(No Model.) 3 Sheets—Sheet 1.

E. H. SMITH.

SEWING MACHINE.

No. 553,139. Patented Jan. 14. 1896.

Fig. 1

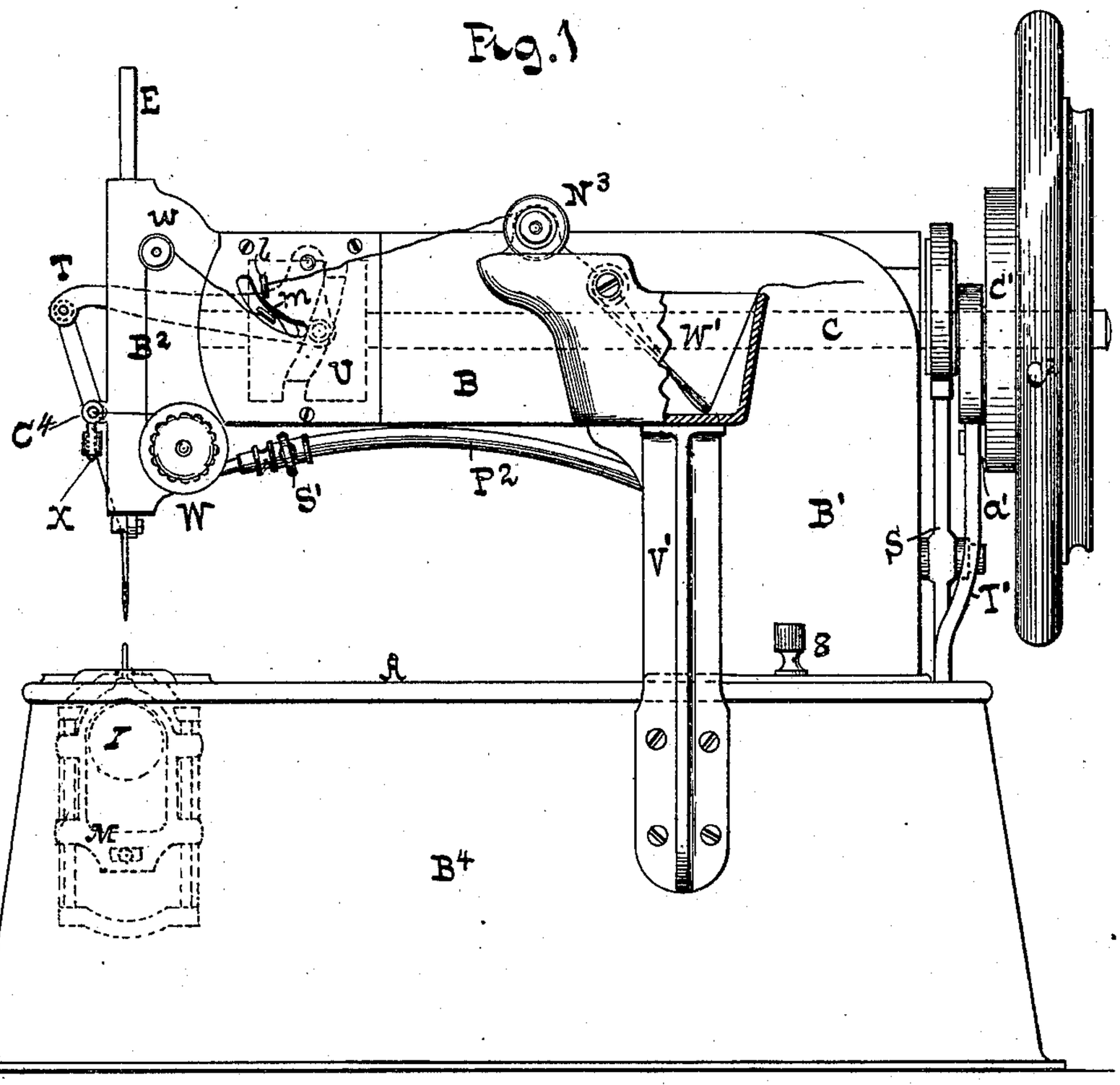
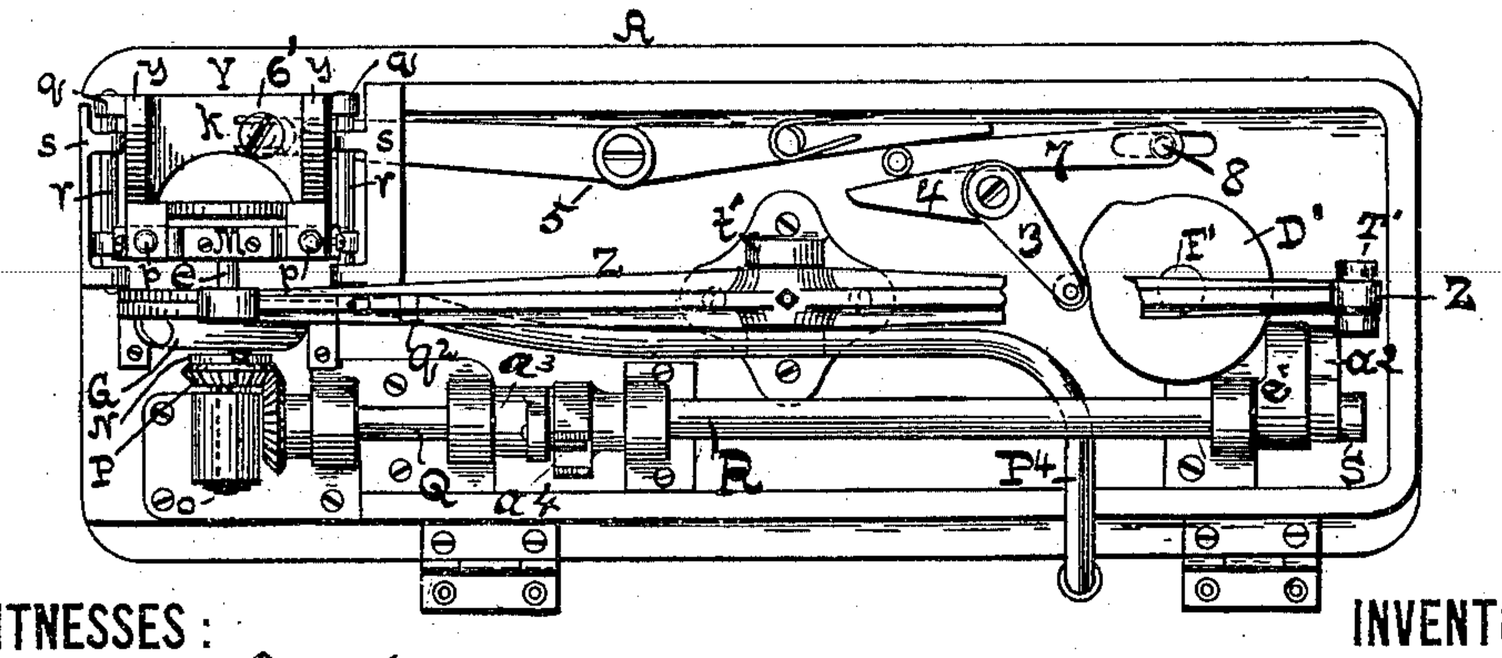


Fig. 2.



WITNESSES:

A Faber du Faur Jr.

Jos. H. Blackwood

INVENTOR

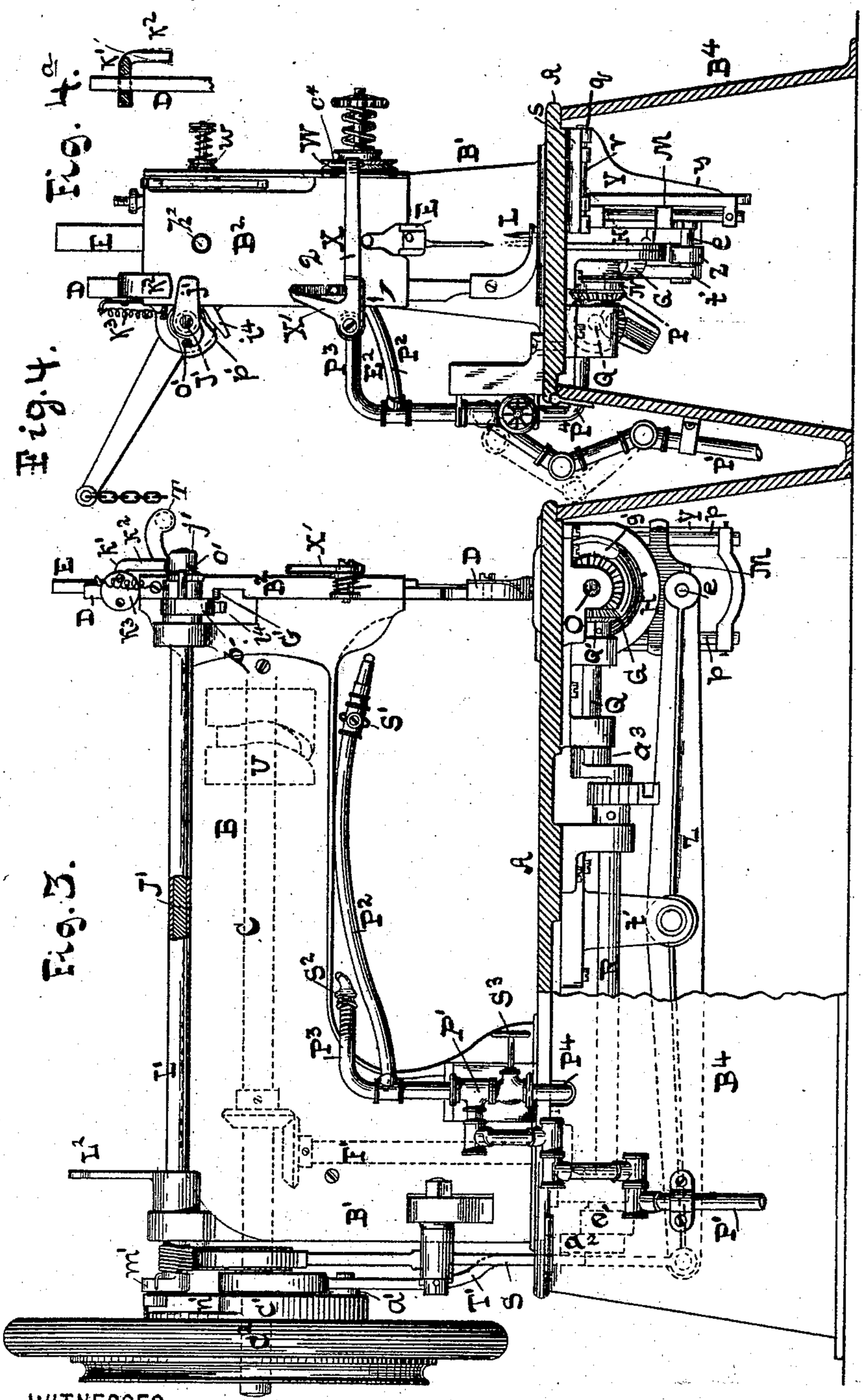
Earle H. Smith

(No Model.) 3 Sheets—Sheet 2.

E. H. SMITH.

SEWING MACHINE.

No. 553,139. Patented Jan. 14, 1896.



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(No Model.)

3 Sheets—Sheet 3.

E. H. SMITH.

SEWING MACHINE.

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Fig. 4.

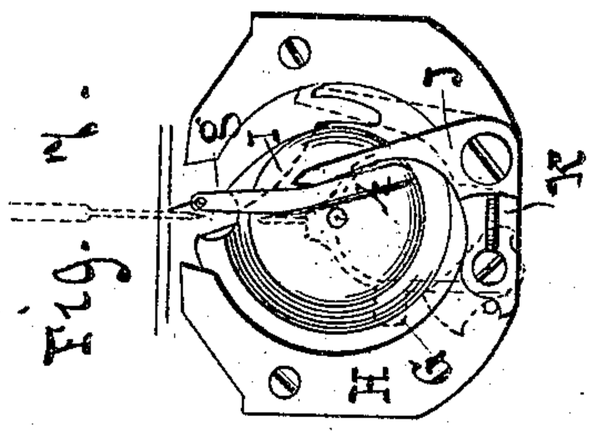


Fig. 8.

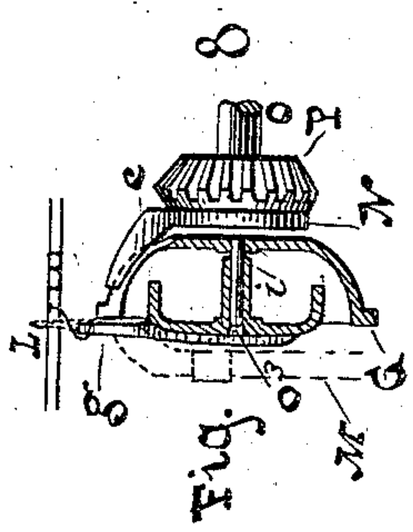


Fig. 11.

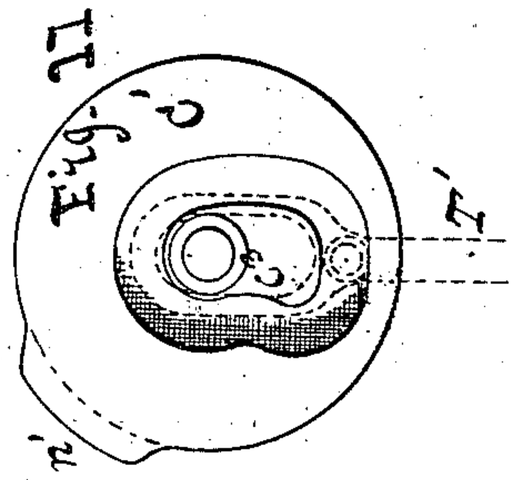


Fig. 6.

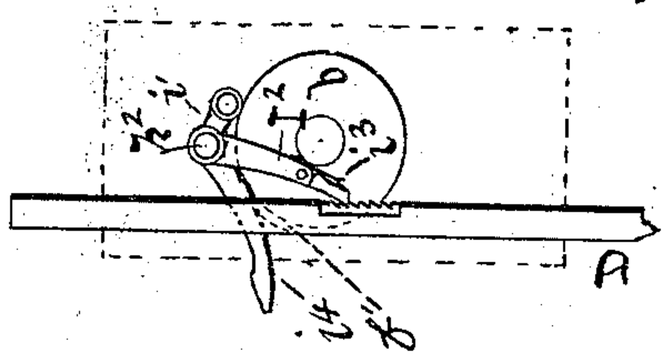


Fig. 9.

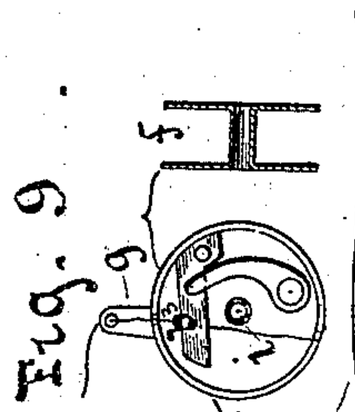


Fig. 10.

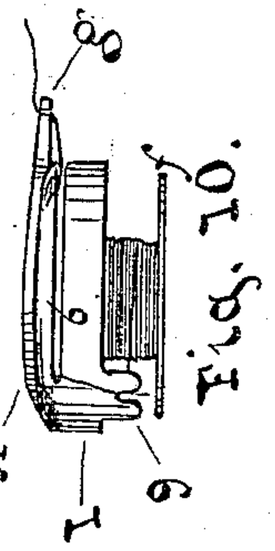
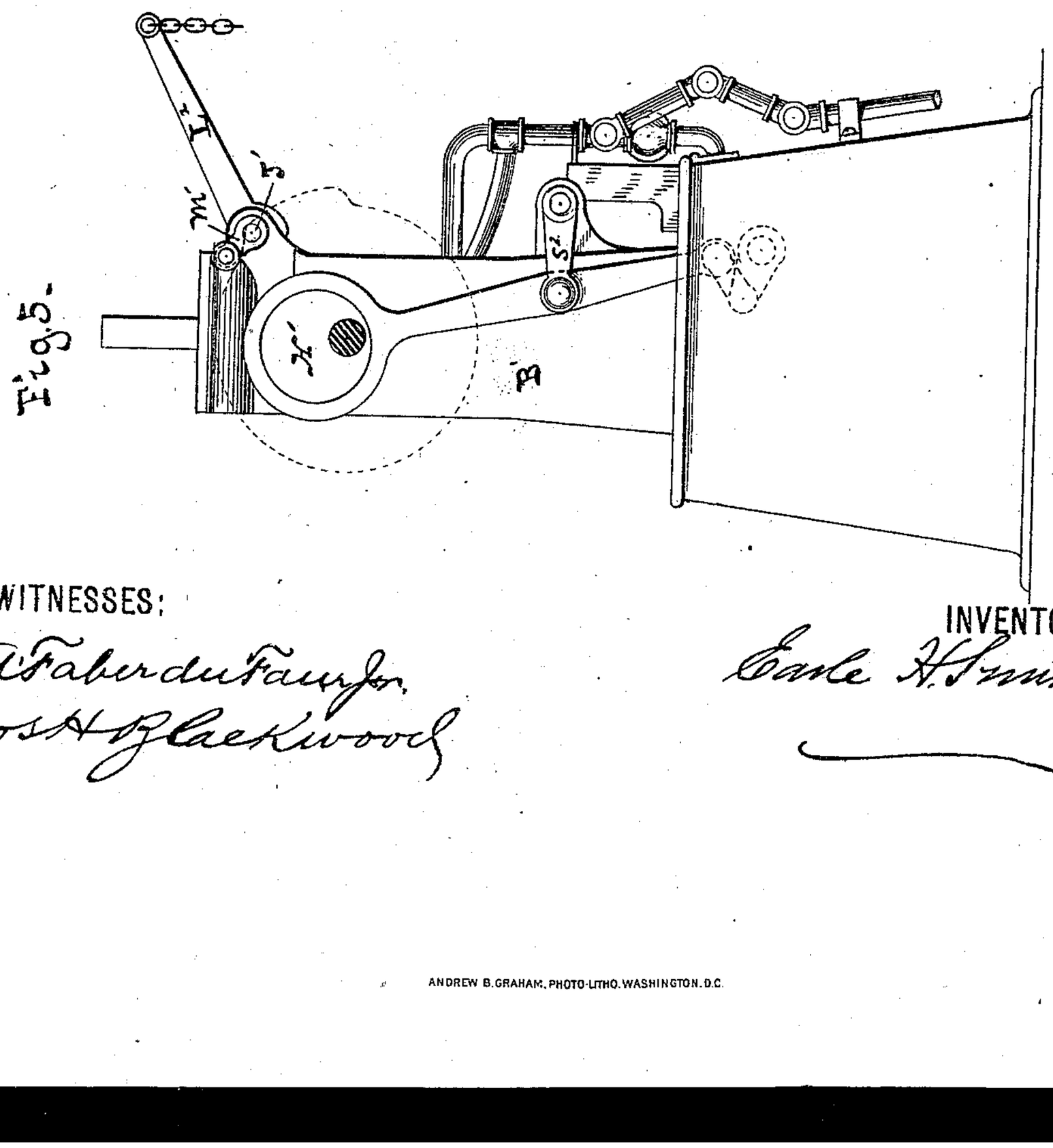


Fig. 5.



WITNESSES;

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UNITED STATES PATENT OFFICE.

EARLE H. SMITH, OF NEW YORK, N. Y.

SEWING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 553,139, dated January 14, 1896.

Application filed July 1, 1891. Serial No. 398,175. (No model.)

To all whom it may concern:

Be it known that I, EARLE H. SMITH, a citizen of the United States, and a resident of the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Wax-Thread Sewing-Machines, of which the following is a specification.

The annexed drawings show a machine which illustrates my invention, wherein—

Figure 1 is a side elevation. Fig. 2 is an underneath view. Fig. 3 is an elevation showing the reverse side of the machine and parts under the bed-plate. Fig. 4 is a front view partly in section. Fig. 4^a is a detail of the presser-bar lifting device. Fig. 5 is a rear view as with balance-wheel removed. Fig. 6 is a separate view of presser-bar lock and release. Fig. 7 is a face view of the shuttle and shuttle-race. Fig. 8 is a cross-section of the shuttle and thread-case, also exhibiting the shuttle-driver and pinion on the driver-shaft. Fig. 9 is a reverse view of the thread-case and an edge view of the bobbin. Fig. 10 is a side view of thread-case. Fig. 11 shows the awl-cam.

A indicates the bed-plate; B B′, the bracket-arm and post, in which arm is mounted the main driving-shaft C. The head B^2 of the arm contains the presser-foot bar D and the needle-bar E, the latter operated from a crank-disk *b* on the front end of the shaft C in any usual manner, as by a crank and link. The needle operates in connection with a rotary shuttle having a variable motion.

The machine is also provided with a take-up, tensions, and a device for manipulating the needle-thread in consonance with the variably-rotating shuttle independently of the needle-bar. The shuttle is circular in form and adapted to rotate about its own axis. It is dishing in shape, while flat on the front, and is arranged to revolve in a vertical plane in a circular raceway H. The shuttle is rotated continuously, being driven around by a stud C set as a crank in a disk N, Figs. 2, 4 and 8, such driver always moving in one and the same direction. In the present instance the shuttle is arranged so that its plane of rotation is transverse to the line of sewing. To operate the shuttle so arranged the driver-disk N is fixed on a short shaft O, here placed at right angles to the bracket-arm. Said shaft is provided with a pinion or gear wheel P made fast thereto. Motion is conveyed to the shuttle from the main shaft C through a second shaft, as R, operatively connected with the main shaft in any manner common to the art, and this second shaft R has a crank that operates gearing mechanism between this shaft and the driver-shaft O, which mechanism engages the gear-wheel P thereon. The said second shaft R is here placed horizontally. When thus disposed, the means employed to convey motion thereto from the main shaft is a pitman connection S. As here made, it is fulcrumed to a radius-bar S^2 pivoted to the arm-post B′. The upper end is a strap or follower which encircles an eccentric H (or crank) on the main shaft, and the lower end connects by a link a^2 with a crank on the aforesaid second shaft R and so revolves it. The gearing mechanism intervening between said second shaft and the driver-shaft pinion consists in this instance of a shaft Q placed with the axis parallel to but out of line with the shaft R, which latter shaft is provided at one end with a grooved crank receiving the crank-pin a^4 of a crank a^3 carried by shaft Q, thus producing a variable or differential motion in shaft Q, which is conveyed to the shuttle through shaft O by means of a gear-wheel Q′ on shaft Q that meshes into the pinion P, rotating the shaft O carrying the shuttle-driver.

The shuttle G, Figs. 8, 9, and 10, carries a circular thread-case I centrally hung therein, and when the latter is inserted in the shuttle a pin Q^3 made fast in the center of the shuttle enters said tube *i* freely, whereby the thread-case (and thread therein) is made independent of the rotary motion of the shuttle, and may be held at rest while the shuttle revolves. This is a new and important feature, no way having been heretofore devised of holding the thread-case still in a machine combining with a continuously-rotating shuttle, a needle, and an awl. The shuttle-thread is led from the bobbin around a guide-post 9 at the lower side of the thread-case, thence to a projection *g* above, termed a "finger," passing on its way under a spring b^3 for tension, and thence to the point of delivery, being a hole in the finger *g* and to the under side of the work, the thread thus coming out of the front of the

shuttle. A slit is made in the side of the thread-case at 6, which allows the thread to be drawn under the tension-spring sidewise. The finger *g* extends beyond the periphery of the shuttle, and so holds the shuttle-thread delivery above the path of the shuttle's point, which passes below it and under that portion of the shuttle-thread reaching up to the work. The finger *g*, for convenience, is secured to the face of the thread-case, where it serves as a rib *h* or stop, that aids in preventing the latter from revolving with the shuttle and twisting the thread, the thread-case being so prevented, by means here consisting of a check-bar J, removably attached to the front of the shuttle-race by a pivot. Such bar has a curved depression in one side, and a latch K is shaped and adapted to be turned into said depression and holds the check-bar in front of the thread-case and near one side of the rib *h* thereon, leaving space for the thread to pass between in the operation of the machine.

When the thread-case is to be removed to insert a bobbin the latch K is turned up and the check-bar swung aside, as shown in dotted lines in Fig. 8, to give clearance, and to facilitate the removal of the thread-case the shuttle may have an opening *g* in the back. (Indicated in Fig. 3.)

The device for handling the needle-thread with the variable motion of the shuttle, giving down thread for the shuttle's loop and pulling up such loop and tightening the stitch, is a lever T, termed a "thread-lever," operated positively by a cam U on the driving-shaft C, and therefore independent of the movement of the needle-bar.

W is the main tension, preferably a grooved wheel. The thread is led from the wax-pot W′ through any usual stripper N^3 and guiding-eyes over an auxiliary tension *w* to a take-up, thence to the thread-lever, and to the needle. The slack-thread take-up is a lever X pivoted at E^2 to the face-plate, and there having a spring 1 tending to push it downward. It has an eye C^4 at the free end, through which the thread is led on its way from the tension to the lever T. Said lever X is provided with an arm X′, reaching up and resting, by force of the spring, against a pin 2 in the presser-bar, whereby its action is varied automatically for different thicknesses of work, according to the height of the presser-foot.

The pull-off for drawing thread from the wax-pot at every stitch is of very simple construction. An eye *l* is fixed in the bracket-arm, and an eye *m* is set in the thread-lever T and disposed between the said fixed eye *l* and the auxiliary tension *w*. By means of these eyes the said lever T serves as a pull-off, drawing the thread through the wax-pot stripper N^3 at every downward motion of said lever. This forms a surplus from which the requisite thread is taken by the thread-lever in its upward motion when finishing each stitch, whereby uniformity of operation is secured and the variations of the stitches otherwise contingent are avoided.

The work may be fed or advanced in any known manner. In the illustrative machine of the drawings it is done by an awl L. This awl punctures the work for the entrance of the needle, and in so doing moves up and down in front of the thread-case I in line with the needle. The shuttle-thread finger *g* is disposed at one side of the path of the awl, whereby the portion of thread reaching from said finger to the work is kept clear of the awl. In its feeding action the awl moves toward the shuttle and transverse to the plane of its rotation.

It is necessary that the thread-finger *g* and the means of holding the thread-case from revolving, as bar J, should be so disposed as not to interfere with the awl and needle. To insure this the check-bar J is set out of the way of the path of the awl, which, as here shown, is placed on the other side of the stop *h* and finger *g* from the location of the check-bar, so that the path of the awl and needle is at one side of the finger *g* and the check-bar on the other side. The awl is secured in a carrier termed the "awl-gate," made in the form of a frame M, through which the thread-case may be inserted and withdrawn from the shuttle. The awl-gate is fitted to slide on rods *p*, fixed in a species of frame Y, adapted to receive a horizontal motion to provide the lateral movement of the awl. Said frame Y is here made in form of two "knees" *y* united by a web *k*. On the sides near the top are ears *q* receiving rods *r* made fast in portions *s* of the bed A, and nearly in line with the butt of the awl when feeding the work. (See Fig. 4.)

In the present machine the awl and needle enter the work from opposite sides, and in all cases the means of operating the awl are entirely separate from that of the needle.

The awl-gate is reciprocated vertically by a lever Z fulcrumed in a hanger *t*′ and operated by a face-cam C′ on the side of the balance-wheel C^2. The cam has a groove in its face that receives a friction-roller *a*′ carried by a vertically-reciprocating bar T′. The upper end of this bar has an opening that receives the hub C^3 of the cam C′ for a guide, and the lower end is jointed to the rear end of the awl-gate lever Z. The front end of this lever connects with the awl-gate by a pin *e* entering a slot in the awl-gate, and hence leaves the awl-gate free to move on said pin in the feeding action of the awl without affecting the connection of the lever Z therewith.

The lateral motion of the awl is produced from a cam D′, fixed on an upright shaft F′, geared by bevel-wheels to the main shaft C. Said cam acts on one arm, 3, of a two-armed lever 3 4, the other arm, 4, of which vibrates a lever 5, slotted at the forward end to embrace a screw-stud 6′ set in web *k* of the frame Y

in which the awl-gate reciprocates. A roller at the end of a swinging arm 7 and interposed between the arm 4 and the rear of the lever 5 is loosely attached to a knob-spindle 8, and by moving such spindle in a slot in the bed-plate the stitch can be lengthened or shortened, and the arrangement of the levers 3, 4, and 5 is such as to bring the awl directly under the needle (see Fig. 4) when withdrawing from the work after its feeding action.

To hold the work down firmly by the presser-foot against the upward action of the thread-lever and that of the awl, there is combined with the presser-bar a hold-fast, which is represented by an arm I^2 jointed to a pawl i^3 engaging ratchet-teeth on the presser-bar. The pawl-arm I^2 forms part of a rocker pivoted to the arm-head and operated from a cam-surface f' (dotted) on the crank-disk b acting on a roller-stud in a short arm i' made fast to pawl-arm I^2. The pawl i^3 is normally in engagement with the presser-bar, locking it fast, as shown. When the arm i', obeying said cam-surface, moves up, the pawl-arm swings back with its pawl, releasing the presser-bar.

Combined with the hold-fast for the presser-foot and means of releasing it mechanically, as aforesaid, I use a device for lifting the foot mechanically when advancing or feeding the work. (See Figs. 3 and 4.) For this purpose J' is a rock-shaft, having at the front end a lifting-toe j', which takes under a clutch-fixture k', attached to the foot-bar and adjustable thereon. At the rear such rock-shaft has an arm m' lying over the path of a peripheral cam n' on the awl-cam C, which cam n' strikes the arm m', turning the rock-shaft and operating the lifting-toe, which engages the fixture k' by a pendent arm k^2.

The means for lifting the presser-foot manually, before mentioned, are independent of the mechanical lifting thereof and involve a contrivance for first releasing the lock-lever. For this purpose the rock-shaft J' is inclosed in a hollow shaft L'. At the front end this hollow shaft has a cam-piece p' affixed, adapted to act on the projecting end of the branch i^4 of the rocker I'. Such cam-piece also has a pin o', here shown as set in the side thereof. On turning the shaft L' the cam-piece p' first acts on the rocker by depressing the branch i^4 thereof, causing the pawl-arm I^2 to swing back with its pawl and release the presser-b^2. This done the pin O' next comes in contact with and turns up the lifting-toe j' affixed to the rock-shaft J' until such toe reaches the clutch-fixture k' on the foot-bar and lifts the foot. The said hollow shaft is so turned for this purpose by an arm L^2 at the rear for operation by hand. The arm also has a chain attached, or it may be a rod, for communicating with a treadle.

For heating the machine gas is preferred, as being cheap and convenient. The end here sought is to provide a plan simple of application and management. The means of applying the heat to every necessary part of the machine is embraced in three sections or branches, leading from a common source, each provided with its separate stop-cock, and all conveniently arranged for manipulation by the operator of the machine. P' is the main trunk or supply from which a branch P^2 extends to the neck of the arm B, where a tip or burner under the head B^2 heats the tensions and parts in the head. Another branch P^3 holds a burner under the wax-pot W' and the third branch P^4 goes down under the machine, reaching to and holding a burner q^2 near the shuttle and awl-carrier. These places are all that need heating. The machine is hinged to its base B^4, so that it can be swung back for access to the underneath parts. The wax-pot is maintained stationary by attachment to a standard V' made fast to said base. The gas comes to the main trunk through a flexible arrangement of pipes, whereby the gas connections are not detached, but simply change their position to accommodate that of the machine when thus turned up or swung over, as aforesaid, (illustrated in Fig. 4,) where the full and dotted lines respectively show the position taken by the flexure of the pipes.

I am aware that gas has been used as the heating medium in wax-thread machines, but the above arrangement of local heating at the three points named by means of the three independent branches, as described, each provided with a separate cut-off, provides all the heat necessary for the whole machine, while separate stop-cocks, as S', S^2, and S^3, enable the operator to regulate or cut off the heat of each burner independently of its fellows.

I claim as my invention—

1. The combination, in a wax thread sewing machine, of a reciprocating needle, a rotary shuttle, a puncturing awl, mechanism for separately operating the needle and awl, rotary motion devices imparting rotary motion to the shuttle in one direction only, and an independent non revolving thread-case in the shuttle.

2. The combination in a wax thread machine, of a needle, a rotary shuttle, a puncturing awl, mechanism for separately operating the needle and awl, rotary motion devices for imparting a continuous rotary motion to the shuttle, an independent thread-case hung centrally in the shuttle, and means for holding the thread-case stationary, arranged to prevent the same from revolving with the shuttle, without interfering with the action of the awl.

3. The combination, in a wax thread sewing machine, of a needle and awl arranged to enter the work from opposite sides thereof, mechanism for separately operating the needle and awl, a rotary shuttle, means for imparting a continuous motion to the shuttle, an independent thread-case in the shuttle, a stop on the thread case, and removable means for holding the thread-case stationary, arranged

to prevent the same from revolving with the shuttle without interfering with the movements of the needle and awl.

4. The combination in a wax thread sewing machine, of a needle, a rotary shuttle, a puncturing awl moving in line with the needle, an independent thread case in the shuttle and a finger, as *g* thereon, for delivering the shuttle thread to the work above and clear of the shuttle's point while holding such thread out of the way of the needle and awl.

5. The combination in a wax thread sewing machine, of a continuously rotating shuttle provided with an independent thread-case having a thread delivery finger and stop-rib thereon, a needle and awl reciprocating at one side of said finger, and a check-bar for holding the thread-case stationary disposed on the other side of such finger and stop-rib, whereby the awl and needle are prevented from interfering with the shuttle thread, and the thread finger and check-bar do not interfere with the needle and awl.

6. The combination in a wax-thread machine of a needle, a puncturing awl, constituting a feeding device, a rotary shuttle arranged to revolve in a vertical plane at right angles to the line of the feed motion, an independent thread-case in the shuttle whose thread delivery is from a finger on the front side of the shuttle and a check bar that prevents the thread-case from revolving, said feeding device arranged to move toward the shuttle in feeding the work.

7. The combination in a wax-thread machine of a needle and needle-bar operated from the main shaft, a separately operated puncturing awl, a shuttle driver and shuttle rotating in a vertical plane and co-operating with the needle, means of feeding the work transverse to the plane of rotation of the shuttle, a second shaft as R rotated from the main shaft at the rear, a short shaft at the front of the machine carrying the shuttle driver, a pinion on this driver shaft, gearing to match the said pinion, and mechanism operated by the second shaft aforesaid, and engaging the said gearing and pinion to give a variable rotary motion to the shuttle, and a thread lever for handling the needle thread in consonance with the variable motion of the shuttle.

8. In a wax thread sewing machine the combination of a needle, a work support, a puncturing and feeding awl working from beneath it, mechanism for separately operating the needle and awl, a presser foot to hold the work down, a rotative shuttle, mechanism imparting to the shuttle a continuous and variable motion, a thread lever which delivers needle thread to the shuttle and draws it into the work, the self acting locking and releasing lever which holds down the foot against the upward force of the awl and that of the thread lever in drawing in the stitch.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two witnesses.

EARLE H. SMITH.

Witnesses:
R. T. VAN BOSKERCK,
K. T. O'BRIEN.