May 10, 1927. 1,628,173

A. A. MERRITT

SEWING MACHINE

Original Filed Jan. 2, 1918 12 Sheets-Sheet 1

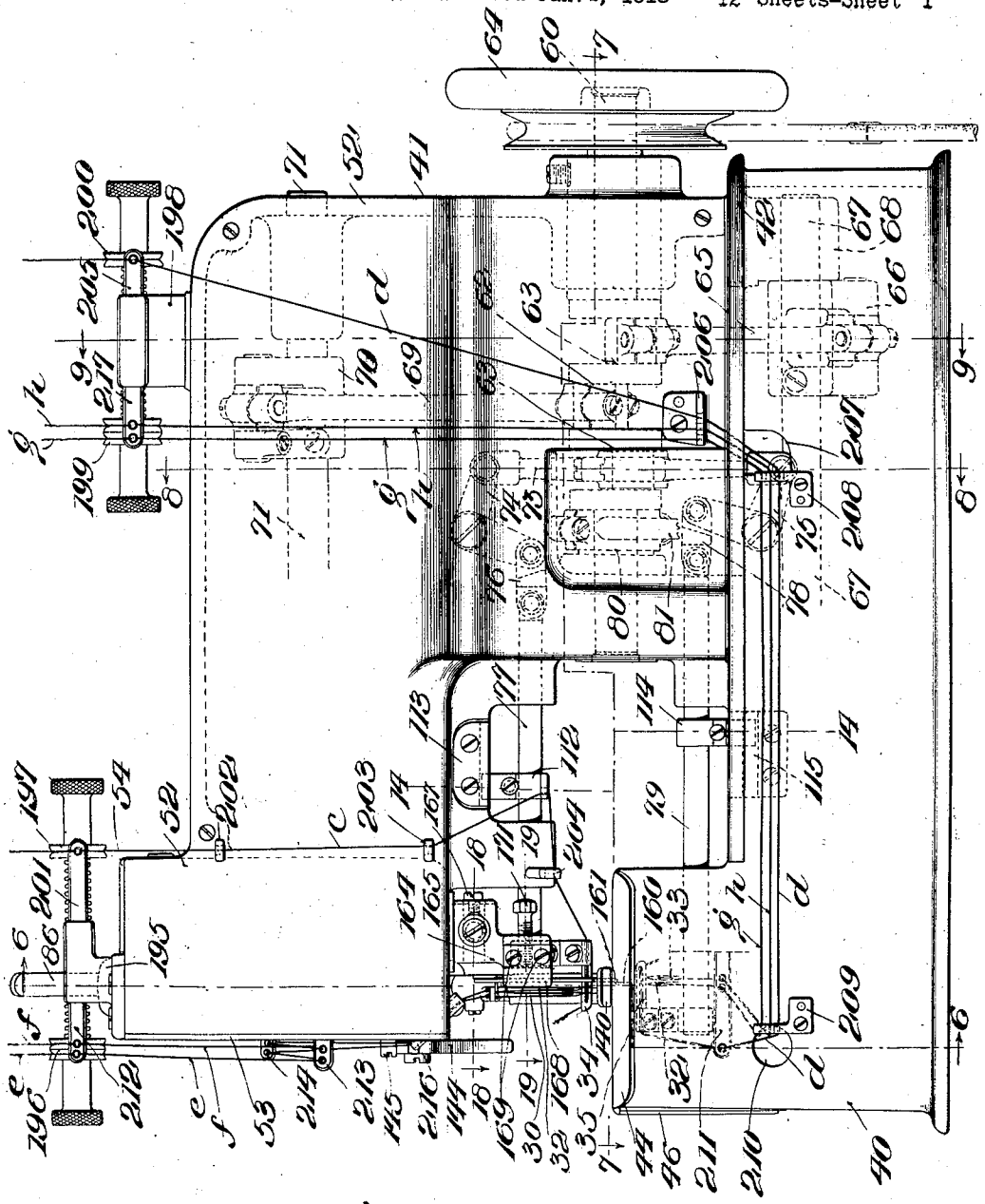


Fig. 1.

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A. A. MERRITT

SEWING MACHINE

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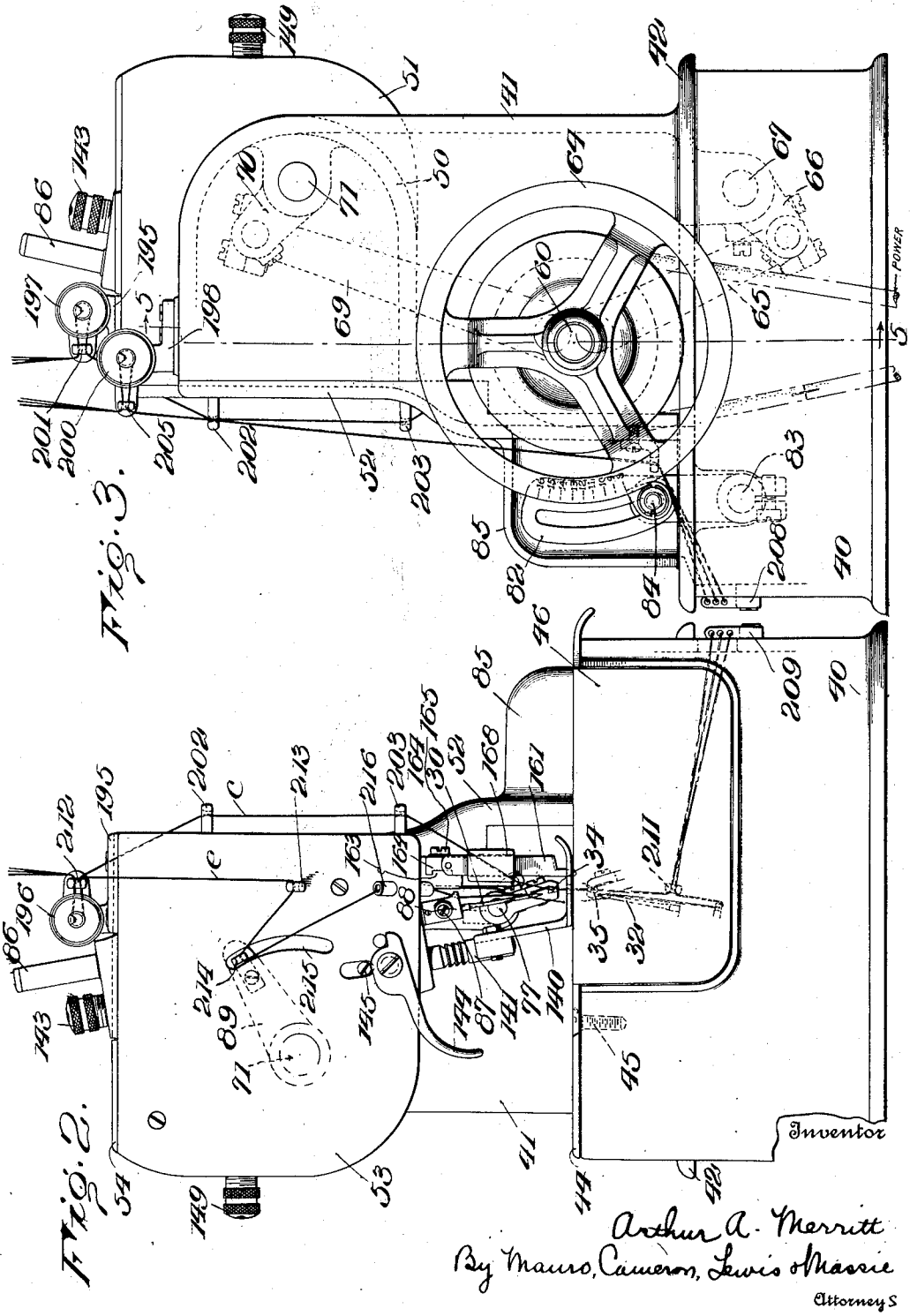


Fig. 3.

Fig. 2.

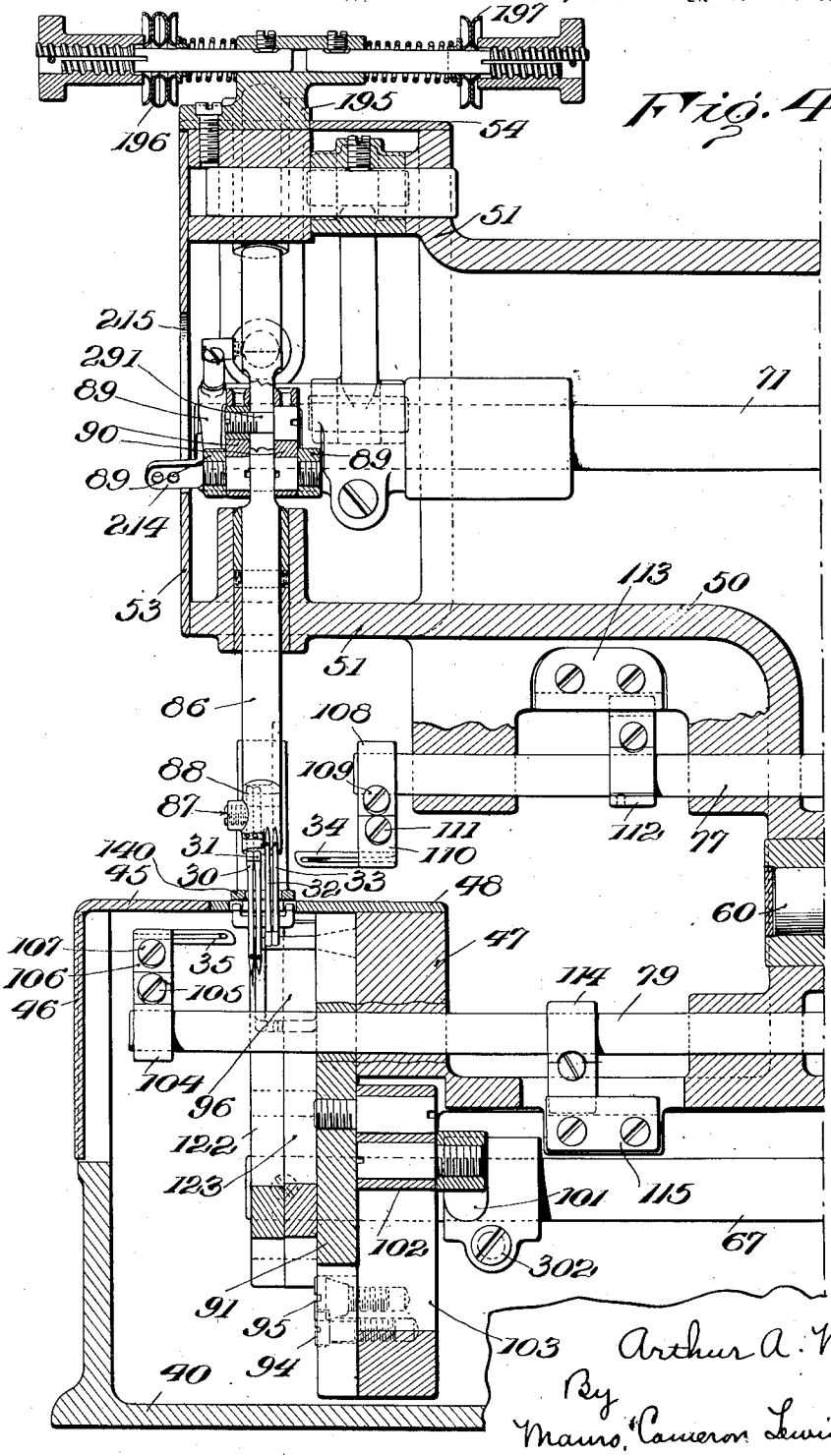
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A. A. MERRITT

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Fig. 4.



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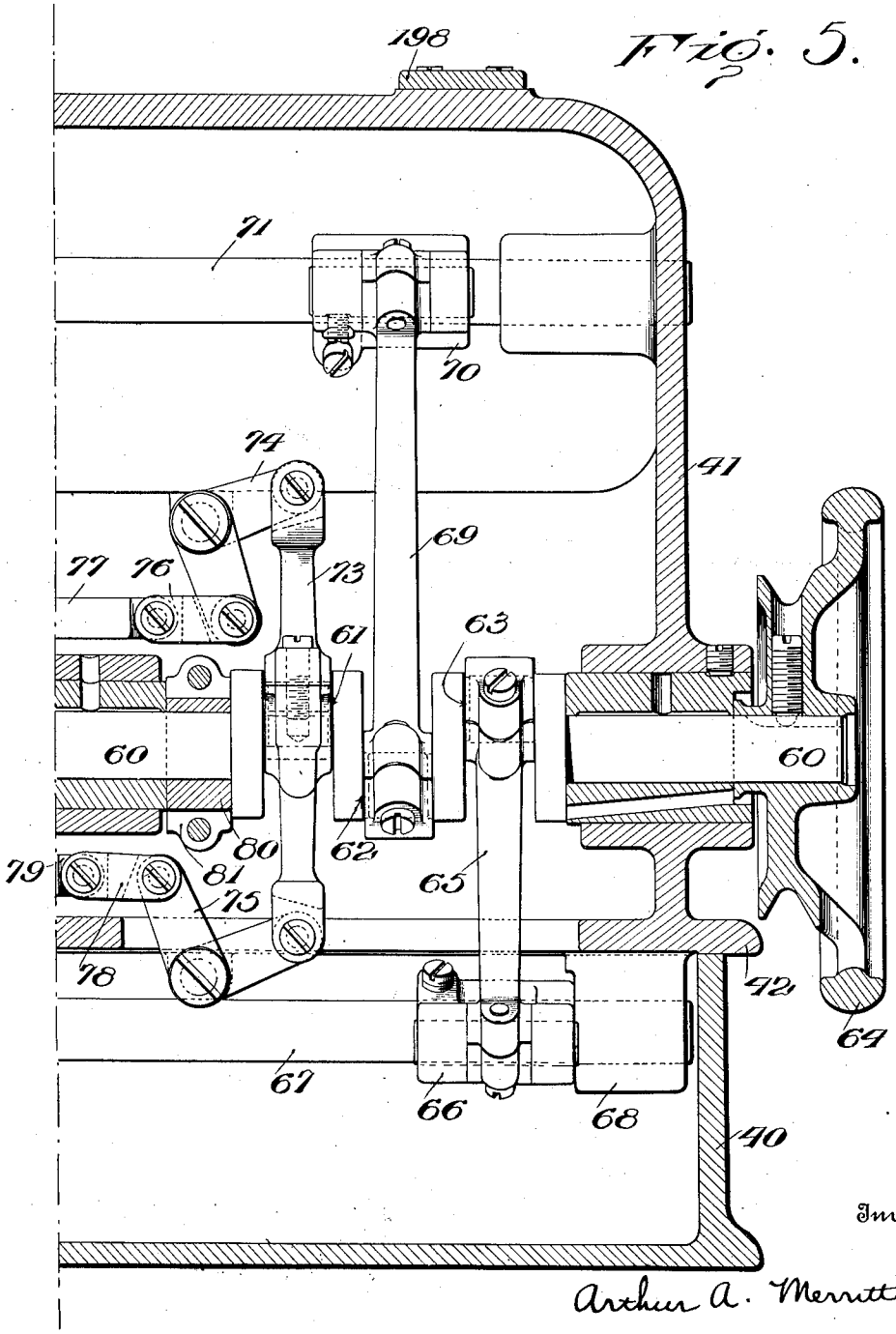
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Fig. 5.



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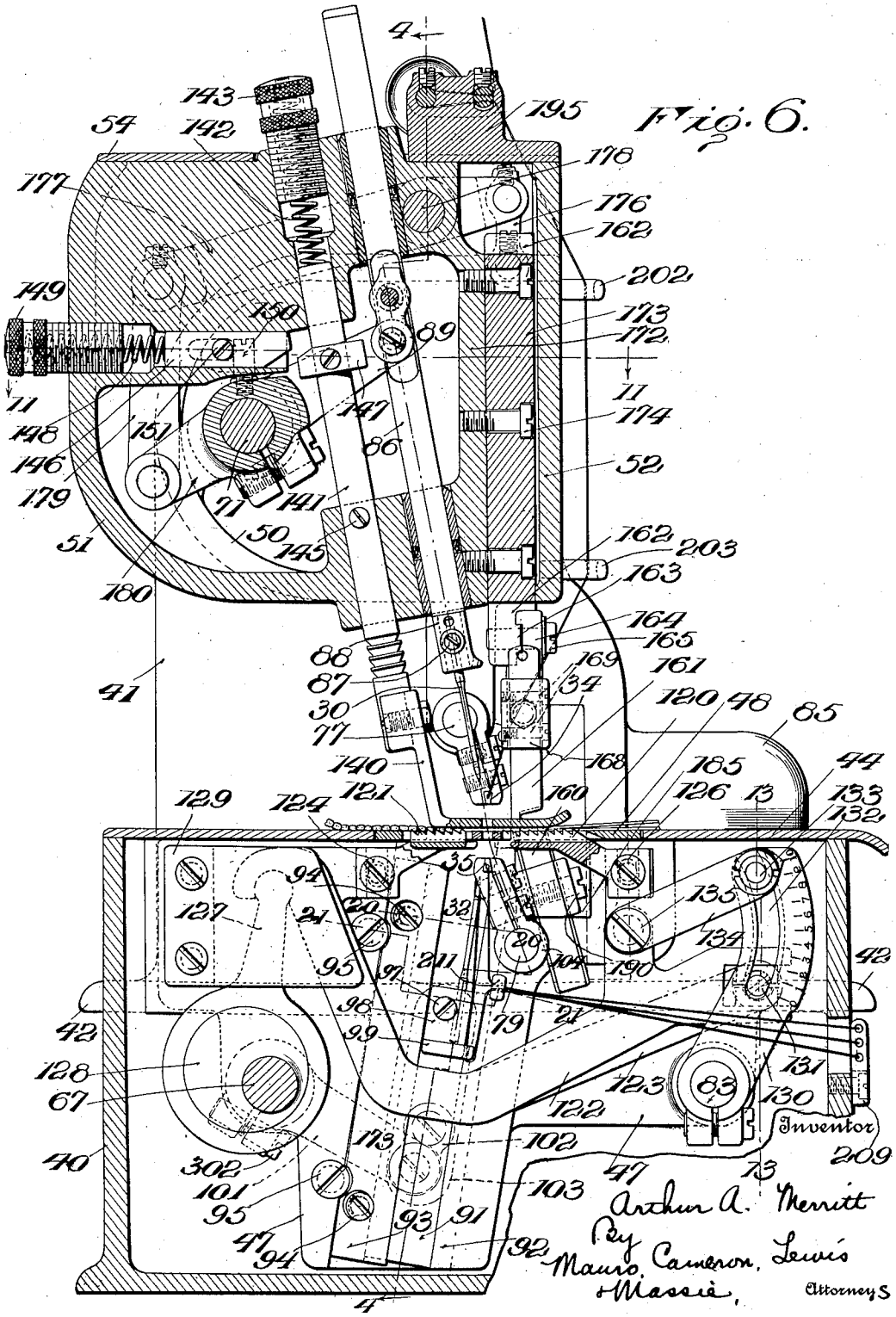


Fig. 6.

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A. A. MERRITT

SEWING MACHINE

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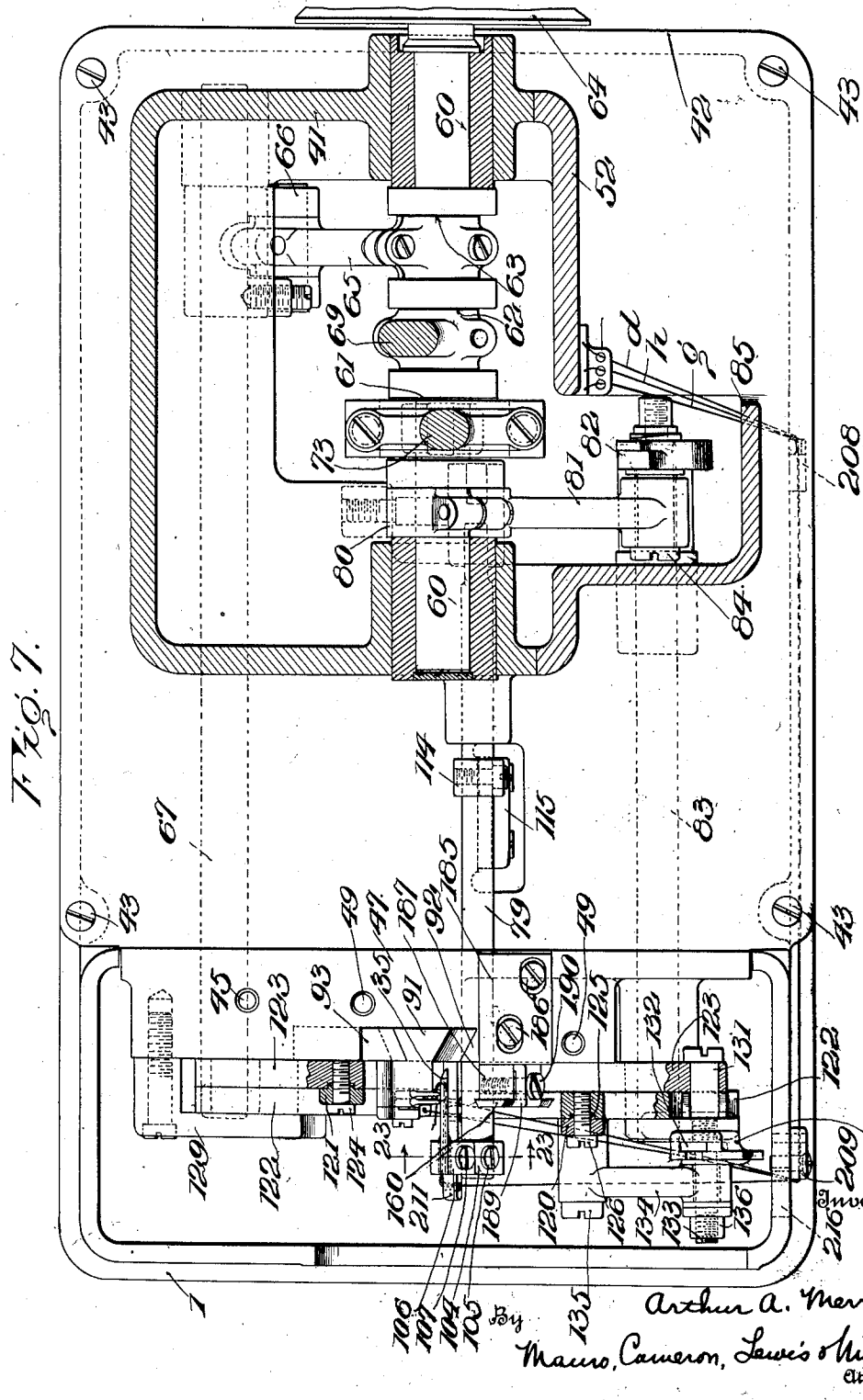


Fig. 7.

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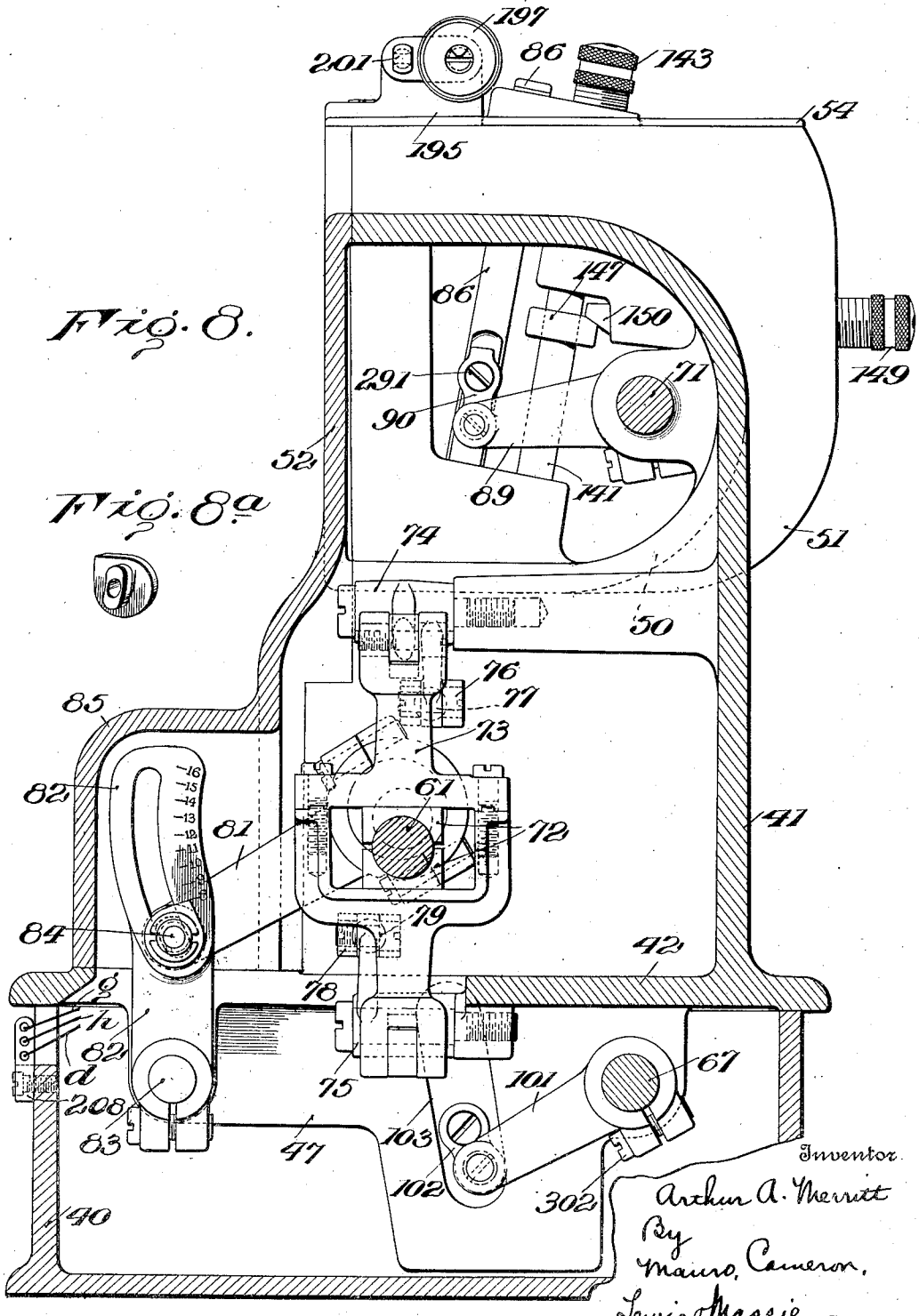
A. A. MERRITT

SEWING MACHINE

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Fig. 8.

Fig. 8a



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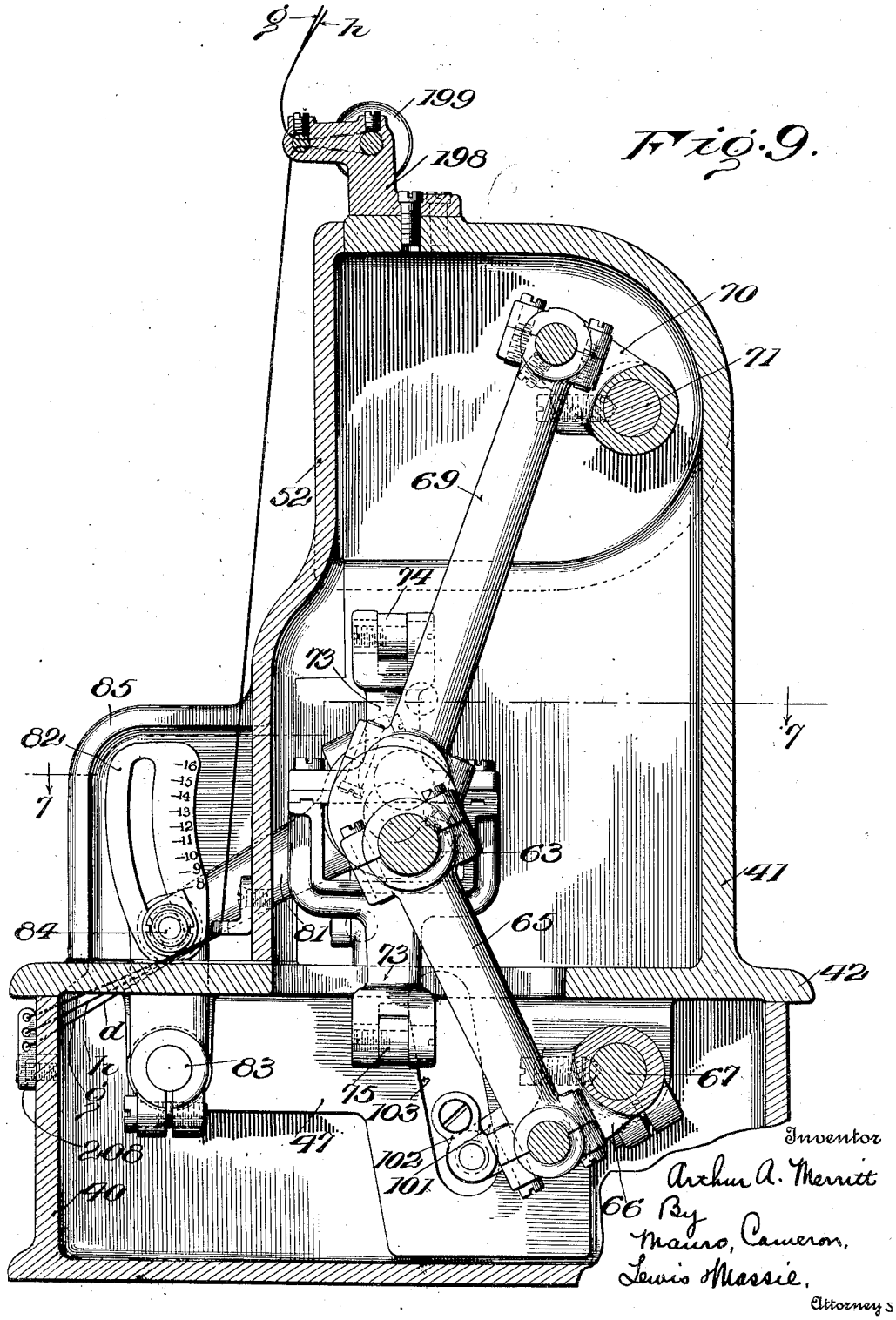
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SEWING MACHINE

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Fig. 9.



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Fig. 10.

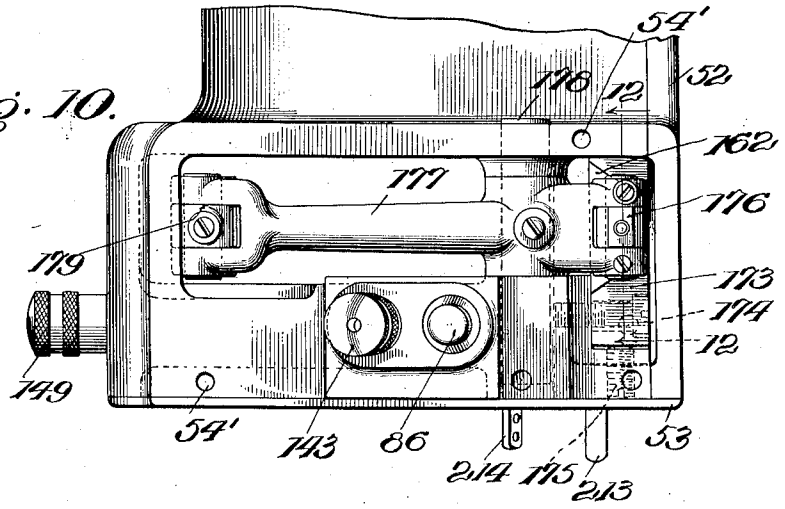


Fig. 11.

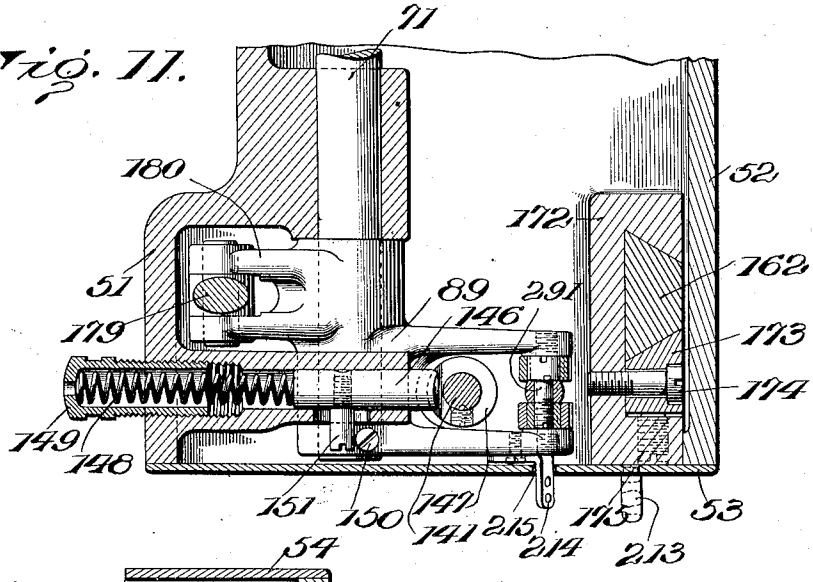
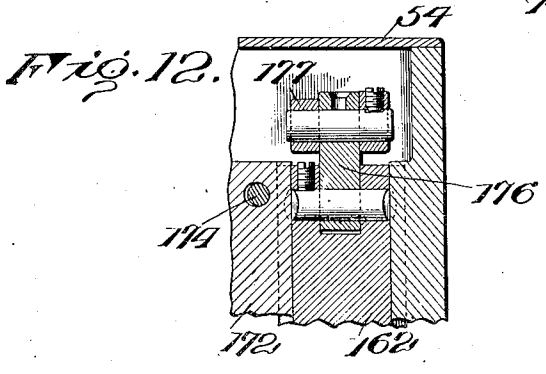


Fig. 12.



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A. A. MERRITT

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Fig. 13.

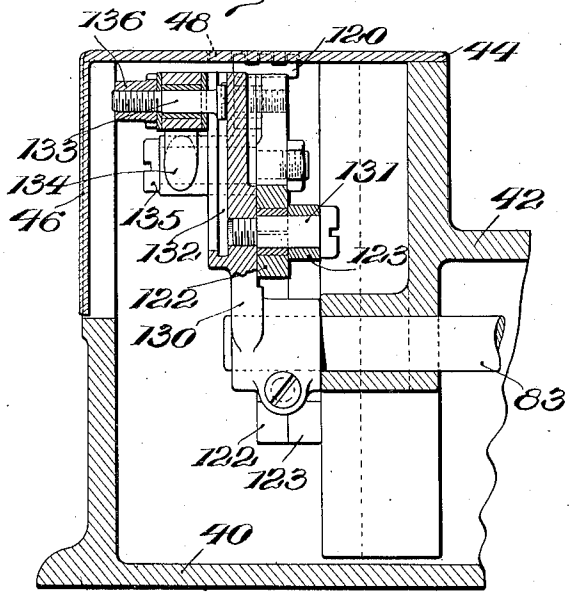


Fig. 14.

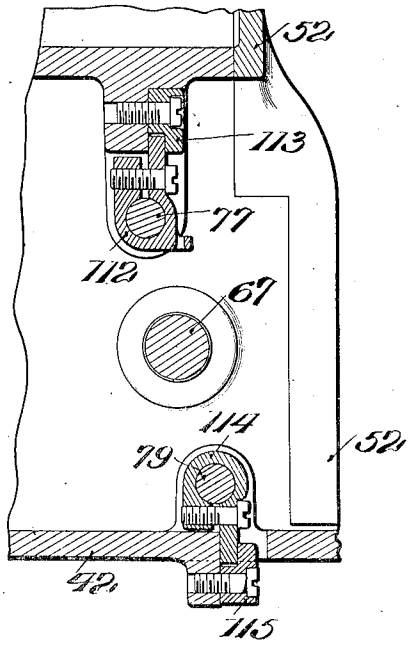


Fig. 15.

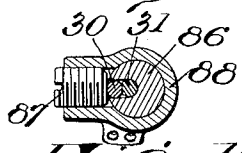


Fig. 16.

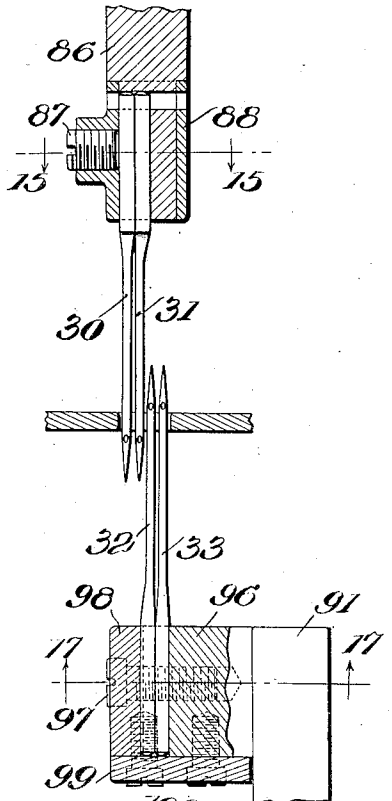
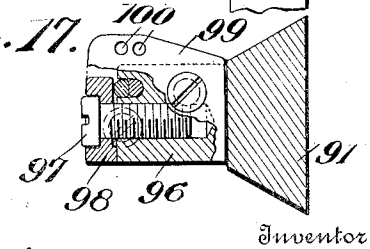


Fig. 17.



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May 10, 1927. 1,628,173

A. A. MERRITT

SEWING MACHINE

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Fig. 23.

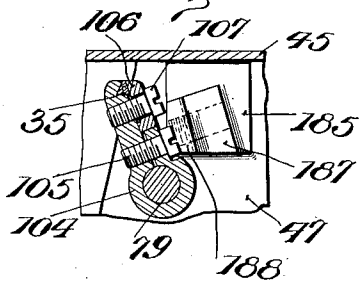


Fig. 24.

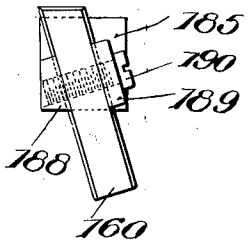


Fig. 18.

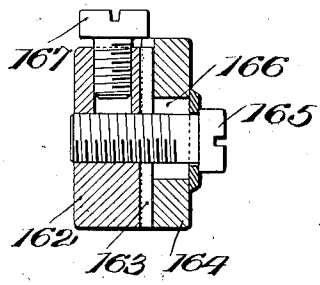


Fig. 19.

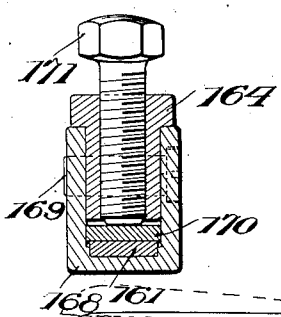


Fig. 20.

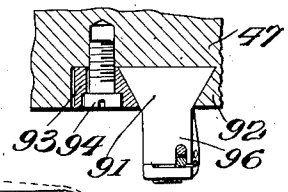


Fig. 21.

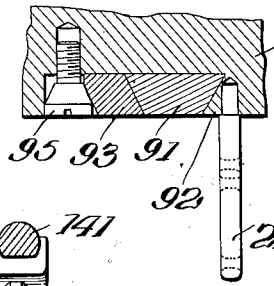


Fig. 22a.

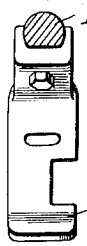
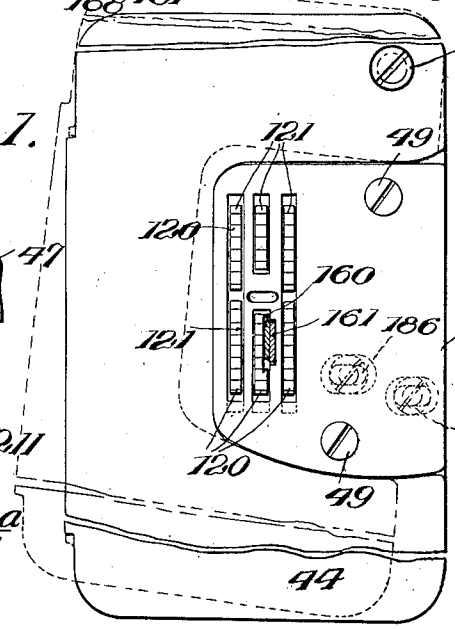


Fig. 22.



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May 10, 1927. 1,628,173

A. A. MERRITT

SEWING MACHINE

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Fig. 25.

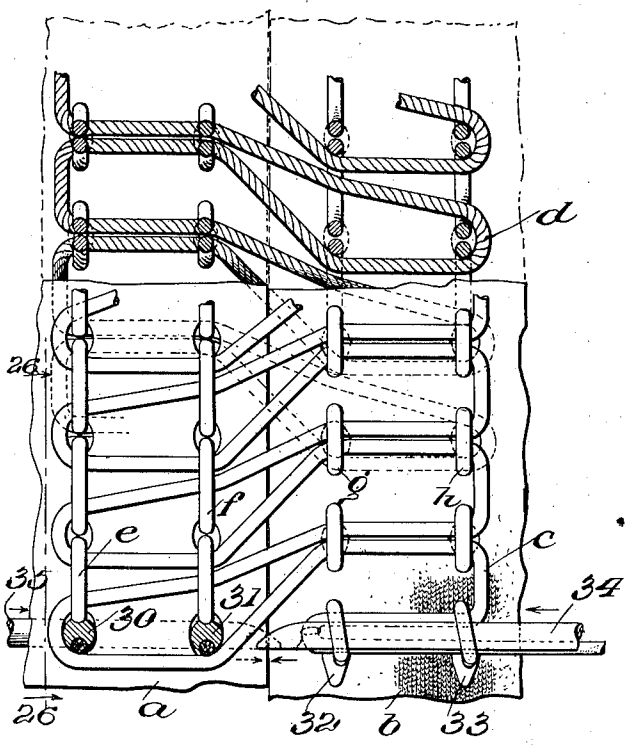


Fig. 26.

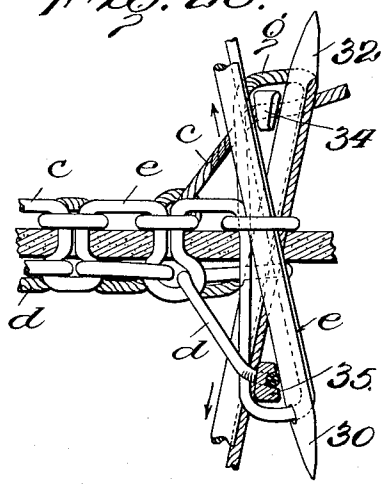


Fig. 27.

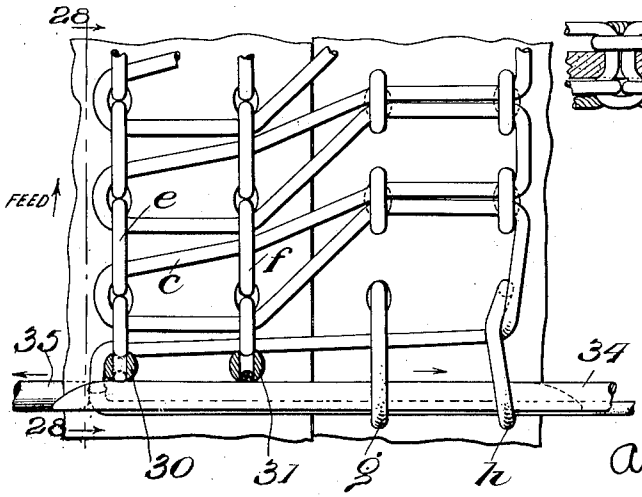
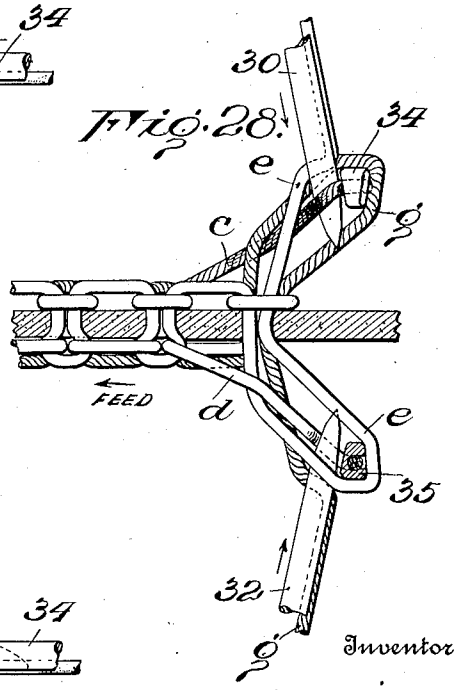


Fig. 28.



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Patented May 10, 1927. 1,628,173

UNITED STATES PATENT OFFICE.

ARTHUR A. MERRITT, OF EDGEWOOD, RHODE ISLAND, ASSIGNOR TO WILLCOX & GIBBS SEWING MACHINE CO., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

SEWING MACHINE.

Application filed January 2, 1918, Serial No. 209,987. Renewed October 4, 1926.

The present invention relates to improvements in sewing machines.

The machine herein illustrated and described in detail, and constituting what is at present regarded as the preferred embodiment of the invention, has as its particular object and design the production of the seam of Merritt Patents Nos. 1,219,023 and 1,219,024 of March 13, 1917, and the carrying out of the method of said last-enumerated patent. Other objects and advantages will be apparent from the drawings and detailed description which follow, the invention not being restricted to the attainment of any particular seam structure or method of seam formation.

Fig. 1 is a front elevation of the complete machine, some of the parts within the casing being shown in dotted lines;

Fig. 2 is an end elevation looking from the left of Fig. 1;

Fig. 3 is an end elevation looking from the right of Fig. 1;

Fig. 4 is a vertical sectional view of one end of the machine on line 4—4 of Fig. 6, but with the needles and loopers at the other limit of their movement from that shown in Fig. 6;

Fig. 5 is a vertical sectional view of the other end of the machine on line 5—5 of Fig. 3;

Fig. 6 is a vertical section on line 6—6 of Fig. 1;

Fig. 7 is a view partly in horizontal section and partly in plan view on line 7—7 of Figs. 1 and 9. The work-supporting plate and cloth-plate upon which the work rests, and also the feed-members, are omitted to show other parts operating beneath the work in the stitch formation.

Fig. 8 is a vertical section on line 8—8 of Fig. 1;

Fig. 8[a] is a perspective view of a washer;

Fig. 9 is a vertical section on line 9—9 of Fig. 1;

Fig. 10 is a detail plan view of the head of the machine with its top cover and thread-tension carrying bracket removed;

Fig. 11 is a horizontal section on line 11—11 of Fig. 6;

Fig. 12 is a vertical detail section on line 12—12 of Fig. 10;

Fig. 13 is a vertical detail section on line 13—13 of Fig. 6;

Fig. 14 is a vertical detail section on line 14—14 of Fig. 1;

Fig. 15 is a section on line 15—15 of Fig. 16;

Fig. 16 is an upright section through the two sets of needles on line 4—4 of Fig. 6;

Fig. 17 is a sectional view (with parts in bottom plan view) on line 17—17 of Fig. 16;

Fig. 18 is a detail sectional view, on line 18—18 of Fig. 1, of the adjusting means for securing the holder of the movable trimmer-blade to the lower end of its vertically reciprocating carrier;

Fig. 19 is a detail section, on line 19—19 of Fig. 1, of the movable trimmer-blade holder;

Fig. 20 is a detail section on line 20—20 of Fig. 6;

Fig. 21 is a detail section on line 21—21 of Fig. 6;

Fig. 22 is a fragmentary plan view of the work-supporting and cloth plates;

Fig. 22[a] is a detail plan view of the presser-foot;

Fig. 23 is a detail section on line 23—23 of Fig. 7;

Fig. 24 is an end view of the fixed trimmer-blade carrier with the blade clamped in place;

Fig. 25 is a top plan view illustrating a portion of a seam and the relative positions of the needles and loopers at one stage of the operation thereof. The lower portion of the figure shows the thread concatenation on the upper side of the seam; the upper portion of the figure shows the thread concatenation on the underside of the same seam.

Fig. 26 is a sectional view on line 26—26 of Fig. 25;

Fig. 27 is a plan view illustrating a portion of a seam and relative positions of the needles and loopers at another stage of the operation thereof;

Fig. 28 is a sectional view on line 28—28 of Fig. 27.

Figs. 25–28, Sheet 12, illustrate an embodiment of the seam invention of said Merritt Patent 1,219,024 in a seam composed of six threads, two looper threads *c* and *d*, and four needle threads *e*, *f*, *g*, and *h*, said threads being concatenated into a seam joining together the abutted edges *a* and *b* of two pieces of fabric, or of the same piece of

fabric. The two needle threads *e* and *f* are carried by a pair of needles 30 and 31 operating from above the work-plate or throat-plate, and the two needle-threads *g* and *h* by a pair of needles 32 and 33 operating from beneath the work-plate. Loopers 34 and 35 operating respectively above and below the work-plate carry looper threads *c* and *d* respectively. The loopers 34 and 35, and also the two sets of needles, operate simultaneously in opposite directions.

The aforesaid Merritt Patent 1,219,024, in illustrating the method of seam formation to which some of its claims are directed, indicates an elliptical path of movement for each looper to enable it to enter a needle thread loop at the rear side of one needle and to then assume a position slightly in advance of the needles so that the other needle may descend into a loop of looper thread extended across the seam by said looper. The machine of the present invention, adapted to carry out said method, makes provision for avoiding such sidewise, so-called "needle avoiding" movement of the loopers. This is accomplished by inclining the plane of movement of the upper pair or set of needles 30 and 31 so that their path of travel is close to the rear edge of the looper 34 operating above the work-plate and close to the front edge of the looper 35 operating below the work-plate. The two loopers are positioned one above the other on opposite sides of the work-plate respectively. They reciprocate longitudinally and simultaneously in opposite directions in rectilinear paths across the path of seam formation at right angles to the direction of feed. The plane of movement of the lower pair or set of needles 32 and 33 is oppositely inclined so that their path of travel is close to the rear edge of looper 35 operating below the work-plate and close to the front edge of the looper 34 operating above the work-plate. By this relationship of the thread-carrying implements, and with the two pairs of needles projected through the work or fabric from opposite sides thereof and on opposite sides of the medial line of the seam (the line of abutment of the two fabric edges *a* and *b*), as shown in Figs. 25 and 26, the upper looper 34 enters, at the rear side of the needles 32 and 33, loops of needle threads *g* and *h* projected upward through the work by said needles. Simultaneously therewith, as also shown in said Figs. 25 and 26, the lower looper 35 enters the rear side of needles 30 and 31, loops of needle-threads *e* and *f* projected downward through the work by said needles. The directions of movement of the thread-carrying implements, at the stage of operation shown in Figs. 25 and 26, are indicated by arrows on said figures, the return movements of the needles having just about begun.

At the stage of the operation shown in Figs. 27 and 28, the loopers have passed the limit of their advance movement, and are just beginning to return; the needles have passed the limit of their return movements and are beginning another advance movement. The upper needles 30 and 31 are passing close to the rear edge of looper 34 and into the loop of looper thread *c* extended across the seam by said looper. Simultaneously, the lower needles 32 and 33 are passing close to the rear edge of looper 35 and into the loop of looper thread *d* extended across the seam by said looper. The feeding mechanism (elsewhere illustrated) is advancing the work in the direction of the arrows marked "feed" and has made a little more than one-half of its fabric-carrying movement. In other words, when the upper and lower sets of needles are at the limit of their retreating movements, in their furthermost positions from the fabric, the feed-members (shown in Fig. 6 for example) are at the highest point of their movement above the cloth-plate and have advanced the work just one-half the length of a stitch.

The framework and casing of the machine include two main castings, to wit:—a rectangular base section 40 having a bottom wall but open at its top, and a hollow top section 41. As clearly shown in Figs. 3, 5, 8, 9 and 10, the top section 41 includes a flat-bottom plate 42 which seats against the upper edge of the side walls of the base section 40, and closes the larger part of the open top thereof. Screws, such as 43 Fig. 7, secure the casing sections together. At the left-hand end of base section 40, Figs. 1, 4 and 7, the side walls thereof rise higher than elsewhere and support plate 44 which has an integral depending part 46, Fig. 4, closing an opening in the end wall of the base section. At the left-hand end of plate 42, there is cast, integral therewith, a thick vertical plate 47, Figs. 4, 6 and 7, upon and in which, as will presently appear, there are formed slideways and bearings for several parts. A screw 45 (Figs. 2 and 22) through plate 44 and threaded into plate 47 (Fig. 7) constitutes a pivot on which said plate 44 with its depending part 46 may be swung aside (to the left Fig. 22) to give free access to the parts under it. The throat-plate or work-plate 48, Figs. 4, 6 and 22, is secured to the upper edge of 47 by screws 49 and fits in a recess in plate 44.

The upper casing section 41 has a horizontal neck portion 50 leading to a head portion 51 (Figs. 4 and 5) which overhangs the work-plate of the machine. The entire upper casing section 41, cast with an open front, is closed by a removable front cover 52. As shown in Fig. 1, for example, cover 52 is extended to constitute a closure for the neck and head portions of the upper casing

section. Any suitable means, three screws being shown in Fig. 1, may be used to secure cover 52 in place. A plate 53, secured by screws shown in Fig. 2, closes the open end of head 51 and an L-shaped plate 54, secured by two screws 54', Fig. 10, closes the open top of said head. These plates are removably secured in place by screws as shown.

Main driving connections.—The main drive of the machine is a horizontal crank shaft 60, journalled in bearings of casing section 41. It has three alternately disposed cranks 61, 62 and 63, and at its outer end carries the usual combined hand-wheel and drive-pulley 64. A pitman 65 from crank 63 is pivotally connected to an arm 66 secured to the shaft 67 and rocking the latter. Shaft 67 is journalled at one end in a bearing 68 depending from plate 42, Fig. 5, and at its other end in the vertical plate 47. Through connections later described, said shaft 67 actuates the needles 32 and 33 which operate upward from beneath the work and also imparts up and down movement to the feed members. A pitman 69 from crank 62, Figs. 5 and 9, is pivotally connected to an arm 70 secured to the shaft 71, rocking the latter. Through connections later described shaft 71 actuates the needle bar carrying the needles 30 and 31 which operate from above the work, and also the upper movable trimmer blade. The crank 61 (Figs. 5 and 8) is embraced by two bearing blocks 72 adapted to slide horizontally in an opening of a vertically movable pitman or bar 73, and the latter is pivotally connected at its upper and lower ends to bell-crank levers 74 and 75 respectively. Through a link 76 the bell-crank lever 74 longitudinally reciprocates a horizontally disposed looper-bar 77, which, as later described more in detail, carries a looper which operates above the work. Similarly, bell-crank lever 75, through a link 78, longitudinally reciprocates a horizontally disposed looper-bar 79 which as later described more in detail carries a looper which operates beneath the work.

Adjacent the crank 61, the main shaft 60 carries an eccentric 80 (Fig. 5) which actuates a pitman 81 (Figs. 7, 8 and 9) pivotally connected to an upright arm 82 secured to a horizontal rock-shaft 83. Through connections presently described in detail, shaft 83 actuates the feed members to impart the backward and forward movement thereto. The pivotal connection between pitman 81 and arm 82 is adjustable to vary the effective length of the arm, which in turn results in varying the length of back and forward movement of the feed members and consequently the length of stitch formed, as presently more fully described. The upper end of arm 82 has an elongated slot with a neighboring scale of figures as a guide to the adjustment. A pivot-screw 84 passing through the end of pitman 81 and the slot of arm 82, has a shoulder bearing against a washer at one side of said arm and at the other side of the arm carries a washer and a nut. The washer, Fig. 8a, projects into the slot of 82 with straight sides to prevent turning, and has a point contiguous to the adjustment scale on 82. The end of screw 84 has flattened sides bearing against the edges of the slot in 82 to prevent turning of the screw in said slot.

A bulged portion 85 of the front cover 52, which is open, looking from the right-hand end of the machine (see Figs. 3, 7 and 9), to give access for adjustment, covers the connection between pitman 81 and arm 82.

Needle driving connections.—The upper needles 30 and 31 are clamped to the lower end of a needle bar 86, Fig. 6. As shown more in detail in Figs. 15 and 16, the lower reduced end of needle bar 86 is longitudinally grooved on one side, the needles are laid one against the other in the groove and the set-screw 87 of a collar or needle clamp 88 is firmly set in engagement with the outermost needle, and clamps both needles in place. Needle bar 86 reciprocates longitudinally in an upright position in bearings in the head 51 of the machine, the plane of movement being inclined so that the lower end of the needle bar is nearer the front of the machine than the upper end of said bar. The needle bar is reciprocated from the shaft 71 through a double arm 89 secured to said shaft and pivoted at its outer end to the lower ends of links 90, 90, which have flattened surfaces bearing against flattened surfaces at opposite sides of the needle bar, said links being pivoted at their upper ends to said bar by a pivot-screw 291. These connections between the shaft 71 and the needle bar are substantially those of Merritt Patent No. 1,041,654, October 15, 1912.

The lower needles 32 and 33 are clamped to the upper end of a needle bar or slide 91 which reciprocates longitudinally in an upright position in a groove or slideway in the thick vertical plate 47. As shown in Fig. 6, the upright position of the groove and of the slide 91 and its movement are somewhat inclined (the reverse of the inclination of needle bar 86) so that the upper end of said slide is nearer the front of the machine than the lower end thereof. The slide has oppositely beveled edges one of which dovetails under an overhanging lip 92 along one edge of the slideway; the other beveled edge of the slide dovetails under the oppositely beveled edge of a bar 93 secured in one edge of the groove in plate 47 by screws 94, 94, passing through slightly elongated slots (Fig. 20) in said bar. Screws 95, 95 (Figs. 6 and 21) with conical heads serve to adjust the bar 93 toward slide 91

to take up unnecessary freedom of the slide in its slideway due to wear or other cause.

The clamping means for securing needle 32 and 33 to the upper end of slide 91 are best shown in Figs. 16 and 17. An enlargement or head 96 at the upper end of slide 91 has a vertical groove in which the shanks of the needles fit one against the other. A screw 97 forces a plate 98 against the outer needle and firmly secures both needles in place. A plate 99 secured by screws to the under side of head 96 closes the lower end of the needle groove and has therein two needle-thread guide openings 100, 100 (Fig. 17).

An arm 101 (Figs. 4, 6 and 8), clamped to rock-shaft 67 by screw 302, connects at its outer end to needle-slide 91 by means of a link 102, these connections imparting up and down movement to said slide. Link 102 is positioned in a slot 103 through plate 47.

The loopers and their carriers.—A lower looper-carrier 104, best shown in Figs. 6 and 23, embraces the end of looper-bar 79 and is contracted and clamped thereon by a screw 105. The shank of looper 35 is clamped in a notch in carrier 104 by a plate 106 and a screw 107. As shown in Figs. 4 and 23, the looper 35 has an axial thread passage through the thickened end of its shank which is embraced by the clamp, said passage joining a thread groove along the front side of the looper terminating at the looper eye.

The upper looper 34 and its carrier are of similar construction, Fig. 4. Upper looper-carrier 108 embraces and clamps onto the end of looper-bar 77 by means of screw 109. Plate 110 and screw 111 clamp looper 34 in a notch of the carrier.

A collar 112 (Figs. 4 and 14), clamped on looper-bar 77 by means of a set-screw, has a lip which works in a groove formed by a plate 113 screwed to the top-section of the casing, thereby preventing any turning movement of bar 77 and consequent displacement of its looper in the longitudinal reciprocation of said bar. The same function is served as to the lower looper and its bar 79 by a similar collar 114 clamped to said looper-bar by a set-screw and having a lip working in a groove formed by plate 115 screwed to plate 42 of the top casing-section. As readily apparent from their driving connections, the upper and lower loopers, in their reciprocations, move longitudinally and simultaneously in opposite directions in rectilinear paths one directly above the other on opposite sides of the work.

Feed.—It is preferable, particularly in work upon fabrics which stretch easily, such as knit-goods, to use a "fulling feed" operating in advance of the needles, and a "stitch feed" operating in the rear of the needles, as in the machine known as the Willcox & Gibbs Sewing Machine Company's "flatlock machine". Giving the fulling-feed member more movement than the stitch-feed member acts to present the material to the needles in an unstretched condition and thereby avoids puckering such as results from formation of the stitches on the material or fabric when in a stretched condition.

120 is a fulling-feed member and 121 a stitch-feed member; each have three parallel rows of teeth (Fig. 22) adapted to engage the work through slots in throat-plate 48. 122 and 123 are parallel rocker-bars peculiarly bent or dipped to avoid interference with other parts. The shank of feed-member 121 has a vertical rib (Figs. 6 and 7) fitting a vertical groove in a horizontal arm branching from bar 123, with a screw 124 to complete the fastening together of these parts. Similarly, the shank of feed-member 120 has a vertical rib 125 (Figs. 6 and 7) fitting a vertical groove in a vertical arm branching from bar 122 and a connecting screw 126. At their left-hand ends, Fig. 6, both bars 122 and 123 are hooked over the rounded upper ends of two pitmen 127, 127, actuated by a common eccentric 128 on shaft 67, to impart up and down movement to the feed-members. A plate 129 secured to plate 47 confines the rocker-bars to their proper places while moving. As thus appears, the lift or up and down movement imparted to both rocker-bars and their feed-members 120 and 121 by the common eccentric 128, will be approximately the same. The screws 124 and 126 pass through slots (dotted lines Fig. 6) in the shanks of feed-members 120 and 121, affording adjustment to vary the amount of the up and down movement which takes place above the surface of the throat-plate. But, as further appears, the two pitmen 127 may, simultaneously with their up and down movement, move sidewise at their upper ends independently of each other and in accordance with the differential horizontal movements imparted to the rocker-bars 122 and 123, as next described.

130, Figs. 6, 7 and 13, is an arm securely clamped on the end of rock-shaft 83 and carrying a pivot-screw 131 passing through the end of rocker-bar 123 which carries the stitch-feed member 121. It follows that the horizontal movement of 121 is imparted from eccentric 80 on the main shaft, through pitman 81, arm 82, shaft 83, and arm 130 to rocker-bar 123. Adjustment of the connection between 81 and 82, as hereinbefore described, will vary the length of horizontal movement of stitch-feed member 121 and determine the length of stitch formed by the machine.

The rocker-bar 122 and its fulling-feed member 120 are also driven in their horizontal movement from arm 130, through a

connection which may be adjusted to afford the desired differential over the movement of the stitch-feed member 121. 132 is a curved undercut groove in the face of arm 130 engaged by the flattened head of pivot-screw or stud 133 on which one end of link 134 pivots. At its other end, said link pivots on a stud 135 which screws into the arm branching from rocker-bar 122. A nut 136 on the outer end of stud 133 clamps the stud in any desired position of adjustment in groove 132, a neighboring scale of figures (Fig. 6) on the face of arm 130 serving as a guide. The right-hand end of rocker-bar 122 (Fig. 6; see also Fig. 7) is forked to receive two bearing blocks shown in dotted lines Fig. 6, and said blocks in turn embrace pivot-stud 131, thereby supporting rocker-bar 122.

Presser-foot.—Presser-foot 140 is carried by presser-foot bar 141. Spring 142 presses upon the upper end of the bar, the tension thereof being variable by adjustment of screw-cap 143. The usual lever 144, Fig. 2, acting against a stud 145 on presser-foot bar 141, serves to lift the presser-foot and hold it elevated. But such lifting of the presser-foot, while the upper needles are down and the lower needles up, is prevented by automatic locking means as follows:—146 is a reciprocatory plunger or stop, most clearly shown in Figs. 6 and 11, cooperating with a collar 147 on presser-foot bar 141. A spring 148, the tension of which may be varied by adjusting screw-cap 149, tends to force the plunger-stop to the limit of its outward movement in contact with or in the path of collar 147, thereby obstructing the lifting of the presser-foot. But, when the upper needles are up and the lower needles down, as shown in Fig. 6, a stud 150 on the hub of arm 89 acts against a stud 151 on the plunger-stop 146 and withdraws the same against the tension of spring 148 to a position out of the path of the collar 147, leaving the presser-foot free to be lifted.

Trimmer.—The machine as illustrated includes vertically operating trimmer blades adapted to trim an edge, or two or more superimposed edges, of fabric to which the seam is to be applied. There is a fixed lower blade 160 and a movable upper blade 161, Fig. 6, which cooperate through a slot in the throat-plate, Fig. 22, the upper blade 161 also working in a recess in the right-hand edge of the presser-foot 140, Fig. 22ª. Upper blade 161 is rigidly and adjustably clamped to the lower end of a vertically reciprocating trimmer bar or slide 162 by the following means:—A horizontal rib 163, Figs. 1, 6 and 18, on the lower end of slide 162 engages a corresponding groove of a blade-holder 164. A screw 165 passing through a slot 166 (Fig. 18) in part 164 secures the latter to slide 162 in the desired position of adjustment. A screw 167 (Fig. 18) threaded into slide 162 has a head overlapping the edge of blade-holder 164, whereby turning the screw serves to accurately adjust the holder and set its blade 161 to the desired position. U-shaped plate 168 embraces and is secured to the holder 164 by two screws 169, 169. Trimmer blades 161 is positioned in the closed end of plate 168 and engaged by a filler or follower plate 170 (Fig. 19) against which a clamping bolt 171 acts.

Trimmer slide 162 is beveled or dovetailed along its opposite edges (Figs. 10, 11 and 12) and reciprocates in a vertical groove in a part 172 of the head portion 51 of the upper casing section, said groove being undercut along one edge for engagement with one beveled edge of the slide. The other beveled edge of the slide is contacted by an undercut or beveled edge of a bar 173 paralleling the slide in its groove. Screws 174 passing through slightly elongated holes in bar 173 secure the latter in place. Screws 175, dotted lines Figs. 10 and 11, serve (with screws 174 loosened) to adjust bar 173 toward slide 162 to take up objectionable play due to wear or other cause.

The driving connections for reciprocating the trimmer-slide 162 and its movable trimmer blade 161, are as follows:—A link 176 connects the upper end of slide 162 to one end of a lever 177 fulcrumed on a short shaft 178 (Figs. 6, 10 and 12). Link 179 connects the other end of 177 to a bifurcated arm 180 (Fig. 11) formed integral with arm 89 before mentioned, and secured to shaft 71 driven from the main shaft of the machine as hereinbefore described.

The lower trimmer blade 160 is fixed in place by the following means:—A block or carrier 185 (Figs. 6, 7, 23 and 24) fits a recess across the upper edge of thick plate 47 and is secured by screws 186, 186, which pass through elongated holes of carrier 185, permitting adjustment of the position of the carrier and its blade. The end of block or carrier 185 is reduced to form part 187, and still further reduced to form part 188. One beveled edge of the blade 160 fits beneath an undercut edge of part 188 (Fig. 24), one face of the blade bears against the flat end surface of the part 187, and the other beveled edge of the blade is engaged by an undercut edge of a clamping plate 189 secured in place by a screw 190 engaging part 187.

As will be apparent, the position of the line of cut of the trimmer may be adjusted laterally to the direction of feed by the adjustments provided for the two blades. The adjustment of either or both blades may also be utilized to get their edges in proper cutting relationship.

In applying the seam for the purpose of

joining abutted edges of fabric, as shown in Figs. 25 and 27, the edges may be trimmed before the goods are presented to the machine. Or, if it is desired to trim the edges in the machine in advance of the needles, trimmer-means suitable to that work—preferably of the type shown in Merritt Patent No. 1,041,652, with horizontally operating blades—may be substituted for the vertically operating trimmer blades shown.

Thread guides, tensions and take-up means.—A bracket 195, secured by screws on top of the head portion 51 of the upper casing section, supports two rods, one carrying tension disks 196 and the other tension disks 197. Each rod also carries the usual spring for pressing the disks together, and an adjusting nut or sleeve for varying the spring pressure and hence the tension of the disks on the thread. A similar bracket 198 screwed to the top of the upper casing section at the other end of the machine supports similar tension means, including a set of disks 199 and another set 200.

The upper looper thread *c* leads (Fig. 1) from its source of supply through guide 201, between tension disks 197, back through guide 201, through guides 202, 203, through a thread-eye on a lip of collar 112, thread guide 204 to looper 34. The movement of collar 112 with looper bar 77 acts to pull upon the thread, lengthen its path between guides 203 and 204, and thus take up slack at the proper time in the cycle of operations.

The lower looper-thread *d* leads (Fig. 1) from its source of supply, through guide 205, between tension disks 200, back through guide 205, to guide 206, thence through an opening in plate 42 and an opening 207 in base section 40 of the casing to guide 208, guide 209, through another opening 210 and a thread guide 211 to the lower looper 35.

The two upper needle-threads *e* and *f* lead from a source of supply through a guide 212, between tension disks 196, back through guide 212 to guide 213, thence through the movable take-up member 214 secured to the outer branch of the double arm 89 and projecting through a slot 215 (Figs. 2, 4 and 11) in plate 53, through tubular guide 216 and thread eyes on the needle clamp 88 to needles 30 and 31 respectively. The movable take-up member 214 takes up slack in the upper needle threads *e* and *f* at the proper time in the cycle of movement of the stitch-forming elements.

The lower needle threads *g* and *h* lead from their source of supply through a guide 217 (Fig. 1), between tension disks 199, back through guide 217, to guide 206, through opening in plate 42, opening 207, to guides 208 and 209, opening 210, guide 211, through thread openings 100 in plate 99, to needles 32 and 33, respectively. The movement of plate 99 relative to the fixed thread guide 211 takes up slack in the lower needle threads *g* and *h* at the proper time.

While the invention has been herein described with particular reference to its embodiment in a machine for forming a seam made with four needles and four needle threads and two loopers and two looper threads, it will be readily apparent that it is adapted to the production of varied forms of seams and stitches. For example, one needle of each of the pairs of needles 30 or 31 and 32 or 33, and its thread, may be omitted, resulting in a four-thread seam with two parallel lines of stitches interconnected in both faces of the seam. By so using only two oppositely acting thread-carrying needles, with two non-thread-carrying loopers or spreaders acting to spread loops of the needle threads across opposite sides of the seam, in place of the looped threads, there will be formed a two-thread seam with two parallel lines of stitching interconnected in both faces of the seam. By using only two oppositely acting thread-carrying needles with one thread-carrying looper and one non-thread-carrying looper, a three-thread seam will result having two parallel lines of stitches interconnected in both faces of the seam. By omitting one of the needles shown in the drawings, a five-thread seam will result having three parallel lines of stitches interconnected in both faces of the seam. And to make seams of more than six threads, and more than four parallel lines of stitches, either or both sets of two needles as shown may be increased by the addition of one or more needles. Thus, for a seven-thread seam of five parallel lines of stitches interconnected in both faces of the seam, three thread-carrying needles would be used in one set and two in the other.

As illustrated in Figs. 25 and 27, seams formed by the machine of this invention are primarily intended for joining abutted edges, and particularly abutted cut edges of knit goods. Said seams are, however, adapted to use for purely ornamental or other purpose, either along the edges of fabric or back from the edge thereof. Instead of being trimmed in the machine, the edges may be previously trimmed and straightened in any suitable manner, in which event the trimmer blades will be removed from the machine.

As will be apparent, the invention is susceptible of embodiment in other types of machine than that specifically illustrated: for example, it is applicable to a work-arm or horn machine for sewing tubular work, with the work feeding either onto or off of the free end of the arm.

What is claimed is:—

1. In a sewing machine, the combination of a work supporting surface, a thread-carrying needle positioned to operate from one

side of the work, a second thread-carrying needle positioned to operate from the other side of the work, driving connections actuating said needles to simultaneously project loops of their threads through the work in opposite directions respectively, and a looper and means actuating the same approximately in a plane upright with relation to the work supporting surface and in a path to the rear of one needle and in front of the other needle to engage loops of thread projected through the work by one needle and to extend loops of thread across the seam for the other needle to pass therethrough.

2. In a sewing machine, the combination of a work supporting surface, a thread-carrying needle positioned to operate from one side of the work, a second thread-carrying needle positioned to operate from the other side of the work, driving connections actuating said needles to simultaneously project loops of their threads through the work in opposite directions respectively, and a thread-carrying looper and means reciprocating the same in a plane upright with relation to the work supporting surface and in a path to the rear of one needle and in front of the other needle, said looper in each reciprocation thereof projecting a loop of looper thread through a loop of needle thread projected through the work by one needle in one stroke of the needles and extending said looper thread across the seam for the other needle to pass therethrough in a succeeding stroke of the needles.

3. In a sewing machine, the combination of a work supporting surface, a thread-carrying needle positioned to operate from one side of the work, a second thread-carrying needle positioned to operate from the other side of the work, driving connections actuating said needles to simultaneously project loops of their threads through the work in opposite directions respectively, a thread-carrying looper and means reciprocating the same in a plane upright with relation to the work supporting surface and in a path to the rear of one needle and in front of the other needle, said looper in each reciprocation thereof projecting a loop of looper thread through a loop of needle thread projected through the work by one needle in one stroke of the needles and extending said looper thread across the seam for the other needle to pass therethrough in a succeeding stroke of the needles, and work feeding means acting to advance the work in the intervals between succeeding needle strokes.

4. In a sewing machine, the combination of a work supporting surface, a thread-carrying needle positioned to operate from one side of the work, a second thread-carrying needle positioned to operate from the other side of the work, driving connections actuating said needles to simultaneously project loops of their threads through the work in opposite directions respectively, a looper at one side of the work and means actuating the same approximately in a plane upright with relation to the work supporting surface to engage loops of thread projected through the work by the first needle and to extend loops of thread across the seam into position for the second needle to pass therethrough, and a second looper at the other side of the work and means actuating the same approximately in a plane upright with relation to the work supporting surface to engage loops of thread projected through the work by the second needle and to extend loops of thread across the seam into position for the first needle to pass therethrough.

5. In a sewing machine, the combination of a work supporting surface, a thread-carrying needle positioned to operate from one side of the work, a second thread-carrying needle positioned to operate from the other side of the work, driving connections actuating said needles to simultaneously project loops of their threads through the work in opposite directions respectively, a thread-carrying looper at one side of the work and means actuating the same approximately in a plane upright with relation to the work supporting surface to project loops of its looper thread through loops of thread projected through the work by the first needle and to extend said looper thread loops across the seam into position for the second needle to pass therethrough, and a second thread-carrying looper at the other side of the work and means actuating the same approximately in a plane upright with relation to the work supporting surface to project loops of its looper thread through loops of thread projected through the work by the second needle and to extend said looper thread loops across the seam into position for the first needle to pass therethrough.

6. In a sewing machine, the combination of a work supporting surface, a thread-carrying needle positioned to operate from one side of the work, a second thread-carrying needle positioned to operate from the other side of the work, driving connections actuating said needles to simultaneously project loops of their threads through the work in opposite directions respectively, a thread-carrying looper at one side of the work and means reciprocating the same approximately in a plane upright with relation to the work supporting surface, said looper at each reciprocation thereof projecting a loop of looper thread through a loop of needle thread projected through the work by the first needle in one stroke of the needles and extending said looper thread loop across the seam for the second needle to pass therethrough in the next succeeding needle stroke, a second thread-carrying

looper at the other side of the work and means reciprocating the same approximately in a plane upright with relation to the work supporting surface, said looper at each reciprocation thereof projecting a loop of looper thread through a loop of needle thread projected through the work by the second needle in one stroke of the needles and extending said looper thread loop across the seam for the first needle to pass therethrough in the next succeeding needle stroke, and work feeding means acting to advance the work in the intervals between succeeding needle strokes.

7. In a sewing machine, the combination of a work supporting surface, a first looper and a second looper, and means differentially relatively reciprocating said loopers across the path of seam formation on opposite sides of the work respectively and each approximately in a plane upright with relation to the work supporting surface, a needle and driving means reciprocating it through the work from one side thereof its path of movement being in front of the first looper and to the rear of the second looper, and a second needle and driving means reciprocating it through the work from the other side thereof its path of movement being to the rear of the first looper and in front of the second looper.

8. In a sewing machine, the combination of a work supporting surface, a first looper and a second looper, and means differentially relatively reciprocating said loopers across the path of seam formation on opposite sides of the work respectively and each approximately in a plane upright with relation to the work supporting surface, a first thread-carrying needle and driving means reciprocating it through the work from one side thereof its path of movement being in front of the first looper and to the rear of the second looper, a second thread-carrying needle and driving means reciprocating it through the work from the other side thereof its path of movement being to the rear of the first looper and in front of the second looper, one of said loopers operating to engage loops of thread projected through the work by the first needle and to extend loops of thread across the seam into position for the second needle to pass therethrough, and the other looper operating to engage loops of thread projecting through the work by the second needle and to extend loops of thread across the seam into position for the first needle to pass therethrough.

9. In a sewing machine, the combination of a first looper and a second looper one of them being a thread-carrying looper, and means differentially relatively reciprocating said loopers across the path of seam formation on opposite sides of the work respectively, a first thread-carrying needle and driving means reciprocating it through the work from one side thereof its path of movement being in front of the first looper and to the rear of the second looper, a second thread-carrying needle and driving means reciprocating it through the work from the other side thereof its path of movement being to the rear of the first looper and in front of the second looper, the thread-carrying looper operating to engage loops of thread projected through the work by the first needle and project loops of looper thread therethrough and to extend said looper thread loops across the seam into position for the second needle to pass therethrough, and the other looper operating to engage loops of thread projected through the work by the second needle and to extend loops of thread across the seam into position for the first needle to pass therethrough.

10. In a sewing machine, the combination of a first thread carrying looper and a second thread carrying looper and means differentially relatively reciprocating said loopers across the path of seam formation on opposite sides of the work respectively, a first thread carrying needle and driving means reciprocating it through the work from one side thereof its path of movement being in front of the first looper and to the rear of the second looper, a second thread carrying needle and driving means reciprocating it through the work from the other side thereof its path of movement being to the rear of the first looper and in front of the second looper, one of said loopers operating to engage loops of thread projected through the work by the first needle and to project loops of looper thread therethrough and to extend said looper thread loops across the seam into position for the second needle to pass therethrough, and the other looper operating to engage loops of thread projected through the work by the second needle and project loops of looper thread therethrough and to extend said looper thread loops across the seam into position for the first needle to pass therethrough.

11. In a sewing machine, the combination of a first looper and a second looper and means differentially relatively reciprocating said loopers across the path of seam formation on opposite sides of the work respectively, a first thread carrying needle and driving means reciprocating it through the work from one side thereof its path of movement being in front of the first looper and to the rear of the second looper, a second thread carrying needle and driving means reciprocating it through the work from the other side thereof its path of movement being to the rear of the first looper and in front of the second looper, one of said loopers operating to engage loops of thread project-

ed through the work by the first needle and to extend loops of thread across the seam for the second needle to pass therethrough, and the other said looper operating to engage loops of thread projected through the work by the second needle and to extend loops of thread across the seam for the first needle to pass therethrough, and work feeding means acting to advance the work in the recurring intervals between the engagement of the loopers with needle thread loops and the engagement of the needles with the work after passing through the loops of thread extended across the seam by the loopers.

12. In a sewing machine, the combination of a first looper and a second looper and means simultaneously oppositely reciprocating said loopers across the path of seam formation on opposite sides of the work respectively, a first thread carrying needle and driving means reciprocating it through the work from one side thereof its path of movement being in front of the first looper and to the rear of the second looper, a second thread carrying needle and driving means reciprocating it simultaneously with the first needle through the work from the other side thereof its path of movement being to the rear of the first looper and in front of the second looper, one of said loopers operating at each reciprocation thereof to engage a loop of thread projected through the work by the first needle at one stroke of the needles and to extend a loop of thread across the seam for the second needle to pass therethrough in a succeeding stroke of the needles, and the other said looper operating to engage loops of thread projected through the work by the second needle and to extend loops of thread across the seam for the first needle to pass therethrough, and work feeding means acting to advance the work in the recurring intervals between said succeeding needle strokes.

13. In a sewing machine, the combination of a first thread carrying looper and a second thread carrying looper and means simultaneously and differentially relatively reciprocating said loopers across the path of seam formation in opposite directions on opposite sides of the work respectively, a first thread carrying needle and driving means reciprocating it through the work from one side thereof its path of movement being in front of the first looper and to the rear of the second looper, a second thread carrying needle and driving means reciprocating it simultaneously with the first needle through the work from the other side thereof its path of movement being to the rear of the first looper and in front of the second looper, one of said loopers operating at each reciprocation thereof to project a loop of looper thread through a loop of needle thread projected through the work by the first needle and to extend said looper thread loop across the seam for the second needle to pass therethrough in a succeeding stroke of the needles, and the other looper operating at each reciprocation thereof to project a loop of looper thread through a loop of needle thread projected through the work by the second needle and to extend said looper thread loop across the seam for the first needle to pass therethrough in a succeeding stroke of the needles, and work feeding means acting to advance the work in the recurring intervals between said succeeding needle strokes.

14. In a sewing machine, the combination of a first looper and a second looper and means simultaneously oppositely reciprocating said loopers each approximately in a plane transverse to the path of seam formation and one above the other on opposite sides of the work respectively, a first thread carrying needle and driving means reciprocating it through the work from one side thereof its path of movement being in front of the first looper and to the rear of the second looper, a second thread carrying needle and driving means reciprocating it simultaneously with the first needle through the work from the other side thereof its path of movement being to the rear of the first looper and in front of the second looper, one of said loopers operating at each reciprocation thereof to engage a loop of thread projected through the work by the first needle in one stroke of the needles and to extend a loop of thread across the seam for the second needle to pass therethrough in the next succeeding stroke of the needles, and the other looper operating at each reciprocation thereof to engage a loop of thread projected through the work by the second needle at one stroke of the needles and to extend a loop of thread across the seam for the first needle to pass therethrough in the next succeeding stroke of the needles, and work feeding means acting to advance the work in the recurring intervals between said succeeding needle strokes.

15. In a sewing machine, the combination of a work-plate, two loopers and means differentially relatively reciprocating them back and forth in the same path transverse to the direction of feed and with their reciprocating movements entirely at opposite sides of the work-plate respectively, a needle and driving means reciprocating it through the work-plate from one side thereof in a path of movement in front of one looper and to the rear of the other looper, and a second needle and driving means reciprocating it through the work-plate from the other side thereof in a path of movement in front of one looper and to the rear of the other looper.

16. In a sewing machine, the combination

of a work-plate, two loopers and means differentially reciprocating them transverse to the direction of feed and approximately one above the other and with their reciprocating movements entirely at opposite sides of the work-plate respectively, and a needle and means reciprocating it in a path inclined to the plane of the work-plate and passing in front of one looper and to the rear of the other looper.

17. In a sewing machine, the combination of a work-plate, two loopers and means differentially reciprocating them in rectilinear paths transverse to the direction of feed and approximately one above the other at opposite sides of the work-plate respectively, and a needle and means reciprocating it in an inclined path passing in front of one looper and to the rear of the other looper.

18. In a sewing machine, the combination of a work-plate, a thread-carrying looper with reciprocating means therefor, and two needles with means reciprocating them approximately in paths oppositely inclined with relation to the work-plate, said needle paths passing said looper in front and to the rear thereof respectively.

19. In a sewing-machine, the combination of a work-plate, a thread carrying looper at one side of the work-plate and reciprocating means therefor, and two needles with means reciprocating them in oppositely inclined paths and simultaneously through the work-plate from opposite sides thereof respectively, said needle paths passing said looper at opposite sides thereof respectively.

20. In a sewing machine, the combination of a work-plate, a first looper and a second looper, and means relatively reciprocating said loopers transverse to the direction of feed and at opposite sides of the work-plate respectively, and two needles and means reciprocating them in inclined paths the path of one needle passing in front of the first looper and to the rear of the second looper and the path of the other needle passing to the rear of the first looper and in front of the second looper.

21. In a sewing machine, the combination of a work-plate, a first looper and a second looper and means reciprocating them relatively in opposite directions transverse to the direction of feed at opposite sides of the work-plate respectively, and two needles and means reciprocating them in oppositely inclined paths and through the work-plate from opposite sides thereof respectively, the path of one needle passing in front of the first looper and to the rear of the second looper and the path of the other needle passing to the rear of the first looper and in front of the second looper.

22. In a sewing machine, the combination of a work-plate, an upper looper and a lower looper and means simultaneously reciprocating them in rectilinear paths and in relatively opposite directions transverse to the direction of feed and approximately one above the other at opposite sides of the work-plate respectively, and upper and lower needles and means simultaneously reciprocating them in oppositely inclined paths and through the work-plate from opposite sides thereof respectively, the path of the upper needle passing to the rear of the upper looper and in front of the lower looper and the path of the lower needle passing to the rear of the lower looper and in front of the upper looper.

23. In a sewing machine, the combination of a first looper and a second looper operating one above the other with the movements entirely on opposite sides of the work respectively with means reciprocating said loopers relatively differentially in approximately opposite directions across the path of seam formation, and a thread carrying needle and means reciprocating it in an inclined path passing in front of one looper and to the rear of the other looper, one of said loopers operating to engage loops of thread projected through the work by the needle, and the other looper operating to extend loops of thread across the seam for the needle to pass therethrough.

24. In a sewing machine, the combination of a first looper and a second looper operating one above the other on opposite sides of the work respectively with means relatively differentially reciprocating said loopers across the path of seam formation, a first thread carrying needle and means reciprocating it in an inclined path passing to the rear of the first looper and in front of the second looper, and a second thread carrying needle and means reciprocating it in an inclined path passing to the rear of the second looper and in front of the first looper, one of said loopers operating to engage loops of thread projected through the work by the first needle and to extend loops of thread across the seam into position for the second needle to pass therethrough, and the other looper operating to engage loops of thread projected through the work by the second needle and to extend loops of thread across the seam into position for the first needle to pass therethrough.

25. In a sewing machine, the combination of a first thread carrying looper and a second thread carrying looper operating one above the other on opposite sides of the work respectively with means relatively differentially reciprocating them across the path of seam formation, a first thread carrying needle and means reciprocating it in an inclined path passing to the rear of the first looper and in front of the second looper, and a second thread carrying needle and means reciprocating it in an inclined

path passing to the rear of the second looper and in front of the first looper, one of said loopers operating to engage loops of thread projected through the work by the first needle and to project loops of looper thread therethrough and to extend said looper thread loops across the seam into position for the second needle to pass therethrough, and the other looper operating to engage loops of thread projected through the work by the second needle and to project loops of looper thread therethrough and to extend said looper thread loops across the seam into position for the first needle to pass therethrough.

26. In a sewing machine, the combination of a first thread carrying looper and a second thread carrying looper operating one above the other on opposite sides of the work respectively with means relatively differentially reciprocating them across the path of seam formation, a first thread carrying needle and means reciprocating it in an inclined path passing to the rear of the first looper and in front of the second looper, and a second thread carrying needle and means reciprocating it in an inclined path passing to the rear of the second looper and in front of the first looper, one of said loopers operating to project a loop of its looper thread through each needle thread loop projected through the work by the first needle and to extend each said looper thread loop across the seam into position for the second needle to pass therethrough in a succeeding stroke of the needles, the other looper operating to project a loop of its thread through each needle thread loop projected through the work by the second needle and to extend each said looper thread loop across the seam into position for the first needle to pass therethrough in a succeeding stroke of the needles, and feeding means acting to advance the work between needle strokes.

27. In a sewing machine, the combination of a set of thread carrying needles and driving connections actuating the same to project loops of their threads through the work from one side thereof, a second set of thread carrying needles and driving connections actuating the same to project loops of their threads through the work from the other side thereof, and a looper and means actuating the same to engage loops of thread projected through the work by one set of needles and to extend loops of thread across the seam for the other set of needles to pass therethrough.

28. In a sewing machine, the combination of a set of thread carrying needles and driving connections actuating the same to project loops of their threads through the work from one side thereof, a second set of thread carrying needles and driving connections actuating the same to project loops of their threads through the work from the other side thereof, a looper at one side of the work and means actuating the same to engage loops of thread projected through the work by the first set of needles and to extend loops of thread across the same into position for the second set of needles to pass therethrough, and a second looper at the other side of the work and means actuating the same to engage loops of thread projected through the work by the second set of needles and to extend loops of thread across the seam into position for the first set of needles to pass therethrough.

29. In a sewing machine, the combination of a set of thread carrying needles and driving connections actuating the same to project loops of their threads through the work from one side thereof, a second set of thread carrying needles and driving connections actuating the same to project loops of their threads through the work from the other side thereof, a thread carrying looper at one side of the work and means actuating the same to project loops of its looper thread through loops of thread projected through the work by the first set of needles and to extend said looper thread loops across the seam into position for the second set of needles to pass therethrough, and a second thread carrying looper at the other side of the work and means actuating the same to project loops of its looper thread through loops of thread projected through the work by the second set of needles and to extend said looper thread loops across the seam into position for the first set of needles to pass therethrough.

30. In a sewing machine, the combination of a first looper and a second looper and means reciprocating said loopers across the path of seam formation on opposite sides of the work respectively, a set of needles and driving means reciprocating them through the work from one side thereof their path of movement being in front of the first looper and to the rear of the second looper, and a second set of needles and driving means reciprocating them through the work from the other side thereof their path of movement being to the rear of the first looper and in front of the second looper.

31. In a sewing machine, the combination of a first thread carrying looper and a second thread carrying looper and means reciprocating said loopers across the path of seam formation on opposite sides of the work respectively, a first set of thread carrying needles and driving means reciprocating them through the work from one side thereof their path of movement being in front of the first looper and to the rear of the second looper, a second set of thread carrying needles and driving means recip-

rocating them through the work from the other side thereof their path of movement being to the rear of the first looper and in front of the second looper, one of said loopers operating to engage loops of thread projected through the work by the first set of needles and to project loops of looper thread therethrough and to extend said looper threads across the seam into position for the second set of needles to pass therethrough, and the other looper operating to engage loops of thread projected through the work by the second set of needles and project loops of looper thread therethrough and to extend said looper thread loops across the seam into position for the first set of needles to pass therethrough.

32. In a sewing machine, the combination of a first thread carrying looper and a second thread carrying looper and means simultaneously reciprocating said loopers rectilinearly across the path of seam formation in opposite directions and one above the other on opposite sides of the work respectively, a first set of thread carrying needles and driving means reciprocating them through the work from one side thereof their path of movement being in front of the first looper and to the rear of the second looper, a second set of thread carrying needles and driving means reciprocating them simultaneously with the first set of needles through the work from the other side thereof their path of movement being to the rear of the first looper and in front of the second looper, one of said loopers operating at each reciprocating thereof to project a loop of looper thread through the loops of needle threads projected through the work by the first set of needles in one stroke of the needles and to extend said looper thread loop across the seam for the second set of needles to pass therethrough in the next succeeding stroke of the needles, and the other looper operating at each reciprocation thereof to project a loop of looper thread through the loops of needle threads projected through the work by the second set of needles at one stroke of the needles and to extend said looper thread loop across the seam for the first set of needles to pass therethrough in the next succeeding stroke of the needles, and work feeding means acting to advance the work in the recurring intervals between said succeeding needle strokes.

33. In a sewing machine, the combination of a work-plate, two loopers and means differentially reciprocating them transverse to the direction of feed and approximately one above the other with the movements entirely at opposite sides of the work-plate respectively, and a set of needles and means reciprocating them in an inclined path passing in front of one looper and to the rear of the other looper.

34. In a sewing machine, the combination of a looper with reciprocating means therefor, and two sets of needles with means reciprocating the sets in oppositely inclined paths, said needle paths passing said looper in front and to the rear thereof respectively.

35. In a sewing machine, the combination of a work-plate, a first looper and a second looper, and means reciprocating said loopers transverse to the direction of feed and at opposite sides of the work-plate respectively, and two sets of needles and means reciprocating them in inclined paths the path of one set of needles passing in front of the first looper and to the rear of the second looper and the path of the other set of needles passing to the rear of the first looper and in front of the second looper.

36. In a sewing machine, the combination of a first looper and a second looper operating one above the other on opposite sides of the work respectively with means reciprocating said loopers across the path of seam formation, a first set of thread carrying needles and means reciprocating them in an inclined path passing to the rear of the first looper and in front of the second looper, and a second set of thread carrying needles and means reciprocating them in an inclined path passing to the rear of the second looper and in front of the first looper, one of said loopers operating to engage loops of thread projected through the work by the first set of needles and to extend loops of thread across the seam into position for the second set of needles to pass therethrough, and the other looper operating to engage loops of thread projected through the work by the second set of needles and to extend loops of thread across the seam into position for the first set of needles to pass therethrough.

37. In a sewing machine, the combination of a work-plate, one or more needles operating through the work-plate from above the same and carried by a needle-bar supported in bearings in a head portion of the machine frame to reciprocate in an inclined position relative to the work-plate, driving connections for said needle-bar, one or more needles operating through the work-plate from beneath the same, means carrying and reciprocating said lower needle or needles in an inclined position relative to the work-plate, two loopers on opposite sides respectively of the work-plate and driving connections reciprocating the same each in a path lying between the paths of movement of the upper and lower needles.

38. In a sewing machine, the combination of a work-plate, one or more needles operating through the work-plate from above the same and carried by a needle-bar supported in bearings in a head portion of the machine frame to reciprocate in an inclined position relative to the work-plate, one or

more needles operating through the work-plate from beneath the same and carried by a needle-bar supported in bearings to reciprocate in an inclined position relative to the work-plate opposite the inclination of the upper needle bar, two loopers on opposite sides respectively of the work-plate and driving connections reciprocating the same each in a path lying between the paths of movement of the upper and lower needles.

39. In a sewing machine, the combination of a work-supporting surface an upper and a lower needle bar and one or more needles carried by each bar, bearings supporting said needle bars to move in oppositely inclined positions relative to said work-supporting surface, driving connections reciprocating said needle-bars in their bearings, an upper and a lower looper with means for reciprocating the same, the path of reciprocation of the upper looper being in front of the path of movement of the upper needle or needles and to the rear of the path of movement of the lower needle or needles, and the path of reciprocation of the lower looper being in front of the path of movement of the lower needle or needles and to the rear of the path of movement of the upper needle or needles.

40. In a sewing machine, the combination of a work-supporting surface an upper and a lower needle-bar and one or more needles carried by each bar, bearings supporting said needle bars to move in oppositely inclined positions relative to said work-supporting surface, driving connections reciprocating said needle bars in their bearings, an upper and a lower looper-bar and a looper carried by each, means actuating said looper-bars to simultaneously reciprocate the loopers relatively in opposite directions transverse to the line of seam formation, the path of movement of each looper passing between the paths of movement of the needles carried by the upper and lower needle-bars.

41. In a sewing machine, the combination of a work-plate, upper and lower needles and driving connections causing the same to operate simultaneously through the work-plate from opposite directions respectively, upper and lower loopers, and driving connections actuating each looper to pass to the front of one needle and to the rear of the other needle.

42. In a sewing machine, the combination of a looper having means reciprocating the same in a path transverse to the direction of feed, and two needles with means reciprocating them in paths each inclined from the vertical in a plane approximately parallel to the direction of the feed said needle paths passing said looper in front and to the rear thereof respectively.

43. In a sewing machine, the combination of a looper, two needles, means reciprocating one needle to penetrate loops of thread formed by the looper, means simultaneously reciprocating the other needle to form loops of thread penetrated by the looper, and means reciprocating the looper in an approximately right line path to the rear of one needle and in front of the other needle.

44. In a sewing machine, the combination of a thread-carrying looper, two needles, means reciprocating one needle to project loops of thread through loops of said looper thread formed by the looper, means simultaneously reciprocating the other needle to form loops of thread through which said looper projects loops of its looper thread, and means reciprocating the looper in a path to the rear of one needle and in front of the other needle.

45. In a sewing machine, the combination of a looper having means reciprocating the same in a path transverse to the direction of feed, two needles, means reciprocating one needle to pass at one side of the path of the looper to project loops of thread through loops of thread formed by the looper, and means reciprocating the other needle to simultaneously pass at the other side of the path of the looper to form loops of thread through which loops of thread are projected by the looper.

46. In a sewing machine, the combination of a looper having means reciprocating the same at one side of the work in a path transverse to the direction of feed, two needles, means reciprocating one needle to penetrate the work from one side thereof and pass at one side of the path of the looper to project loops of thread through loops of thread formed by the looper, and means reciprocating the other needle to simultaneously penetrate the work from the other side thereof and pass at the other side of the path of the looper to form loops of thread through which loops of thread are projected by the looper.

47. In a sewing machine, the combination of a thread carrying looper having means reciprocating the same at one side of the work in a path transverse to the direction of feed, two needles, means reciprocating one needle to penetrate the work from one side thereof and pass at one side of the path of the looper to project loops of thread through loops of looper thread formed by the looper, and means reciprocating the other needle to simultaneously penetrate the work from the other side thereof and pass at the other side of the path of the looper to form loops of thread through which loops of looper thread are projected by the looper.

48. In a sewing machine, the combination of a work-plate, a first looper and a second looper, and means differentially reciprocating them transverse to the direction of feed and with their reciprocating movements entirely at opposite sides of the work-plate re-

spectively, a first needle and driving means reciprocating it through the work-plate from one side thereof in a path of movement in front of the first looper and to the rear of the second looper, and a second needle and driving means reciprocating it simultaneously through the work-plate from the other side thereof in a path of movement in front of the second looper and to the rear of the first looper.

49. In a sewing machine, the combination of a work-plate, two loopers and means oppositely reciprocating them simultaneously transverse to the direction of feed and approximately one above the other and with their reciprocating movements entirely at opposite sides of the work-plate respectively, and a needle and means reciprocating it in an inclined path passing in front of one looper and to the rear of the other looper.

50. In a sewing machine, the combination of a work-plate, two loopers and means reciprocating them transverse to the direction of feed at opposite sides of the work-plate respectively, a set of needles and means reciprocating them through the work-plate from one side thereof in an inclined path passing in front of one looper and to the rear of the other looper, and a second set of needles and means reciprocating them through the work-plate from the other side thereof in an inclined path passing in front of one looper and to the rear of the other looper.

51. In a sewing machine, the combination of a thread-carrying needle positioned to operate from one side of the work, a second thread-carrying needle positioned to operate from the other side of the work, driving connections actuating said needles to simultaneously project loops of their threads through the work in opposite directions respectively, and a looper and means actuating the same in an approximately right line path to the rear of one needle and in front of the other needle to engage loops of thread projected through the work by one needle and to extend loops of thread across the seam for the other needle to pass therethrough.

52. In a sewing machine, the combination of a thread-carrying needle positioned to operate from one side of the work, a second thread-carrying needle positioned to operate from the other side of the work, driving connections actuating said needles to simultaneously project loops of their threads through the work in opposite directions respectively, and a thread-carrying looper and means reciprocating the same in a path to the rear of one needle and in front of the other needle, said looper in each reciprocation thereof projecting a loop of looper thread through a loop of needle thread projected through the work by one needle in one stroke of the needles and extending said looper thread loop across the seam for the other needle to pass therethrough in a succeeding stroke of the needles.

53. In a sewing machine, the combination of a thread-carrying needle positioned to operate from one side of the work, a second thread-carrying needle positioned to operate from the other side of the work, driving connections actuating said needles to simultaneously project loops of their threads through the work in opposite directions respectively, and a looper and means reciprocating the same in an approximately right line path to the rear of one needle and in front of the needle, said looper in each reciprocation thereof engaging a loop of thread projected through the work by one needle in one stroke of the needles and extending a loop of thread across the seam for the other needle to pass therethrough in the next succeeding stroke of the needles, and work feeding means acting to advance the work in the intervals between succeeding needle strokes.

54. In a sewing machine, the combination of a looper, two needles, means reciprocating one needle to penetrate loops of thread formed by the looper, means simultaneously reciprocating the other needle to form loops of thread to be penetrated by the looper, and means reciprocating the looper in an approximately right line path to the rear of one needle and in front of the other needle.

55. In a sewing machine, the combination of a thread carrying looper, two needles, means reciprocating one needle to project loops of thread through loops of said looper thread formed by the looper, means simultaneously reciprocating the other needle to form loops of thread through which said looper projects loops of its looper thread, and means reciprocating the looper in a path to the rear of one needle and in front of the other needle.

In testimony whereof I have signed this specification.

ARTHUR A. MERRITT.