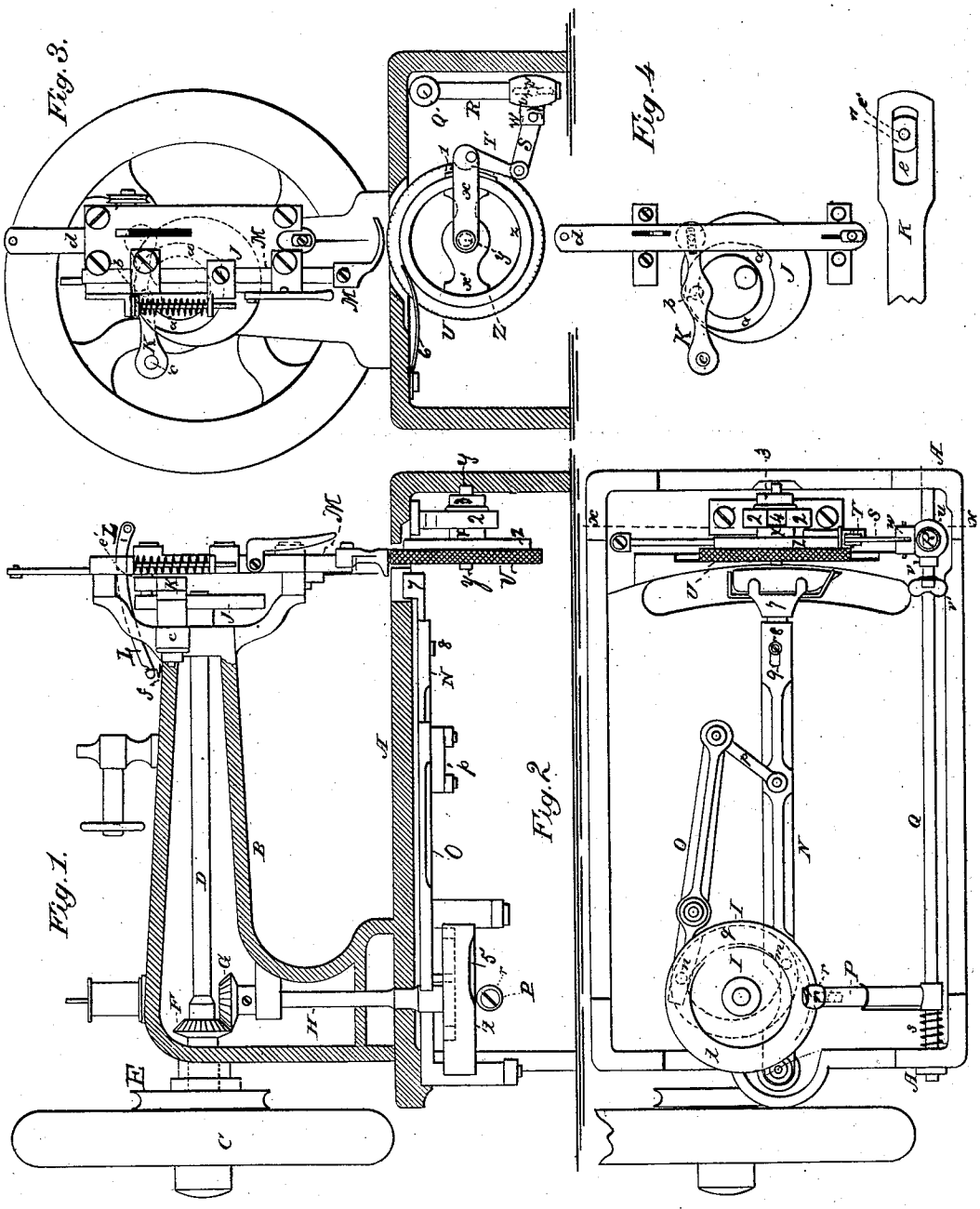
G. H. THIELE.

SEWING-MACHINE.

No. 193,294. Patented July 17, 1877.



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GUSTAV H. THIELE, OF ST. PETERSBURG, RUSSIA.

IMPROVEMENT IN SEWING-MACHINES.

Specification forming part of Letters Patent No. **193,294**, dated July 17, 1877; application filed May 7, 1877.

To all whom it may concern:

Be it known that I, GUSTAV HERMANN THIELE, of the city of St. Petersburg, in the Empire of Russia, 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 thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification, in which—

Figure 1 represents a vertical longitudinal section taken through a portion of the bracket and bed-frame of a sewing-machine to which my improvements have been applied, but showing the operating parts of the machine in elevation. Fig. 2 represents a plan view of the under side of my improved machine; and Fig. 3, a vertical transverse section taken through the line *x x* of Fig. 2. Fig. 4 represents a detail view, being a front elevation of the needle-bar, and of the cam-groove in the disk and lever which drives it, detached from the machine.

My invention relates to a new and improved mode of operating the needle, shuttle, and feed of a sewing-machine.

The invention consists, first, in a new and peculiar mode of operating the needle-bar, by means of which great penetrating power is imparted to the needle, and which peculiarly adapts it to all kinds of heavy work, while not lessening its efficiency in light or fancy work; and, second, in a new and improved combination of devices for operating the feed, whereby it is rendered more simple and effective, and less liable to get out of order, and very easy of adjustment to any required length of stitch; thirdly, in a new and improved combination of devices whereby the motion of the needle and shuttle can be made to relatively correspond with the size of the latter.

To enable those skilled in the art to make, construct, and use my invention, I will describe it in detail.

My improvements relate to that class of machines in which the sewing is effected by means of a lock-stitch, made with a reciprocating straight eye-pointed needle and vibrating shuttle.

The frame of the machine consists of a bed-plate, A, and a goose-neck bracket or overhanging arm, B, which may either be formed or cast together, or made in two parts and afterward firmly secured together in a manner substantially like that employed in the Singer machine.

C represents the fly-wheel mounted on the main shaft D, and which also carries the driving-pulley E. The main shaft D has its bearings in the end walls of the goose-neck or bracket portion B of the machine, and carries a bevel-pinion, F, which gears with another, G, mounted on the upper end of an upright shaft, H, on the lower end of which is secured an eccentric or cam pulley, I. To the front end of the main or driving shaft D is secured a disk, J, in the front face of which a cam-groove, *a*, is cut or otherwise formed. Into this groove plays the cam-pin *b* of a lever of the third class, K, and which has its fulcrum at *c* arranged in a portion of the front end of the bracket B, and made to project sidewise for that purpose.

The free end of lever K is provided with a slot, *e*, running longitudinally, and into which a cam or stud-pin, *e'*, (see Fig. 4 of lever K detached,) secured to the inner face of the needle-bar, is made to project, and through which, as the main shaft D and disk J revolves, is imparted a reciprocating motion to the needle-bar *d*, through the action of the cam-groove *a* on the pin *b* of lever K. On cam-pin *e'*, if desired, a slide-block, 11, may be mounted, it being made of such size and shape as to play back and forth in the slot *e* of lever K to lessen the wear and tear of the slot and pin.

Cam-groove *a* is so constructed as to cause the needle to descend through the cloth, and then to rise sufficiently to form a loop to receive the point of the shuttle, and then to descend to slacken the thread for the free passage of the shuttle, after which the needle-bar is made to ascend to perfect the stitch.

This mode of operating the needle-bar gives to it great penetrating power, and adapts it to all kinds of sewing, from the finest to the very coarsest and strongest materials.

L represents a vibrating "take-up," which is actuated in the one direction by the needle-bar, for the purpose of slackening the thread, and in the other by a spiral spring, *f*, to tighten the thread.

M represents the usual reciprocating presser-foot bar, and which is operated in the ordinary way, and therefore unnecessary to be more particularly described in this connection.

To the under side of the bed-plate at a point in rear of the cam-disk I is pivoted a lever, N, of the third class, and which forms the shuttle-carrier. This lever may be actuated in either one of two ways; directly, by a cam-stud, *m*, shown in dotted lines in Fig. 2; or indirectly through an auxiliary lever, O, and a connecting or link rod, *p*. Lever O is also pivoted to the under side of the bed-plate B.

On the under side of the rear end of the lever O is secured a cam-pin, *n*, which takes into a cam-groove, *q*, cut in the upper face or side of the cam-disk, I.

Where the lever N is operated directly by the cam-pin *m* that pin will also take into the cam or eccentric groove *q*, the groove being formed of proper shape and diameter to impart the necessary motion to the shuttle-carrier.

This mode is better adapted for machines intended to be used in light or fine work, while the other, where the intermediate lever O and link *p* are used, is better adapted for machines intended to be used in heavy work.

The adaptation of a lever of the third class for the carrying of the shuttle, and the arrangement of its pivotal point at the extreme end of the machine from the shuttle enables the latter to be driven in a line more nearly approximating a straight line because of its longer radius, and therefore better adapts it to the use of shuttles of large size than where the shuttle-carrier moves in a curve defined by a shorter radius, thereby adapting the machine, without increasing its general size and weight for use in sewing heavy work, although for very heavy work all the parts of the machine may be made larger. Here it may be well to give a general description of the method of adapting this machine for use on fine and on heavy work.

On fine work, where fine thread ought to to be used, a machine, to be adapted to that kind of work alone, would require but a small shuttle, and the needle have but a correspondingly short range of motion in order to traverse across the shuttle sufficiently far to enable the latter to freely pass through the loop; hence, the eccentricity of the cam-groove *a* in the disk for such machine should be restricted to the necessary dimensions and shape for that purpose, that no unnecessary play may be given to the stroke of the needle.

In the same way for a small shuttle, its length of vibration, in order to fairly pass through the loop of the thread formed by the needle, and back again for another vibration, should—that no unnecessary length of stroke may be employed—be also confined to what is simply necessary for the purpose. For this purpose, therefore, the eccentricity of the cam-groove *q* in the disk I should be so constructed or formed as to yield but the necessary length of stroke; and, vice versa, as with a large shuttle, there should be a greater vibration of the shuttle-carrier N, and, consequently, a greater eccentricity in the cam-groove *q* of disk I, and also a longer stroke to the needle-bar, in order to allow free passage through the loop to the larger shuttle, and, consequently, for this purpose there should be a greater eccentricity in the cam-groove *a* of the disk J.

Two or more disks, I and J, having grooves *q* and *a* of relatively great and small eccentricities, may accompany each machine, so as to be interchangeable, and adapt the same machine to doing different grades of work; but as a rule I prefer to make machines of different sizes and classes, each class with a single set of cam-disks correspondingly adapted to each other for the different grades of work—as, for instance, one class for very fine work, another class adapted to all kinds of family sewing, and a third adapted to all kinds of heavy work, as in sewing leather, &c.

The under side of the disk I is formed into a cam-face, *t*, or another cam-face disk may be secured on the shaft H immediately below it. On this cam-face *t* the free end of a lever-arm, P, bears, the other end of which is firmly secured to a rock-shaft, Q. On the outer end of lever P, if desired, is arranged a friction-roll, *r*, to lessen the wear of the contacting surfaces of the lever and cam.

Rock-shaft Q has its bearings in the end walls of the bed-plate A, and carries at one or both ends a spiral spring, *s*, one end of which bears against the bed-plate and the other against the under side of the lever P in such manner that its tension serves to press or hold the outer end of lever P constantly against the cam-face *t* of the disk I.

On the other end of the rock-shaft Q, and at an angle to lever P, is secured another arm or lever, R, on which is mounted an adjustable sleeve, *u*, carrying two arms, *v* and *w*, through the one, *v*, of which is passed a thumb-screw, *v'*, by means of which the sleeve is adjusted and secured to arm R at any required position thereon.

To its other arm *w* is pivotally connected a link-lever, S, to the outer end of which is also pivotally connected one end of a cam-lever, T. Lever T is pivoted at or near its free end to an arm, *x*, formed on or otherwise secured to a cross-piece, *x'*, which is mounted on the shaft *y* of the feed-wheel U. Shaft *y* is provided with a square shoulder to keep it from turning, and which fits in a slot, 4, formed in the hanger 2, formed on the under side of the bed-plate, and to which it is secured by the nut 3, its outer end for this purpose being provided with a screw-thread.

Feed-wheel U is an ordinary toothed feed-

wheel, having a ring, *z*, formed on or otherwise secured to its outer face.

Cross-piece *x'* is of such size and shape as to fit within the inner surface of the ring *z*, its arm *x*, and which may be formed thereon or otherwise secured thereto, lying flush with or bearing lightly upon the outer edge of the ring.

Between lever T and ring *z* is arranged a plate of metal, 1, having a notch cut in its outer edge, into which arm *x* fits. Plate 1 bears against the feed-wheel on its inner edge, while the cam or free end of lever T bears against its outer side, and in such manner, when power is applied, as to compress or jam it tightly against the ring *z*, thereby clamping feed-wheel U, arm *x*, and lever T firmly together, and hence imparting to the feed-wheel, as the lever T is moved forward, rotary motion on its shaft for a distance corresponding to the motion of the lever, as imparted to the latter through the link S, lever R, rock-shaft Q, lever P, and cam *t* of disk I.

The operation of the machine is as follows: Motion having been imparted to the shaft D, the cam-groove *a* of disk J imparts a vibrating motion to lever K, and it in turn, through its slot *e* and the pin *e'* of the needle-bar, a reciprocating motion to the needle. Simultaneously therewith a related motion is imparted to the shuttle through the lever N and cam-groove *q*, either directly through the pin *m* on the lever N, or indirectly through the medium of the link *p*, lever O, and its cam-pin *n*. And so with the feed, as at the proper time the feed-wheel U is made to perform a partial revolution, graduated according to the length of feed required, in the following manner: As the main shaft revolves, pinion F acts on the corresponding pinion G, turning shaft H, and, with the latter, disk I, on the under surface of which is formed a cam, *t*, which, in revolving, acts on the lever P, causing the latter to impart a partial rotary or rocking motion to rock-shaft Q, and in so doing turning lever R outward. The latter drags with it link S, which, acting on the lower end of cam-lever T, causes its cam end to compress or force the jam-plate 1 firmly against the ring *z* of the feed-wheel, and as the turning of the rod R still continues, the continued thrust of the lever T causes the arm *x*, through the jam-plate and ring *z*, to move the feed-wheel a corresponding distance, regulated so as to be equal to a stitch of the length required for each thrust of the lever.

On the disk I, revolving until the depression 5 therein is reached—and the rise from which forms the cam—the spring *s*, which, by the upward rise of the lever P on the cam, had been placed in a state of tension, now reacts and forces lever P down into the depression 5, and, in so doing, through the rock-shaft Q, turns the lever R in the opposite direction, raising the cam end of lever T from off plate 1, and thereby releasing the connection between the arm *x* and ring *z* of feed-wheel U, and drawing the lever T, plate 1, and arm *x* back to their first position, ready to receive a new impulse for another feed movement for the next stitch. In this backward movement of the feed mechanism the feed-wheel U is held firmly in place by a spring, 6, one end of which bears against the outer surface of the ring *z*, while the other is secured to the bed-plate or frame of the machine.

From what has been said it will be apparent that the greater the oscillation of the lever R the greater will be the thrust and the longer the stitch; hence, by shortening or lengthening the radius of the connection of the lever R with the link S the shorter or longer will be the length of the stitch. This is effected by means of the sleeve *u* and adjusting-screw *v*, whereby, by sliding the former up or down on the lever R, the radius motion of the latter at its point of connection with the link S will be correspondingly lengthened or shortened.

As a rule, I prefer to mount small friction-rolls on the cam-pins *m* and *n*, that work in the cam-groove *q* of disk I and on the cam-pin *e'* that works in the groove *a* of disk J.

Again, the shuttle-holder 7 proper is so applied to the shuttle-carrying lever N as to be capable of adjustment to enable it to receive a large or small shuttle, as may be required. This is effected by means of an adjusting-screw, 8, and a slot, 9, formed in or near the end of lever N, by means of which the carrier can be adjusted to suit the shuttle to be used.

Having described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination of a horizontal driving-shaft and of a plate or disk, J, rotating in a vertical plane, and provided with a cam-groove, *a*, cut in its face, with a slotted lever, K, and the needle-bar, in the manner and for the purpose set forth.

2. In combination with the feeding devices of a sewing-machine, the disk I, having cam *t*, and a rock-shaft, Q, carrying two lever-arms, P and R, the spring *s*, sleeve *u*, adjusting-screw *v*, and link S, substantially as and for the purposes set forth.

3. The combination of a removable plate or disk, I, rotating in a horizontal plane and provided with a cam-groove, *q*, and the shuttle-carrier N, with a removable plate or disk, J, rotating in a vertical plane, and having a cam-groove, *a*, cut in its face, the lever K, and needle-bar and mechanism, substantially as described, for connecting and operating said disks.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

GUSTAV HERMANN THIELE.

Witnesses:

MORITZ ULLMAN,

GEORGE POMUTZ.