May 2, 1933. A. H. WEIS 1,906,294

LOOPER DRIVING MECHANISM

Filed Nov. 5, 1929 4 Sheets-Sheet 1

Fig. 1.

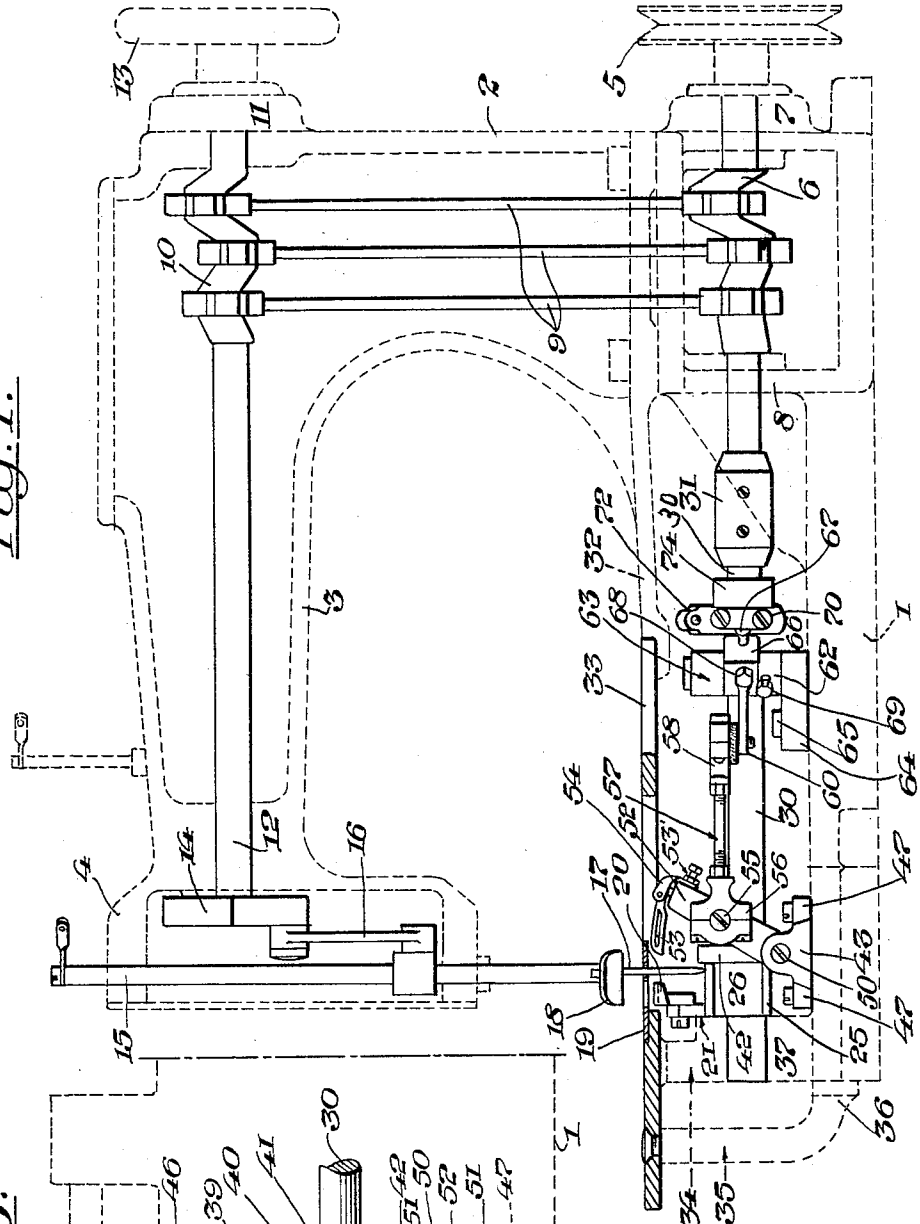
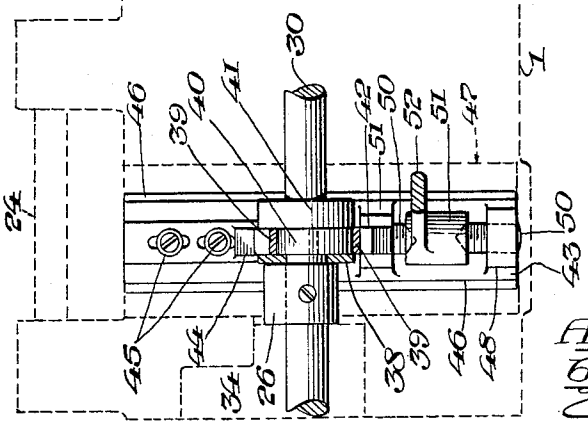


Fig. 5.



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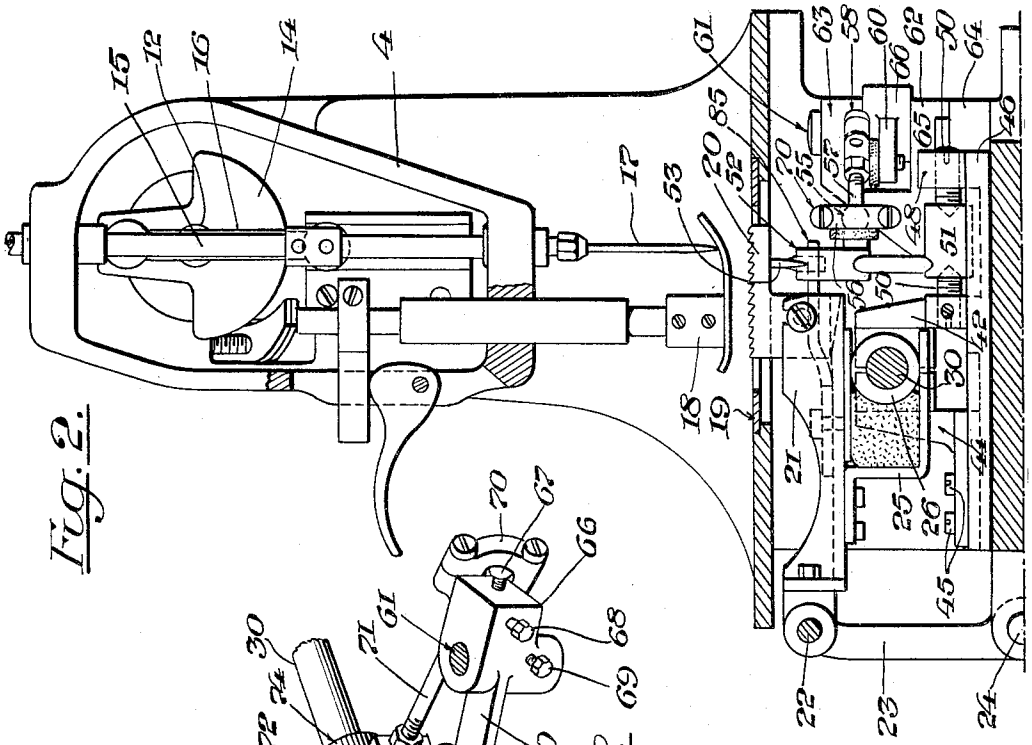


Fig. 2.

Fig. 7.

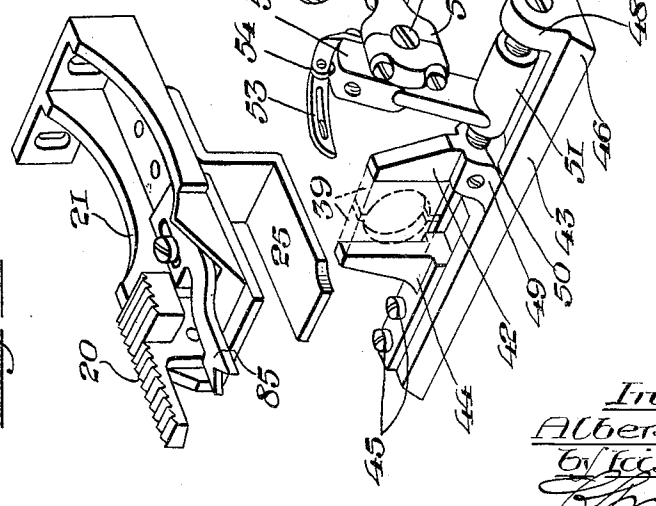


Fig. 6.

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LOOPER DRIVING MECHANISM

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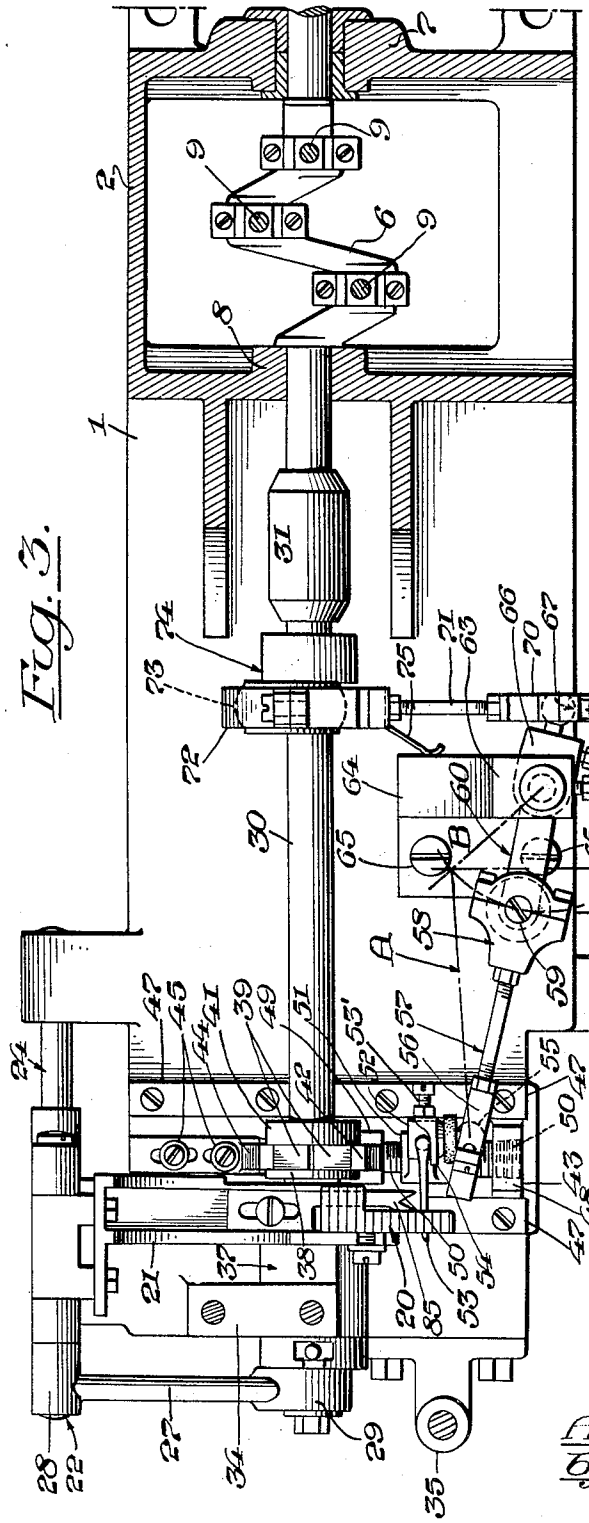


Fig. 3.

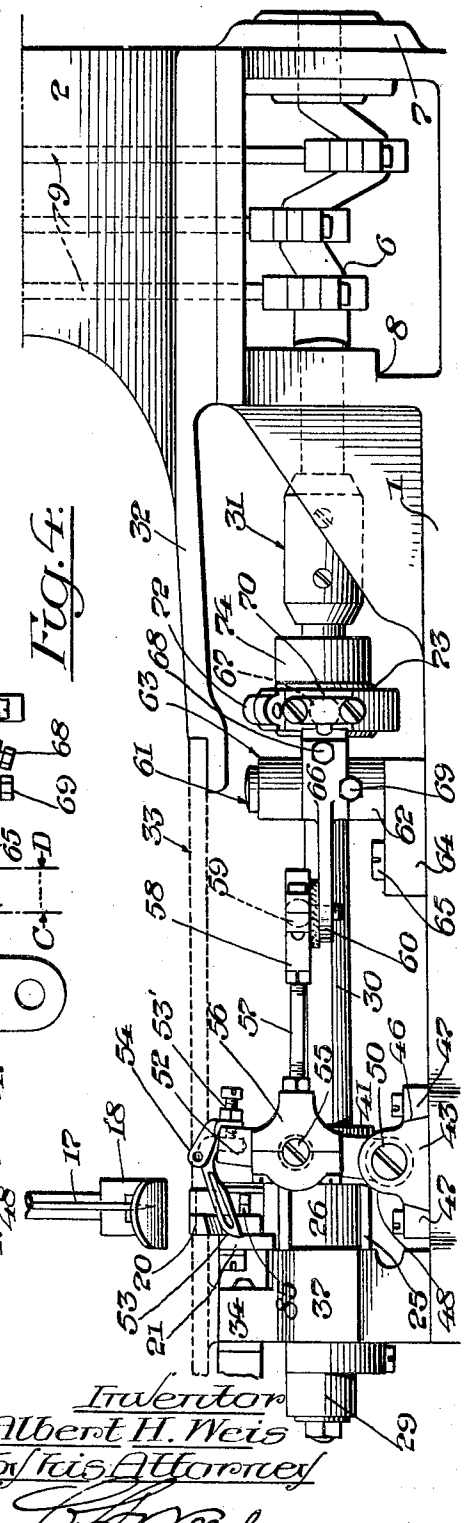


Fig. 4.

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LOOPER DRIVING MECHANISM

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Fig. 8.

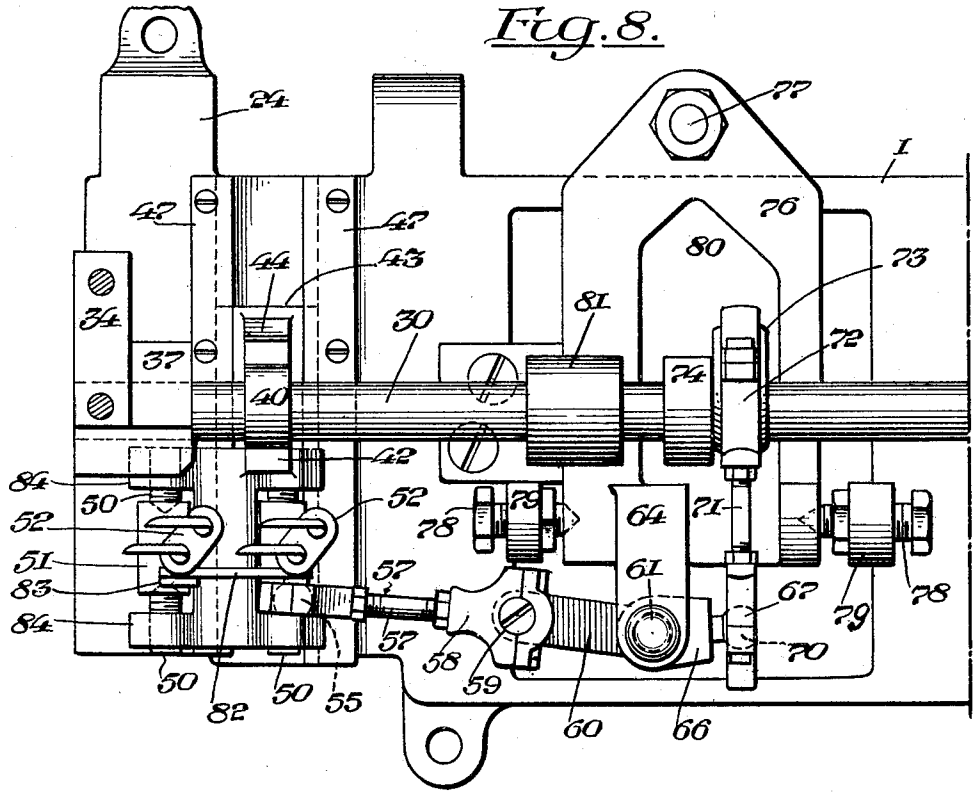
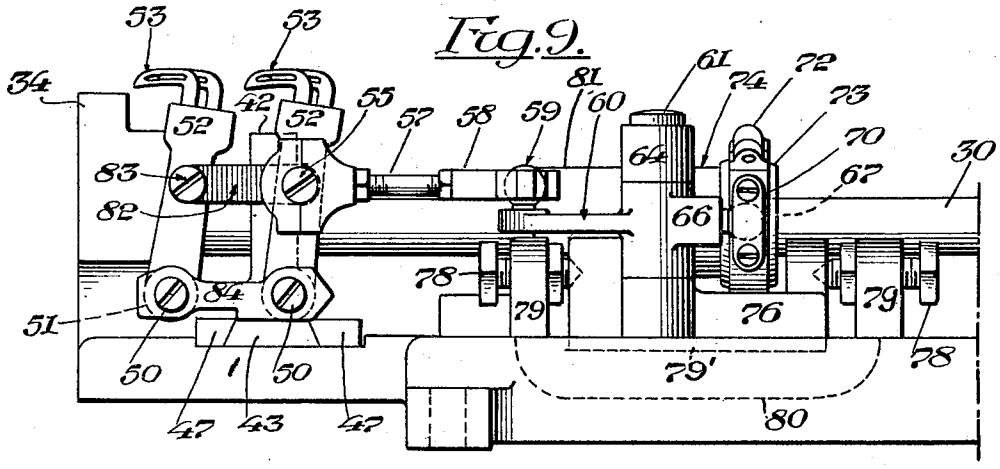


Fig. 9.



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Patented May 2, 1933 1,906,294

UNITED STATES PATENT OFFICE

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LOOPER DRIVING MECHANISM

Application filed November 5, 1929. Serial No. 404,915.

This invention relates to sewing machines and more particularly to a looper driving mechanism therefor, the object of the invention being to provide an improved looper driving mechanism for single and multiple needle machines which is simple in construction, durable in operation, comparatively inexpensive to manufacture and substantially free from vibration when operating at high speeds, and which is effective to give the looper a short throw or movement in proper timed relation with a needle bar having a high lift, whereby the stitching mechanism is particularly adapted for sewing thick work, and in which the several elements are so constructed and organized that they will operate at high speed with a minimum of vibration.

A further object of the invention is the provision of an improved looper driving mechanism by means of which a variable movement will be imparted to the looper whereby it will have a dwell, thereby enabling it to co-operate with a needle having a high lift.

Another object of the invention is the provision of an improved looper driving mechanism effective to give the looper a short throw or movement in proper timed relation with a needle having a high lift, which looper driving mechanism will enable the needle to be set higher to give added needle clearance above the work without the necessity of increasing the throw of the needle bar, whereby the machine is capable of higher speed, will stand up better, and there is less wear and tear on the parts and less vibration.

Heretofore in sewing machines it has been the practice to provide a looper driving mechanism for imparting to the looper a long throw or movement substantially corresponding to the movement or lift of the needle. In other words, the loopers usually have a movement back and forth equal to the up and down vertical reciprocation of the needle,—so that, for instance, when the needle has an inch and a half vertical movement, the looper also has an inch and a half back and forth movement to insure the proper timing of the parts for accurate stitching and high speed. As there is only about a quarter of an inch clearance between the point of the needle and the top surface of the throat-plate, there are numerous disadvantages in a long-throw looper,—one of which is the difficulty of sewing thick work, due to the slight clearance between the point of the needle and the top surface of the throat-plate. It was not practical to lengthen the connection or pitman between the needle bar and the driving crank therefor, thereby to increase this needle clearance, as this would necessitate the raising of the top shaft and top arm and not only make an unsightly machine, but would result in other weaknesses by reason of the long connecting rods transmitting power from the bottom shaft to the top shaft, increasing the vibration, wear and tear, and reducing the speed of the machine.

By means of the present improvement, however, whereby a variable motion is given to the looper so that it will have the proper dwell, it is necessary to give the looper only about five-sixteenths or three-eighths of an inch movement and, therefore, considerably less movement than the needle and yet have the proper timed relation with respect to the needle and also enable the needle to be set higher by about three-eighths of an inch with the same throw of the needle bar and thus get an added needle clearance above the cloth-plate, while permitting the parts to operate at higher speed with less vibration and less wear and tear on the parts. Hence the present improvement has many important advantages over machines in which the looper driving mechanism imparts to the looper the same length of movement as that of the needle—among which advantages is the elimination of costly machine elements heretofore used for imparting the throw to the looper such as spiral gears.

The present improvement is shown applied to the well-known long-arm "Metropolitan" sewing machine having a top and bottom rotary shaft.

In the drawings accompanying and forming a part of this specification—

Figure 1 is a front view of a sewing machine with this improved looper mechanism applied thereto, the framework of the machine being illustrated in dotted lines and in section;

Fig. 2 is a left-hand, partly sectional, end view of Fig. 1;

Fig. 3 is a top plan view of the mechanism located below the cloth-plate of the machine, with the trunk of the machine in section so as to clearly show the looper operating mechanism.

Fig. 4 is a front view of Fig. 3, showing the looper in its foremost position;

Fig. 5 is a detail plan view, partly in section, of the looper slide and its operating means;

Fig. 6 is a perspective view of the feed bar and needle guard;

Fig. 7 is a perspective view of the looper operating mechanism;

Fig. 8 is a top plan view of this improved looper operating mechanism for operating a tandem pair of loopers for making four parallel rows of stitches simultaneously; and

Fig. 9 is a front view of Fig. 8.

Similar characters of reference indicate corresponding parts in the several views.

Before explaining in detail the present improvement and mode of operation thereof, I desire to have it understood that the invention is not limited to the details of construction and arrangement of parts which are illustrated in the accompanying drawings, since the invention is capable of other embodiments, and that the phraseology which I employ is for the purpose of description and not of limitation.

The base or base-plate 1 of the sewing machine carries a hollow trunk 2 having a overhanging arm 3 terminating in a head 4. A belt-wheel 5 is carried by a crank-shaft 6 mounted in bearings 7 and 8 of the base 1, and this crank-shaft is connected by three connecting rods 9 with a crank-shaft 10 supported in bearings 11 and 12 of the overhanging arm. To the rear end of this crank-shaft 10 a hand-wheel 13 is secured, and to the front end of this shaft a needle bar driving crank 14 is secured connected by means of a pitman 16 with a needle bar 15, which is thus reciprocated in the usual bearings in the head 4 in the usual way, and which needle bar carries a needle 17.

The head 4 also carries the usual presser foot mechanism and presser foot 18, which co-operates with a throat-plate 19 and the usual feed dog 20 for feeding the work. This feed dog is carried by a feed bar 21 (see Fig. 6) pivotally connected by a short shaft 22 (see Fig. 2) to the top of the feed rocker frame 23, the bottom of which is pivotally connected, as at 24, to the machine base. The feed bar 21 is provided with a strap 25 (see Figs. 2 and 6) co-operating with the feed lifting eccentric 26 for giving the up and down movement to the feed dog, this eccentric being carried by the main shaft 30 coupled to the forward end of the crank-shaft 6 by a coupling 31. This coupling so connects the crank-shaft 6 and main shaft 30 that they operate as one shaft and thus this coupling facilitates the manufacture, assemblage and adjustment of the parts. The back and forth movement of the feed dog is obtained by means of a connection 27 (see Fig. 3), one end of which is connected, as at 28, to the short shaft 22 while the opposite end is operated by an adjustable crank 29 carried on the front end of the main shaft 30.

The trunk 2 carries an extending portion or apron 32, to which is attached one end of a cloth-plate 33, the opposite end of which is supported by a standard or bracket 34 of the base 1 and also by a support or arm 35 attached to the base 1, as at 36 (see Fig. 1). This support 34 for the cloth-plate also forms a bearing 37 for the front end of the main or bottom shaft 30, and the feed lift eccentric 26 is carried by this main shaft close to this bearing (see Fig. 5). A hardened steel washer 38 acts as a flange for the eccentric and also a face against which the two halves of a split block 39 operate. This split block forms a bearing for an eccentric 40, which has a collar or flange 41 for securing it to the shaft 30, the split block thus being located in the space between the washer 38 and the collar or flange 41 of the eccentric, so that its movement back and forth is controlled by these parts. The two halves of this split block 39 are located between an upstanding jaw 42, formed as a part of a dovetail slide 43, and an adjustable jaw 44 secured to the dovetail slide by screws 45,—so that as the shaft 30 and its eccentric 40 are rotated, a reciprocating motion is given to the slide 43 crosswise of the machine bed and at right angles to the main drive shaft 30, this slide being held in place on the base of the machine (see Fig. 4) by a pair of gibs 47 co-operating with a pair of beveled edges 46 of the slide. This reciprocating slide 43 is provided with a pair of lugs 48 and 49 tapped to receive a pair of conical screws 50 and which are locked in place by any suitable means and form a support for the looper rocker bearing 51 (see Fig. 7). This looper rocker extends upwardly and is provided with a socket in the top portion 52 thereof for the reception of a thread-carrying looper 53 held in place by a screw and nut 53′ (see Fig. 4) which also holds a thread eyelet 54 in place for leading the thread to the looper. A ball stud 55 is tapped into the looper rocker, and this ball stud is received in a ball socket 56 secured to a connecting rod 57, the opposite end of which is also provided with a ball

socket 58 operating on a ball stud 59 carried by an arm 60 of what may be designated as a two-arm lever secured by a screw 69 to a short vertical shaft or stud 61 which pivotally operates in vertical bearings 62 and 63 carried by a supporting bracket 64 secured to the machine base 1 by screws 65 (see Figs. 2, 3 and 4). The other arm 66 of the two-arm lever 60 is also provided with an adjustable ball stud 67 secured to the arm 66 by a screw 68 for in and out adjustment relatively to the arm 66. This ball stud 67 is carried by a ball socket 70 connected to one end of a rod 71, the opposite end of which is connected to an eccentric strap 72 co-operating with a ball eccentric 73 (see Fig. 3) provided with a flange or collar 74 secured to the main shaft 30. By means of this eccentric 73 mounted on the main shaft 30 and the connecting mechanism just described, the looper is reciprocated into and out of the needle loop, while the eccentric 40 also mounted on the main shaft 30 reciprocates the slide 43 to carry the looper from front to rear of the needle at each stitch cycle of the machine for the formation of the stitches. As the looper moves forward into the needle loop, the front side thereof gently contacts with the needle, and as it moves backward while the needle is descending to enter a loop of looper thread, the needle gently contacts with the back of the looper, the needle and looper thus forming the stitches.

A spring guide 75 (see Fig. 3) is carried by the connection formed by the rod 71 and strap 72 so as to ride against the face of the bracket 64, thus preventing this connection from vibrating.

The organization just described thus permits the formation of stitches with a very short looper movement. Heretofore it has been the practice to have a looper movement approximately equal to the vertical movement of the needle, so as to insure the proper timing of the looper in its cooperative action with the needle and thus permit the looper to enter and leave the needle loops fast enough to permit the drawing up of the stitches without undue tension, as well as to stitch accurately without frequent missing of the needle loop. The present improved looper mechanism, however, permits a short looper movement or a short-throw looper with a high needle lift especially adapted for sewing over thick work, while permitting high speed of the parts. This short looper movement has many advantages over the long looper movement. By means of the looper driving mechanism herein described I am able to give the looper a variable motion, thus insuring a short looper movement, this variable motion making up for the difference in the length of movement of the looper heretofore deemed necessary. This variable motion is obtained by the peculiar organization of the parts whereby the location of the vertical shaft 61 relative to the main driving shaft 30 and the looper carrier 52 is such as to cause the connection 57 to swing from the position shown in full lines in Fig. 3 to the dotted-line position A (Fig. 3), thereby bringing the ball stud 59 to the position indicated by B (Fig. 3)—which corresponds to the distance between the two parallel lines C—D (Fig. 3) located at right angles to the main shaft 30, which parallel lines C—D represent the backward and forward movement of the looper.

Thus when the arm 60 of the looper carrying ball stud 59 is caused to swing outward past the center of the vertical shaft 61, a dwell occurs in the movement of the looper which takes place at the time the looper is shifted to the left while the needle loop is on the looper. A change in the length of the connection 71, by adjusting this connection, will effect the relative position of movement of the arm 60 so that variations within certain limits of the variable motion of the looper for speed and dwell can be obtained, and this adjustment also effects a change in the distance of travel along the line C—D representing the lengthwise movement of the looper.

A short movement of the loopers in multiple needle machines is of considerable importance in order to obtain certain needle gauges for making close rows of stitches. Loopers operating at right angles to the line of feed have certain advantages and loopers operating in line with the feed have advantages because it is possible to arrange needle guards and also to obtain higher needle movement or clearance above the cloth-plate for bulky work.

In the present improvement, therefore, it will be observed that by giving a variable motion and dwell to the looper I am able to give the looper a short looper movement without effecting its timed relation with a needle having a high lift which will permit the parts to operate at high speed. This short looper movement permits the setting of the needle higher, by about three-eighths of an inch, with the same throw to the needle bar, thus giving greater clearance between the point of the needle and the top surface of the throat-plate for the stitching of bulky work thus eliminating the necessity of increasing the throw of the needle bar by a longer pitman connection. It is well known that long-throw needle bar movement is detrimental to high speed and, therefore, any increase in the throw of the needle bar by increasing the length of the pitman connection will be a serious disadvantage for the weight of the bar, the length of its movement, and the angle of the driving pitman all set up such a side thrust when the pitman

is directly opposite the horizontal center line of the top shaft as to cause excessive wear—very much the same proposition that the engineers of automobile engines have been up against all along with the short connecting rods and long piston movement. The connecting pitman between the needle bar and its operating crank, as hereinbefore stated, cannot well be lengthened because that would necessitate the raising of the top shaft and make an unsightly machine, as well as cause other weaknesses by reason of the long connecting rods transmitting power from the crank-shaft to the top shaft. Consequently the present improvement is of great importance. This short looper movement, furthermore, offers considerable advantages in the control of the looper thread since the short looper movement, because of the short throw, would require a shorter take-up movement as less thread would have to be handled, while with certain kinds of work the thread control may be entirely dispensed with.

From the foregoing it will be observed that in the present improvement, by means of the variable motion given to the looper, it need only have about five-sixteenths or three-eighths of an inch movement back and forth without affecting its timed relation with respect to the needle having a high lift or length of movement, and yet notwithstanding this short movement the needle can be set higher, thereby increasing the clearance between the needle point and the work-plate without increasing the length of the pitman connection of the needle bar. This short looper movement, therefore, is capable of higher speed, stands up better, and there is less wear and tear on the parts and less vibration.

In Patent No. 1,264,585, dated April 30, 1918, of the Metropolitan Sewing Machine Corporation (the assignee of the present improvement), is shown a looper driving mechanism in which the loopers have a long throw corresponding to the lift or movement of the needle. In this patent the looper is operated back and forth by means of a shaft extending crosswise in the base of the machine, which shaft is driven by spiral gears, so that the looper has a rotary drive by means of a ball connecting rod reaching from the gear-driven crank-shaft to the looper. These spiral gears are expensive to make. Figs. 8 and 9 of the drawings show how this improved short looper driving mechanism may quickly and conveniently be substituted for the spiral gear drive shown in the patent referred to. To effect this substitution it is merely necessary to provide a holding bracket 76 supported at the rear thereof, as at 77, by adjusting nuts and a bolt carried by the base 1 at the rear of the machine. The front end of this bracket is supported by two conical screws 78 tapped into lugs 79 of the base, which is cut out as at 79′. Thus that portion 64 of the bracket which forms a bearing for the vertical shaft 61 is supported by a three-point support. The part 64 is in the form of a bifurcated bearing bored to receive the vertical shaft 61 upon which is pivotally mounted, for swinging movement, the two-arm rocker lever, one arm 60 of which carries the ball stud 59 while the other arm 66 carries the ball stud 70, this lever being rocked by a connecting rod 71 extending to an eccentric strap 72 co-operating with a ball eccentric 73 on the main shaft 30, and this gives a rocking movement to the two-arm lever and, therefore, a variable movement and dwell to the looper. The bracket 76 is provided with an opening 80, thus providing space for the eccentric 73 and the strap 72 connected with the connecting rod 71. I preferably provide an intermediate bearing 81 for the main shaft 30 to prevent springing of the shaft at high speed when the looper driving mechanism is driving two or more loopers.

In these Figs. 8 and 9 four loopers are shown set to cooperate with four needles set obliquely for making four independent rows of stitches. These loopers are located in the looper carriers 52 carried by the looper slide 43 and have a link connection 82 therebetween, which link connection is pivotally connected, as at 83, with the left-hand looper carrier and with the ball stud 55 of the right-hand looper carrier. To pivotally support the left-hand looper carrier, the slide 43 is provided with extending arms 84 carrying the conical screws 50. For the different needle gauges, except for a slight difference in spacing of the looper rockers—which is provided for by different spacings between the looper rockers and the conical screws—all that is necessary is a change in the length of the link 82. A change from a one-inch gauge to a two-inch gauge, however, would require a similar change in the pivotal supports for the looper carriers or rockers.

A needle guard 85 (see Fig. 6) carried by the feed bar 21 is provided to contact with the needle close to the underside of the looper just prior to the looper entering the needle loop.

The improvement shown in Figs. 8 and 9, whereby the loopers may be given a variable movement and dwell, thereby effecting a short looper movement, may readily be substituted on machines now in use having the form of looper mechanism shown in the patent referred to and equipped with a spiral gear drive, since it is interchangeable therewith by any mechanic, who can substitute one for the other in a very short space of time.

This improved looper driving mechanism is capable of higher speeds, is more durable, and requires less repairs, because of the shorter throw of the loopers, than long-throw loopers, while permitting a high-lift needle to have greater clearance space between the point thereof and the cloth-plate for the sewing of bulky work, as well as having many other advantages.

It is to be understood that by describing in detail herein any particular form, structure or arrangement, it is not intended to limit the invention beyond the terms of the several claims or the requirements of the prior art.

Having thus explained the nature of my said invention and described a way of constructing and using the same, although without attempting to set forth all of the forms in which it may be made or all of the modes of its use, I claim:

1. In a sewing machine, the combination with needle mechanism and means for imparting a high lift to the needle, a looper carrier adapted to carry a looper and supported for rocking movement back and forth, means for shifting the looper from front to rear of the needle and transversely of its rocking movement, and means for imparting such rocking movement to the looper and including driving means, a connecting rod and lever mechanism between said driving means, and rod effective simultaneously with the rocking of the looper to shift the rod laterally in the arc of a circle, one end of the connecting rod having a back and forth movement for operating the looper, the opposite end being operated by said lever to swing in an arc, a portion of which arc is substantially at a right angle to the direction of the other movement, so as to impart a variable motion and dwell to the looper whereby it will have less movement than the high lift movement of the needle.

2. In a sewing machine, the combination with needle mechanism and means for imparting a high lift to the needle, a looper carrier adapted to carry a looper and supported for rocking movement back and forth, means for shifting the looper from front to rear of the needle and transversely of its rocking movement, and means for imparting such rocking movement to the looper and including driving means, a connecting rod, and lever mechanism between said driving means and rod and comprising a pivotally supported two arm rocking lever movable in a substantially horizontal plane, one end of the connecting rod having a back and forth movement for operating the looper, the opposite end being operated by said lever to swing in an arc, a portion of which arc is substantially at a right angle to the direction of the other movement to impart a variable motion and dwell to the looper whereby it will have less movement than the high lift movement of the needle.

3. In a sewing machine, the combination with needle mechanism and means for imparting a high lift to the needle, a looper carrier adapted to carry a looper and supported for rocking movement back and forth, eccentric means for shifting the looper from front to rear of the needle and transversely of its rocking movement, and means for imparting such rocking movement to the looper and including eccentric driving means, a connecting rod, and lever mechanism between said driving means and rod effective simultaneously with the rocking of the looper to shift the rod laterally in the arc of a circle, one end of the connecting rod having a back and forth movement for operating the looper, the opposite end being operated by said lever to swing in an arc, a portion of which arc is substantially at a right angle to the direction of the other movement, thereby to impart a variable motion and dwell to the looper whereby it will have less movement than the high lift movement of the needle.

4. In a sewing machine, the combination with needle mechanism and means for imparting a high lift to the needle, a sliding looper carrier adapted to carry a looper supported thereon for rocking movement back and forth, eccentrically operated means for sliding the looper carrier thereby to carry the looper carrier from front to rear of the needle and transversely of its rocking movement, and means for imparting such rocking movement to the looper and including eccentrically operated driving means, a connecting rod, and a two-arm lever mechanism pivotally supported for movement in a horizontal plane between said driving means and rod and effective simultaneously with the rocking of the looper to shift the rod laterally in the arc of a circle, one end of the connecting rod having a back and forth movement for operating the looper, the opposite end being operated by said lever to swing in an arc, a portion of which arc is substantially at a right angle to the direction of the other movement, so as to impart a variable motion and dwell to the looper whereby it will have less movement than the high lift movement of the needle.

5. In a sewing machine, the combination with needle mechanism and means for imparting a high lift to the needle, a looper carrier adapted to carry a looper and supported for sliding movement in one direction and for rocking movement in a transverse direction, means for sliding the looper, and means for rocking the looper, including a connecting rod and lever mechanism, one end of the connecting rod having a back and forth movement for operating the looper, the opposite end being operated by said

lever to move in an arc, a portion of which is substantially at a right angle to the direction of the other movement, thereby to impart a variable motion and dwell to the looper.

6. In a sewing machine, the combination with needle mechanism and means for imparting a high lift to the needle, a plurality of linked looper carriers adapted to carry loopers and supported for sliding movement in one direction and for rocking movement in a transverse direction, means for sliding the loopers, and means for rocking the loopers, the latter including a connecting rod and lever mechanism, one end of the connecting rod having a back and forth movement for operating the loopers, the opposite end being operated by said lever to move in an arc, a portion of which is substantially at a right angle to the direction of the other movement, thereby to impart a variable motion and dwell to the loopers.

7. In a looper driving mechanism for sewing machines, the combination with needle mechanism and means for imparting a high lift to the needle, a looper carrier adapted to carry a looper and supported for sliding movement in one direction, and for rocking movement in a transverse direction, means for sliding the looper, and means for rocking the looper, the latter including a connecting rod and lever mechanism, one end of the connecting rod having a back and forth movement for operating the looper, the opposite end being operated by said lever to move in an arc, a portion of which is substantially at a right angle to the direction of the other movement, thereby to impart a variable motion and dwell to the looper, such rocking means including a connecting means located substantially at right angles to its driving means, and connecting means located transversely to said first connecting means and movable at a varying angle to the driving means.

8. In a looper driving mechanism for sewing machines, the combination of a looper carrier adapted to carry a looper and supported for sliding movement in one direction and for rocking movement in a transverse direction, means for sliding the looper, and means for rocking the looper, the latter including a connecting rod and lever mechanism, one end of the connecting rod having a back and forth movement for operating the looper, the opposite end being operated by said lever to move in an arc, a portion of which is substantially at a right angle to the direction of the other movement, thereby to impart a variable motion and dwell to the looper.

Signed at Nyack, county of Rockland and State of New York, this 2nd day of November 1929.

ALBERT H. WEIS.