(No Model.) 2 Sheets—Sheet 1.

G. FRAME.

THREAD FEEDING DEVICE FOR SEWING MACHINES.

No. 578,097. Patented Mar. 2, 1897.

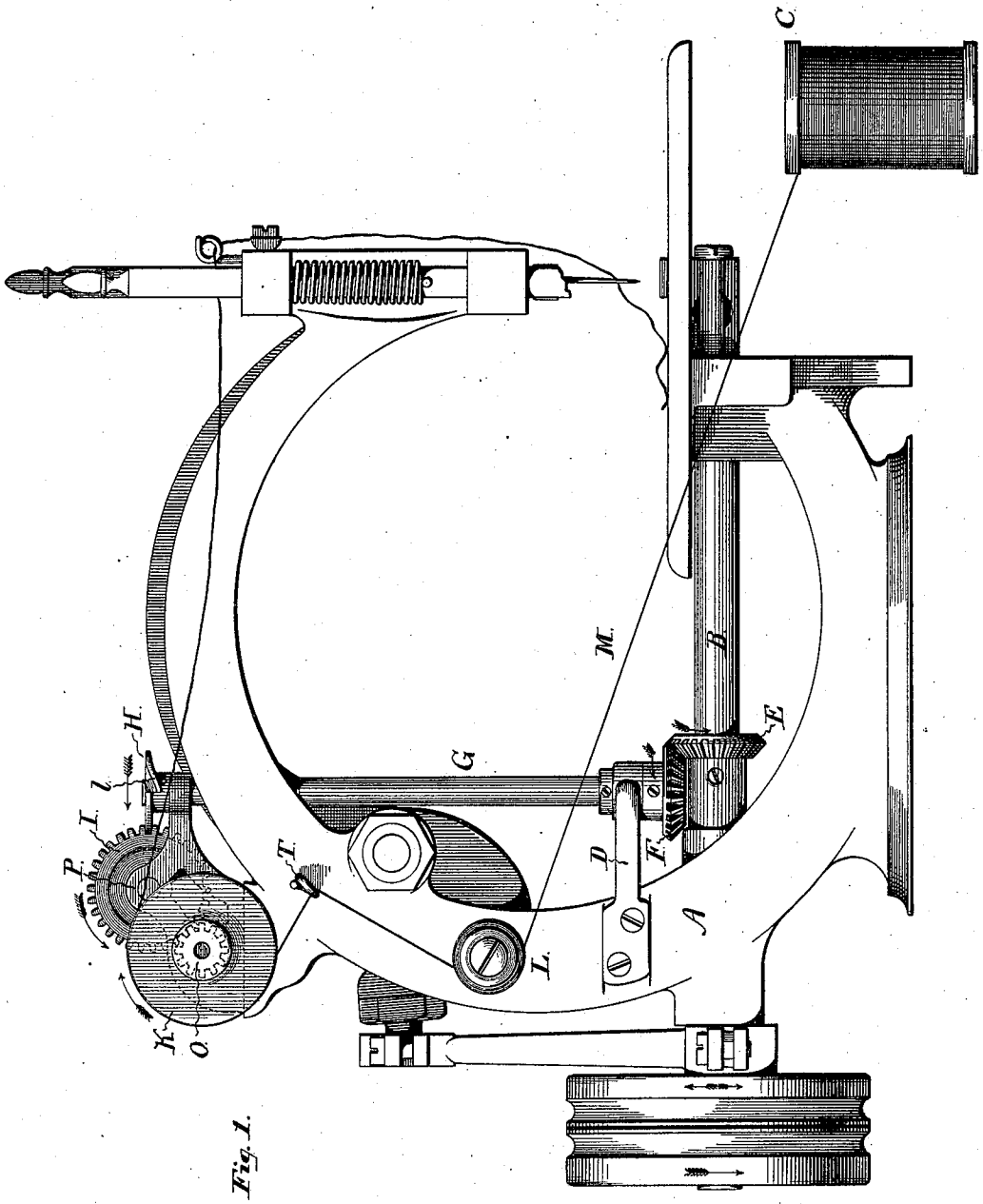

Fig. 1.

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(No Model.) 2 Sheets—Sheet 2.

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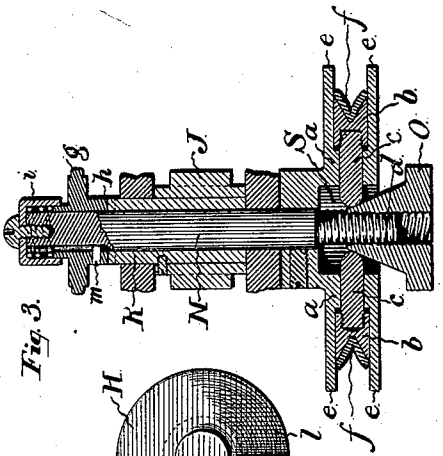

Fig. 3.

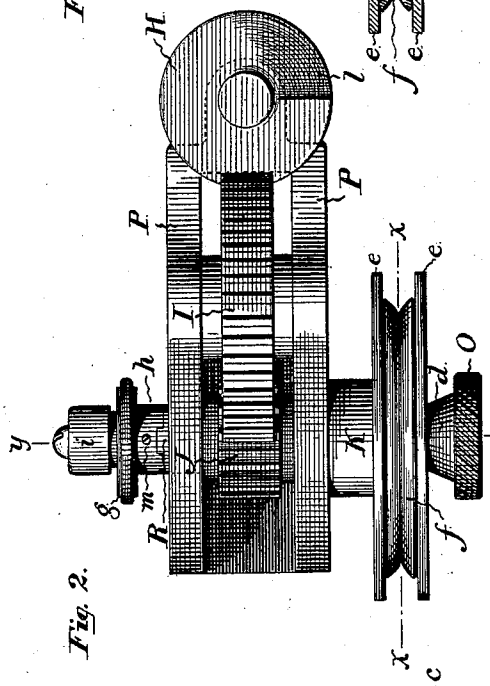

Fig. 2.

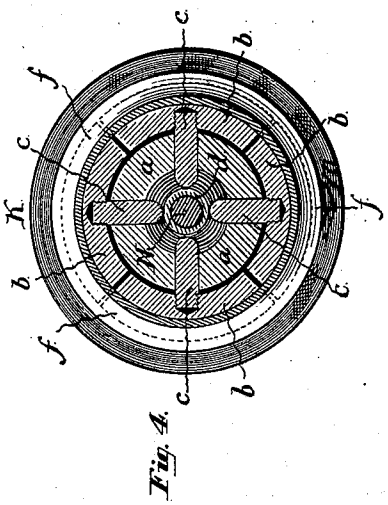

Fig. 4.

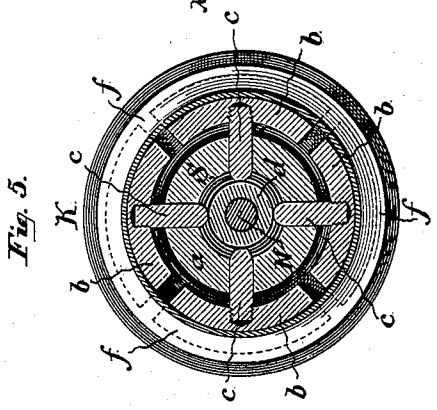

Fig. 5.

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UNITED STATES PATENT OFFICE.

GIBBONS FRAME, OF PHILADELPHIA, PENNSYLVANIA.

THREAD-FEEDING DEVICE FOR SEWING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 578,097, dated March 2, 1897.

Application filed November 16, 1887. Serial No. 255,296. (No model.)

To all whom it may concern:

Be it known that I, GIBBONS FRAME, of the city of Philadelphia, State of Pennsylvania, have invented certain new and useful Improvements in Thread-Feeding Devices for Sewing-Machines, whereof the following is a specification, reference being had to the accompanying drawings.

In said drawings, Figure 1 represents a rear view in elevation of an ordinary Willcox & Gibbs sewing-machine having my improvements applied thereto. Fig. 2 is a top or plan view of the thread-feeding device; Fig. 3, a longitudinal section through the same on the line *y y* of Fig. 2. Figs. 4 and 5 are transverse sections on the line *x x* of Fig. 2, showing two different positions of the adjustable parts. The scale of the four figures last mentioned is considerably enlarged above that of Fig. 1.

Heretofore various devices have been in use for drawing off the thread from the spool in the proper quantity and at the proper moment to supply each stitch as it is made. Among the best known of these are those termed "pull-offs," in which a reciprocating arm pulls from the spool a measured amount of thread at each vibration of the needle-arm, whose movements it accompanies. Such pull-offs to be properly efficient, especially in fast-running machines, require the use of an intermittently-acting clamp or strong tension between the needle and the point where they take hold of the thread in order to prevent the latter from being withdrawn from the needle instead of drawn off from the spool. The efficiency of the apparatus is therefore dependent upon the maintenance of a proper relation between the tension upon the spool and the clamping-tension. Moreover, the presence of a clamping device in that position is undesirable, as it may interfere with that freedom of the thread which is required for the most perfect working of the stitch-forming mechanism. Feeding-rollers have also been used, arranged in pairs and provided with nipping projections, so as to pinch the thread between the opposing surfaces of said projections and pull it along until the rotation of the rollers carried the projecting parts thereof out of contact with one another, whereupon the thread remained loose until said projections again came around. In this case also a gripper or clamping device was interposed between the rollers and the stitch-forming mechanism. Furthermore, the pinching of the thread is in many cases objectionable, as tending to flatten it, and the intermittent grip leaves at intervals a slack which may lead to imperfect work.

The object of my invention is to provide a means for positively feeding a measured amount of thread at each stitch without the use of any clamping tension between it and the needle, and, while never pinching the thread, always maintaining the necessary hold thereon. I thus deliver the thread entirely free to be acted upon by the usual members of a stitch-forming group. I accomplish this end by using, instead of a reciprocating arm, which tends to draw the thread from both directions, a positively-rotated thread-feeding wheel having a hold upon the thread by wrapping only and pulling it only from one direction. I further provide a means of adjustment whereby the diameter of the thread-feeding wheel may be increased or diminished, so that rotation through a given arc will feed more or less thread, as required. I also combine with the automatic actuating mechanism of the thread-feed a device whereby it may be turned forward or backward independently of the operation of the sewing-machine.

Referring to the drawings, Fig. 1 indicates, though without detail, the construction of an ordinary Willcox & Gibbs sewing-machine, which is well understood.

Upon an arm D, projecting from the standard A, I provide a suitable bearing for a vertical shaft G, carrying at its lower end a bevel-gear F, which engages with a similar gear E, mounted upon the main driving-shaft B. At the top of this vertical shaft G is a disk wheel H, having a single screw-tooth *l* of a short and rapid pitch. This wheel H engages with a pinion I, revolving in suitable bearings P, mounted upon the top of the standard A. The pinion I engages with a pinion J, attached to a sleeve R, which is freely mounted upon a horizontal shaft N, having suitable bearings in the frame P. The sleeve R and shaft N are coupled by means of a sliding clutch-box *h*, having a pin *m*, which engages with the longitudinal groove on the shaft N, and

which is also provided with a spring beneath a cap *i*, normally pressing it into engagement with the sleeve R. The clutch-box *h* also carries a milled disk *g*, by means of which the shaft N may be turned in either direction by hand when the clutch is disengaged from the sleeve R.

Near the outer end of the shaft N is secured a thread-feeding wheel K, whose construction is shown in detail in the sectional views of Figs. 3, 4, and 5. This wheel K has a central cavity S, into which projects the threaded end of the shaft N. Two deep annular flanges *e e* extend around the entire periphery of the wheel, and between these flanges segments *b* fit snugly. Said segments are mounted upon pins *c*, which slide freely radially in holes formed through that portion A of the wheel K which immediately surrounds the cavity S. A nut O, having a cone-shaped portion *d*, is mounted upon the threaded end of the shaft N, said cone *d* entering the cavity S and bearing against the inner ends of the pins *c*. A V-shaped groove is formed in the outer periphery of the segments *b*, and a rubber band *f* is sprung over them. This rubber band not only fulfils the function of pressing the segments tightly inward, but forms a frictional surface to take hold of the thread, as hereinafter described. It will be seen that by screwing the nut O inward the sides of the cone *d* will be forced between the inner ends of the pins *c*, and will press them outward so as to increase the periphery of the wheel, the rubber band *f* yielding sufficiently to permit such action.

Fig. 4 represents the segments *b* in a contracted position and Fig. 5 in an expanded one, the rubber band *f* in each instance forming a continuous holding-surface around the thread-feeding wheel.

Returning now to Fig. 1, C represents the thread-spool, which may be located in any convenient position. The thread M may be passed, if desired, through an ordinary tension device L, after which it passes, preferably through an eye T, to the thread-feeding wheel K. One or more turns of thread are taken around the rubber periphery *f* of the thread-feeding wheel, so that it shall take hold upon the thread by light frictional contact, without squeezing or nipping, and thus when the wheel is turned it will be positively fed forward; but it cannot be drawn around the wheel independently of the rotation thereof. The thread then passes to the ordinary stitch-forming devices, whose operation need not be described. At each rotation of the driving-shaft B the disk wheel H advances the pinion I one tooth, and this in turn, actuating the shaft N, turns the thread-feeding wheel K forward through a given arc. The amount of thread thus fed forward depends, of course, upon the diameter of the thread-feeding wheel, and as this may be increased or diminished by turning the nut O in one direction or the other the supply can be regulated with the utmost nicety to suit any given length of stitch and thickness of material. Since the thread is positively held by the frictional contact with the thread-feeding wheel, it cannot be drawn either toward or from the needle without rotation of the wheel. Hence it is that I provide the sliding clutch *h*, whereby the shaft N may be turned independently of the gearing, so as to enable the operator to control the thread by hand in the intervals of sewing, &c.

I have in the foregoing specification mentioned an ordinary tension device L as being arranged between the thread-feeding wheel and the spool; but it is to be observed that such device in no way affects the action of the thread-feeding wheel, nor does it exert any tension which influences the operation of the stitch-forming group, since the positive and constant hold of the thread-feeding wheel surface intervenes between the said tension device and the needle. The only purpose of said tension, therefore, is to prevent the sagging of the thread in the neighborhood of the feeding device, with which it might become entangled. Hence I do not limit myself to the use of a thread-feeding device in connection with a tension device, since the latter might be dispensed with altogether without in any way modifying the action of the thread-feed. The same is true of such check tensions as are ordinarily used in direct proximity to the stitch-forming mechanism, which may be employed or not, as the operator sees fit, without affecting the thread-feed.

It is obviously not essential that the thread-feeding wheel should be circular in outline, nor that its periphery should be absolutely continuous, and hence in using the term "wheel" I do not intend to limit my claims to the described form, but mean to include, broadly, a rotating device of any shape, provided that it operates in substantially the manner above set forth. For the same reason I do not desire to limit myself to the use of a rubber band as the frictional holding-surface, the only essential requirement being that the wheel should be capable of holding the thread with sufficient firmness to prevent slipping. By a greater number of turns of the thread around the wheel this may be accomplished even with a smooth surface. While, therefore, I deem the arrangement above described the best form for embodying my improvements, I do not limit my claims to that particular embodiment.

I am aware that take-up devices consisting of rotating wheels have heretofore been used, but these devices operate upon the slack of the thread after the formation of a stitch and were in no way adapted to feed the thread positively to the stitch-forming mechanism. I do not claim any device of this character, nor do I claim the use of nipping-rollers such as those above referred to herein; but

I claim in a sewing-machine—

1. The combination, with the stitch-forming mechanism and its driving-shaft and with the

thread-supply, of a thread-feeding wheel intermediate between said supply and said stitch-forming mechanism, said thread-feeding wheel having a periphery adapted to receive one or more turns of the thread and frictionally engaging the same by winding contact alone, means substantially as set forth whereby the periphery of said wheel may be enlarged and contracted, and intermittently-acting rotating mechanism substantially as described for said wheel, said rotating mechanism being positively driven from said driving-shaft, whereby the feeding of the thread in conformity with the demands of the stitch-forming mechanism is effected without pinching, substantially as set forth.

2. The combination, with the stitch-forming mechanism and the thread-supply, of an intermediately-placed thread-feeding wheel comprising several segments mounted upon independent supports; a movable cone upon which the supports of said segments rest, and by whose adjustment said supports may be moved radially to increase or diminish the periphery of the wheel; and a shaft supporting said thread-feeding wheel and its cone, said shaft being operatively related to the main driving-shaft of the machine, substantially as set forth.

3. The combination of the driving-shaft, N, the wheel, K, having flanges, *e*, *e*, and a central cavity, S, the segments, *b*, moving freely between said flanges, the inwardly-projecting supports, *c*, extending into said cavity, the cone-nut, O, engaging with a thread upon the end of the driving-shaft and the rubber band, *f*, surrounding the outer periphery of said segments substantially as and for the purposes set forth.

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