is always held up against that part of the jaw which drives the needle downwards, and lost motion from wear of the jaw or plate is obviated, and the needle is prevented from becoming stationary at the end of its reciprocations. By the combined action of the jaw and arm, the tubular needle-slide is also prevented from turning on its guide-rod. The spring L is adjusted to increase or decrease its tension by an adjusting-screw, N, and, if desired, it may be placed above the arm C, instead of below it.

The needle-slide M is hollow, being left open above to allow it to slide up and down upon a hollow stationary guide, O, which it embraces, as shown in the drawing. The lower end of the slide is made solid, and is so formed as to hold the needle by means of a clamp and set-screw. The presser-slide P is also hollow, having its bottom closed and its top left open to allow it to surround and slide upon a hollow stationary guide-rod, Q. The slide P is prevented from falling off its guide-rod by means of a pin extending from said rod through a vertical slot in the slide. Said pin and slot are not shown in the drawing, nor is the lever shown which moves the slide upwards to raise the presser-foot off the feed-wheel, the said pin and slot and lever being of the ordinary construction. The pressure-slide is held down by means of a spring coiled upon the guide-rod Q, between the top of the slide and a collar, R, which is adjusted on the rod by screwing it up or down thereon.

The object of making the needle-slide and the pressure-slide hollow or tubular, and of placing them upon stationary guides, is to enable one to lubricate the said slides in such a manner as to prevent oil from dripping

therefrom upon the table and injuring the material that is being sewed, the oil which is in excess being retained in the bottoms of the hollow slides.

The guide-rods O Q are made hollow throughout to allow the air to pass in and out of the slides during their descent and ascent on the guide-rods. Both the said guide-rods are supported from the end of an arm, B, in tapering holes, which decrease in diameter as they descend, the upper portions of said rod being made tapering from the tops downward for a little distance so as to fit the tapering holes. The object of this arrangement is to allow the said rods to be raised easily out of the holes of arm B, when it is desired to remove them for repairs.

The rods O Q are held down in the arm by a single screw, S, which is screwed down into the arm at a point intermediate of the rods, its head being made of such a size as to partially overlap the tops of the rods, as is shown in fig. 2, the tops of the rods at the places where the screw-head clamps them, being cut down to allow the screw-head to come flush with the tops of the rods. An ornamental appearance may be given to the tops of the rods by balls like T, with short stems which pass into the rods from above, the stems of the balls being fitted in loosely to allow a free circulation of air to and from the rods, and at the same time prevent the oil from being driven out above.

Upon the needle side of the end of arm B is a grooved pulley or wheel, U, made in this example of wood, over which the needle-thread goes on its way to the needle. The groove is deep enough to insure that the thread shall not be accidentally removed in the operation of sewing. As the thread is drawn along in forming the stitches, the pulley is rotated at the same speed by the pressure of the thread thereon. This device is substituted instead of a stationary guide, over which the thread is usually passed, and one of its advantages is to lessen the friction of the thread at the place where its course is changed from a horizontal to a vertical direction.

The spool-spindle is mounted on the arm B, behind the guiding-wheel U, and forward of the tension-device. Upon said spool-spindle is placed a hollow spindle, whose lower end is surrounded by a solid head, Z, which rests upon a cushion of cloth or felt, or other suitable material. From the upper surface of head Z, near its rim, rises a sharp pin which penetrates the flange of the spool far enough to attach it thereto, and prevents it from turning independently of the head. The diameter of the hollow spindle is of such a size that it will fit the pin, which rises from the arm B, and the spool being retained by the sharp pin rising from the head Z, is not allowed to wabble, or move from side to side, no matter what its bore may be, and thereby the unwinding of the thread is rendered regular. Instead of the sharp pin rising from the head, other means for securing the spool might be used, such as sharp-edged feathers, and, if desired, the head Z may be placed on top of the spool instead of below.

The thread is taken from the spool backwards towards the tension-spindle X, which is mounted in a horizontal position on arm B. Said spindle has two collars, one on its outer end to enable the spindle to be turned for adjusting the tension of the needle-thread, and the other, which is marked *y*, and is not far removed from the outer end, to enable the spindle to be clamped against the take-up W, which rises from a hollow spindle that is mounted in a horizontal bearing on arm B. The said hollow spindle has a shoulder that comes against the end of the bearing, and it is held against it by means of a nut and washer on the end of the tension-spindle, which latter extends through the hollow spindle and beyond the bearing far enough to receive said nut and washer.

An elastic cushion is interposed between the collar *y* and the take-up, and by turning the holding-nut the cushion is compressed more or less, so as to compel the tension-spindle to move with the take-up. The thread is taken through the outer end of the tension-spindle, past its outer collar, where it emerges to the surface of the spindle, and is taken around it one or more times, as may be desired to produce the necessary tension, and is thence carried through a hole in the lower part of the take-up, and thence between the side of the take-up and flat spring *a*, which holds the thread fast against the take-up during those intervals when no force is applied to draw the thread from the spool.

By connecting the tension-spindle and the take-up so that they move together, and by taking the thread directly from the tension-device to and through a hole in the take-up, I am enabled to keep the thread in such a position that the tension will not be varied during the vibrations of the take-up by being partly unwound from the tension-spindle when the take-up is moved backwards. The take-up is vibrated directly from the main driving-shaft E in the following manner: *e* is a horizontal arm which extends from the centre of motion to the take-up, in a direction to bring it over the upper end of a rod, *d*, which is held in guides, and rests on a hinged arm, *c*, whose free end extends over a cam, *b*, placed on the main shaft E; *f* is a spring, which constantly draws the arm *e* of the take-up down upon the rod *d*, and restores the take-up to its original position after each vibration caused by the cam, the rod *d* being also thereby held down upon the arm *c*, which rests directly on the face of said cam.

This cam is so shaped that the thread is held extended until the point of the needle strikes the material to be sewed. The main shaft is provided with a belt-pulley, which consists of a solid core of metal, whose diameter is reduced between its ends to form a receptacle for a cushion of rubber or other elastic material, as is clearly shown in fig. 1, while ribs *h* in any convenient number extend across the sunken space from rim to rim, as is shown in Figure 5. The elastic cushion is flush with the periphery of the rims, and both are wrapped about with a covering of leather, which is secured in place by metallic bands at the ends of the pulley over the solid rims. The feed-motion is derived from a cam, *i*, on the main shaft E, through a pendent arm, *j*, which hangs down beside the shaft from the table A. The face of the arm is kept against the cam constantly by a spring, as shown in fig. 1. The back of the arm has an elastic cushion of rubber or other suitable material, which is held to the arm by being compressed between flanges, which rise from the sides of the arm, and are bent over towards each other, so as to bite the sides of the cushion. When the arm is pushed outwards by the cam, it strikes the end of a horizontal rod, *k*, which is suspended in bearings formed on the under side of table A, and extends

through a nut, *n*, to the side of the table A, the said rod *k* having a screw-thread formed on it where it works through the nut, and its end at the side of the table having a thumb-piece which enables one to turn it. The nut *n* is separated from the adjacent bearing by an elastic collar, *m*. Said nut has two radial arms, *p p*, which extend from opposite sides of the nut, and form in this example an obtuse angle with each other towards the feed-wheel. That one of said arms which extends upwards towards the table A, is forked, and embraces a pin on the end of the reversing-lever *r* from which rises a button-head, which moves in a slot, *s*, in the table, and extends through it, so that one can move said lever *r* from the top of the table when it is desired to reverse the direction of the feed. The direction of the feed depends upon the position of the arms *p* of nut *n*, which arms are held by the reversing-lever in such a position that one or the other of the said arms will be beneath one of the toes, *t*, of the rock-shaft *u*, so that the outward movement of the rod *k* will be transmitted to the rock-shaft, which will be rocked to the right or left, according to the position given to nut *n*, which can be so turned that neither of its arms will act against the toes of the rock-shaft, or so that one or the other will act on the rock-shaft through the toes *t t*, beneath one or the other of which the arms *p p* are brought by the reversing-lever, in manner aforesaid. The rock-shaft *u* extends in suitable bearings beneath the table, towards the forward end of the machine, and has fast on its forward end a crank, *v*, which is forked to receive the pointed end of a lever, *w*, which is pivoted near its other end to the part 2 of the friction-clutch, which drives the feed-wheel *z*. The said lever *w* is restored to its former position after every vibration which is given to it, from the rock-shaft by means of a spring-arm, *x*, which projects from the front side of the frame of the machine, and penetrates the lever not far from the end of crank *v*. The feed-wheel *z* turns upon a hollow axis, 8, which extends past the bearing 9, which supports it, to the front of the machine, outside of which it is turned upwards, as shown in fig. 1, to enable the operator to pour in oil, wherewith to lubricate the feed-wheel, the bore of the axis towards its inner end being turned and carried through one side at a point nearly opposite the middle of the hub of the feed-wheel. The axis goes through an elongated vertical slot, 10, cut through the lower end of the bearing 9, so that the feed-wheel can be adjusted vertically, and it is held to the bearing by a washer and nut, in combination with the elastic box next described. The hub of the feed-wheel, on its forward end, has a flange, 18, by means of which the feed-wheel is secured to the axle 8, by the elastic box composed of the following devices: A broad plate, 11, is placed on the axis 8, and from the bottom of this plate extends a right-angled flange, whose edge has projecting corners, between which is held the lower end of a spring-plate, 12, which is fastened to the plate 11 by a screw-bolt, 13. The spring-plate extends upwards about as high as the plate 11, and the hub of the feed-wheel goes through it. The said spring-plate is separated from the flange 18 of the hub of the feed-wheel by a rubber packing-ring, 16, and the said flange is separated from the plate 11 by a packing-ring, 14, of leather. By means of these devices, the said flange 18 is held between elastic surfaces, and the feed-wheel consequently has its support in elastic bearings, although its axis is held to the bearing 9 in a rigid and unyielding manner. The rear face of the feed-wheel has a circular depression with square sides, the hub of the wheel being made to project far enough to permit the feed-clutch, hereinafter described, to be held thereon, so that it can operate within the depression of the wheel. The feed-clutch is composed of the clutches or pieces 2 3, whereof the former is contained in said depression next to the face of the wheel, and the latter is mounted on the former, and slides thereon, being guided between the rims of the sides of the piece. Both pieces have wide elongated central slots, to enable them to be placed over the hub of the wheel, and the upper piece 3 has guide-arms, which extend inwards on the edge of its slot, so as to form guides for the piece 2, and preserve parallelism in the movements of the two pieces on each other. The piece 2 is drawn towards the other and away from the inner circumference of the wheel by a spring, 4, and thereby the clutch is made to release the feed-wheel. The left-hand end of piece 2, observing fig. 2, is curved to fit the said inner circumference, and the piece 3 has segments, which fit within the wheel on the opposite side. The said pieces are held upon the hub by means of a washer and key, said washer having a longitudinal locking-bar, 17, on its right-hand edge, which spans the slot of piece 3, and fits under shoulders formed on the top of piece 3, so that the said piece or clutch 3 is locked to the hub, and has no longitudinal motion allowed to it. The lever *w* has on its right-hand end (fig. 2) two cams 1 1, which are kept in contact with the left-hand end of piece or clutch 3, by the force of spring 4. The piece or clutch 3 is prolonged beyond the rim of the feed-wheel, and has pivoted to the prolongation, two independent fingers 5 5, which compose yielding jaws, which are drawn constantly towards each other by a spring, 6. The jaws embrace a stop, 7, which is made of leather or other suitable material, that has a soft surface, so that the contact of the jaws therewith will not produce noise.

The stop 7 is mounted upon a frame, which is pivoted by its forward end to the side of the table of the machine, so that the said frame can be moved up or down, towards or away from the under side of the table, for the purpose of varying the length of the stitches without changing the oscillations or motions of the rock-shaft. The stop 7 is moved up or towards the table by means of a screw, 20, seen in dotted outline in fig. 2, said screw being surrounded by a rubber tube, 19, which, when the screw is drawn outwards to move the stop towards the table, is compressed against the under side of the table, and, when the screw is turned down, the elasticity of the rubber causes the stop to be moved downwards again to its former position, or as far in that direction as the release of the rubber by the screw permits. When the stop 7 is in a line with the centre of the jaws, or, in other words, in a line with the centre of the feed-wheel, the length of the stitches is the same in whichever direction the feed-wheel is turned. But when the stop is at one side of the centre, the stitches will be longer in one direction than in the opposite direction, so that if the feed is reversed while the stop is at one side of the centre, there will be a corresponding change in the length of the stitches, either longer or shorter, according to the position of the stop on one side or the other of said centre.

The shuttle S′ is driven by a crank from a disk on the end of the main shaft. The shuttle-carrier 21 is seen in several figures of the drawing, but most clearly in Figure 9. The heel of the shuttle is overlapped by a

plate, 22, which holds the shuttle down, so that the same is prevented from being lifted up so as to clamp the loop of the needle-thread between its top and the inner surface of the cover of the shuttle-race. The necessity for the overlapping-plate arises from the peculiar movements of the needle, which has only two simple motions, to wit, one downward and one upward, there being no pause in the course of its upward motion, nor a pause followed by a slight downward movement, in order to give slack to the thread while the shuttle is going through its loop, as in ordinary machines; and consequently, to prevent the possibility of the rising of the shuttle from the pull of the needle-thread while the needle is rising, at which time the needle-thread loop surrounds the shuttle, I provide the said overlapping-plate 22, which acts in combination with the ordinary overlapping-plate, extending over the point of the shuttle to prevent the shuttle from being raised from its place and thrown against the cover of the race.

The needle has no interruption or pause, neither has it a pause and retrograde movement combined, during its ascent, but its movements are a simple and direct reciprocation, derived from a plain eccentric on the main shaft. It follows that no addition is made to the amount of slack of the needle-thread, as is the case in ordinary sewing-machines, from or by any interruption of the ascending movement of the needle; and in order, therefore, to prevent any undue strain on the needle-thread from the passage of the shuttle through the needle-loop during the simultaneous ascent of the needle, I reduce the back surface of the shuttle, so as to make the shuttle narrow for the first half of its length, forming a depression, 25, and from thence increase its width, until it falls off again towards its heel, as shown most clearly in figs. 9 and 11.

While the forward narrow portion of the shuttle is going through the loop of the needle-thread, the needle is rising, and, at the time said loop encircles the shuttle at about the point 25, the needle will have risen far enough to bring its eye above the material, so that the pull and strain thereafter made on the needle-thread by the passage through its loop of the enlarged half of the shuttle will be downwards, and in a line with the needle, and not at right angles thereto, as in ordinary shuttle sewing-machines, and no additional thread will be required in enlarging the loop for the shuttle until the needle has left the material. This provision is of great importance in sewing leather, where the thread is closely pressed between the needle and the sides of the hole, and the shuttle is unable to draw out enough thread to form a loop, causing the thread to snap apart.

The shuttle has on its side next the shuttle-race a hooked guiding-edge, 27, seen in Figure 10, extending nearly its whole length, which engages a reverse guiding-hook, 28, formed on the side of the shuttle-race, a suitable distance, equal at least to the distance of the shuttle's travel. One object of these guiding-hooks is to retain the needle-thread loop in its proper place, and prevent it from being caught between the shuttle and race. Another object of these devices is to prevent irregularity in the motion of the shuttle, and keep it close to the side of the race, so as to insure its taking the loop of the needle. Besides these advantages derived from the said guiding-hooks, there is another advantage, to wit, that I am enabled to use a shorter needle, or to decrease the distance it travels, in comparison with ordinary sewing-machines. This advantage is owing to the fact that the point of the shuttle is elevated, the thread being held by the hook 28 in such a position that it is caught by the elevated point and the side of the race, in consequence whereof the needle is not required to descend any further than to bring its eye to the shoulder formed by the edge of said guiding-hook. As an additional support to keep the shuttle up to the side of the race, I provide an upright plate, 26, which is formed by turning up a portion of the shuttle-carriage near its forward end, as shown in fig. 9.

In order to prevent the shuttle-thread from becoming so placed that the needle will descend behind it and produce a knot, I place on the top of the shuttle a flat tongue, 24, which extends the whole length of the thread-opening made in the top of the shuttle, and laps over the inner edge of the opening sufficiently close to hold the thread by friction, and carry it back when the shuttle moves backward, so that it will be behind the needle when it makes its next descent.

The shuttle is left open on its under side, and is provided with two or more tension-rods, which extend from the pointed end towards the spool, their hinder ends being free, disconnected from each other and from the rest of the shuttle. The shuttle-thread is taken from the spool through hole 29; thence down again into the interior of the shuttle through hole 30; thence around one or both of the tension-rods; thence through the hole 31; thence under the tongue 24. By reason of the disconnected ends of the said rods, I am enabled to pass the thread over them, after it has been threaded through the several holes of the shuttle, by picking it up and passing it over their free ends, and it is not at any time necessary for the thread to be withdrawn from any of the holes in order to put it on one or both of said rods. In addition, I am enabled, by the use of two free rods, to vary and adjust the tension in a nice and delicate manner, by turns varying from one-quarter to three-quarters of the complete circumference of said rods respectively.

The needle is shown detached in Figure 12. It is made out of sheet steel, by cutting it out of the sheet by means of a die-cutter of proper form. After the needle and its shank have been cut to the proper outline, the grooves on the front and back, which intersect the eye, are formed by proper dies. The corners of the needle are rounded off by filing or grinding.

The presser-foot, seen detached in Figure 7, and also seen in Figure 8, is slotted at its heel, in the manner shown, so that it can be inserted between the face of the screw 29 and the bottom of the pressure-rod, the said bottom being cut away so as to leave a rib across it, which enters the said slot. The set-screw which fastens the presser-foot goes up through said slot, and through the rib into the body of the rod. By this construction I am enabled to remove and replace the presser-foot without removing the screw.

The presser-foot has a thread-guide, s^7, formed upon it, in a line with the needle, as shown in fig. 7. This thread-guide, in this example, consists of a tapering groove, whose narrow end is towards the needle. Instead of attaching this thread-guide to the presser-foot, it may be secured to any other part of the sewing-machine.

In using it, the needle-eye is brought opposite to the groove, when the needle is easily threaded. One of the advantages of this device consists in insuring that the needle will be always threaded from the proper side.

The reverse-hook 28, on the side of the race, is cut away, as seen in fig. 2, to form a curved recess or slot, 32, which receives into itself that portion of the needle-thread loop which is on the inside of the shuttle, and prevents the loop from tipping over or kinking, and causes the loop to remain open, to allow the shuttle to enter it. The forward end of said recess or slot operates as a hook, which retains or holds the inner side of the loop while the shuttle is passing through it, and so aids in preventing the loop from being caught between the shuttle and race.

The throat-piece 33 extends across the race, at the place of the descent of the needle, and is perforated, to allow of the passage of the needle through it. That part of the throat-piece which overlaps the edge of the race has a downward projection, 35, seen in Figure 13, which is a perspective view of the throat-piece detached, which projection fits in a recess, 34, made on the verge of the race, (see fig. 2.) This side of the projection which is towards the race forms a shoulder, which prevents fine threads from catching in the joint of the throat-piece, and facilitates the sliding of the thread past the joint, and, by keeping the shuttle-thread off from the joint, prevents it from curling, or bending inward so as to get forward of the needle. As projection 35 is a continuation of the throat-piece, it follows that there is no joint presented at that point, but the throat-piece and projection form an unbroken surface.

The axis of the feed-wheel is square where it is held in the slot of the bearing *q*, so that it cannot turn, by which arrangement its open end is always kept turned upwards. The hub of the feed-wheel is hollow, to receive the axis, but its inner end is closed, so as to prevent oil from dripping upon the wheel.

What I claim as new, and desire to secure by Letters Patent, is—

1. Making the needle-slide M and the guide-rod P, either or both, in the form of tubes, closed below, so as to prevent oil used in lubricating them from falling on the table, substantially as described.

2. The combination of the guide-rods O and Q with the holding-plate S, substantially as and for the purpose described.

3. Making the needle and pressure-guide rods O and Q, either or both, hollow, to allow the escape of air, substantially as described.

4. The combination of the thread-guide s^7 with the presser-foot, substantially as described.

5. The hook 28, formed substantially as and for the purpose described.

6. The combination of the grooved shuttle with the hook 28, as and for the purpose set forth.

7. The disconnected friction-pins in the shuttle, arranged substantially as described.

8. The shuttle S′, constructed as shown and described.

9. The spring L, arranged so as to bear upwards against the needle-slide, substantially as described.

10. The combination of the eccentric r^7, universal joint G I, rod F, and needle-lever C, constructed and operating substantially as and for the purpose described.

11. The tension-device X *y*, and the take-up W, arranged and combined substantially as described.

12. The combination of the reversible slide *r*, the nut *n*, having arms *p p*, and the rock-shaft *u*, having toes *t t*, substantially as described.

13. The lever *w*, provided with two shoulders, 1 1, in combination with the spring *x*, substantially as described.

14. The adjustable plate 7, for regulating the length of the stitches, in combination with the jaws 5 5 of the feeding-apparatus, substantially as described.

15. The box that holds the feed-wheel, composed of the rigid plate 11, the spring-plate 12, and the elastic rings 14 16, substantially as described.

16. The hollow axis in which the feed-wheel turns, in combination with the hollow hub, closed at one end, substantially as shown and described.

ALBIN WARTH.

Witnesses:

W. HAUFF,

G. BERG.