J. FORMAN.

MACHINE FOR MAKING HAND BUTTONHOLE STITCHES.

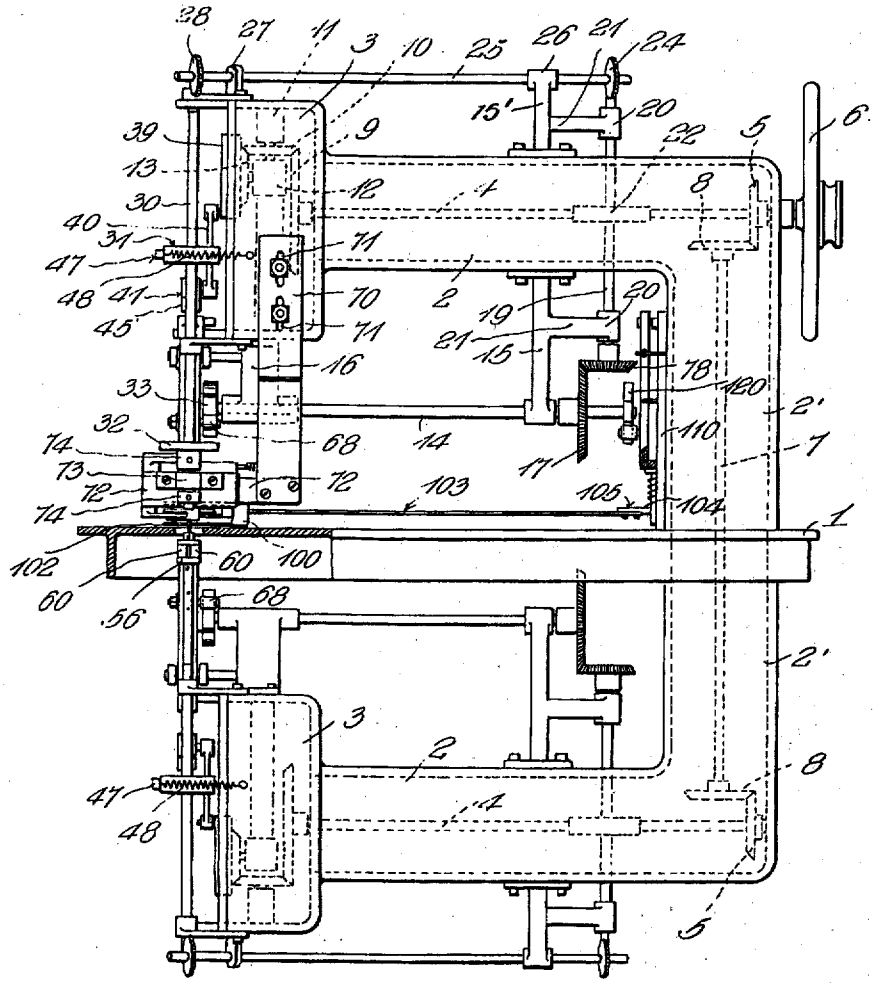
APPLICATION FILED MAY 20, 1915.

1,269,415.

Patented June 11, 1918.

5 SHEETS—SHEET 1.

FIG. 1



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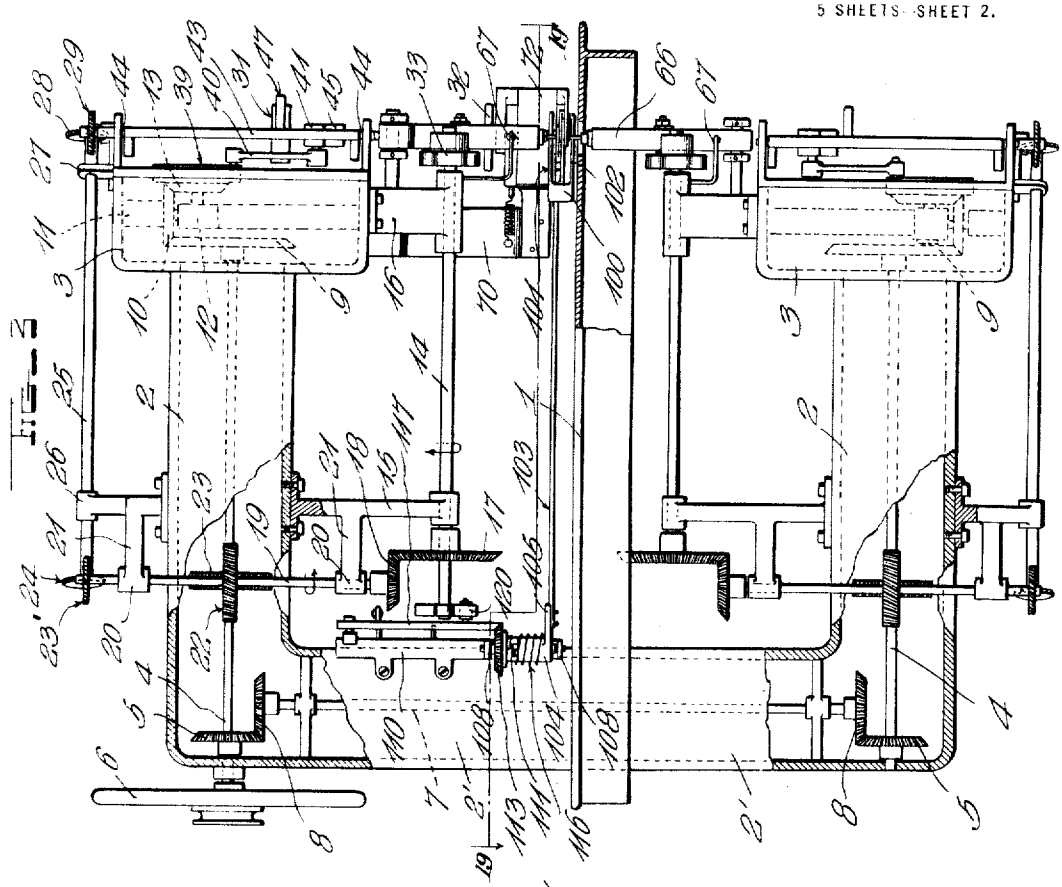


FIG. 2

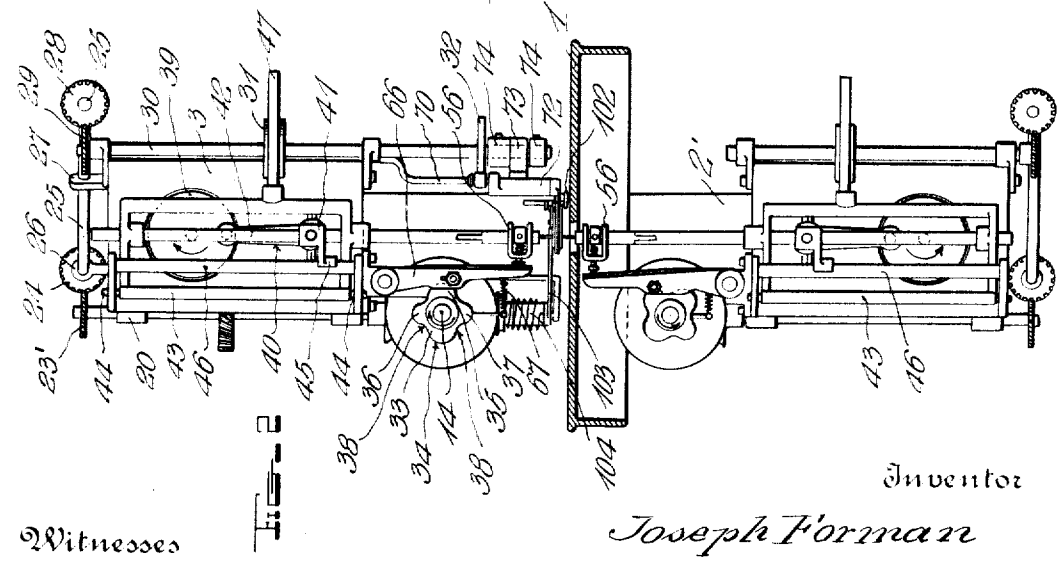


FIG. 3

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FIG. 4

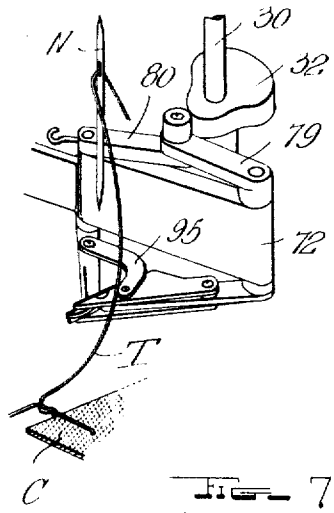


FIG. 5

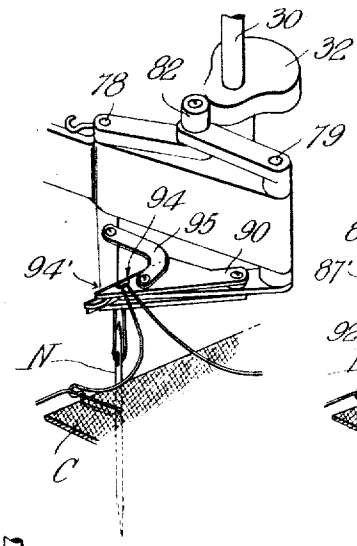


FIG. 6

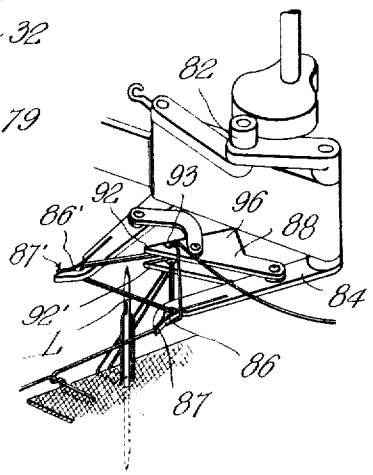


FIG. 7

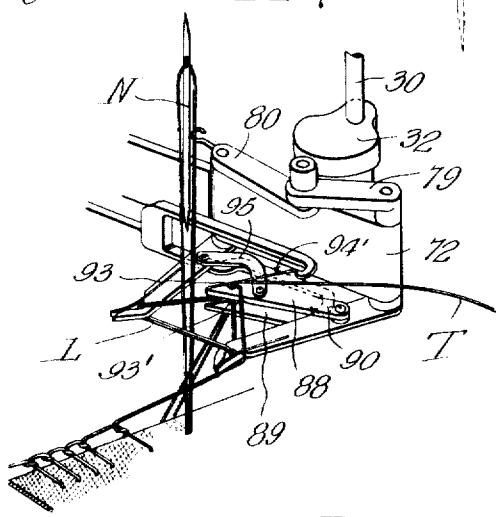


FIG. 8

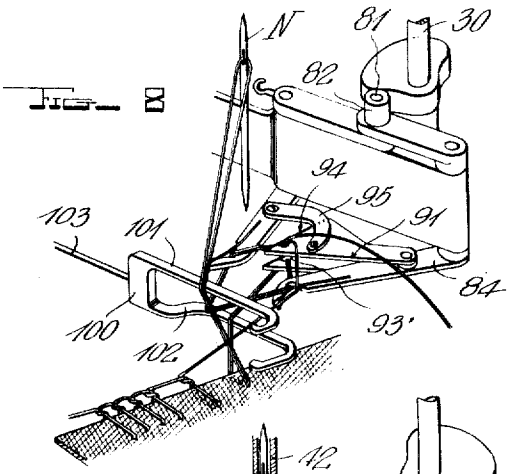
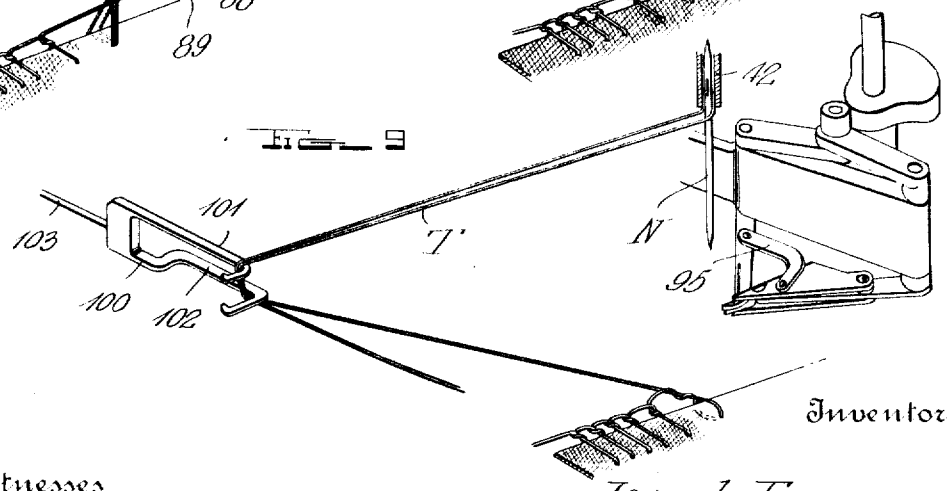


FIG. 9



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FIG. 10

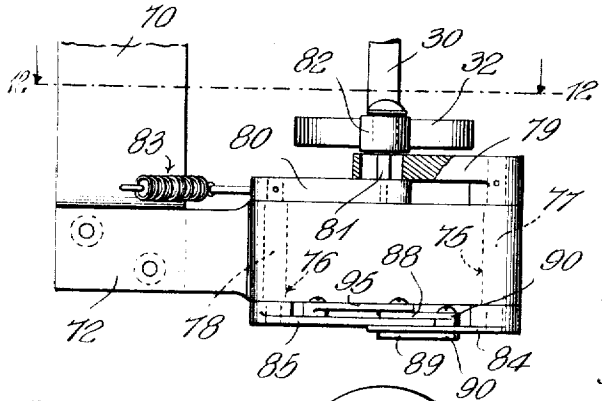


FIG. 11

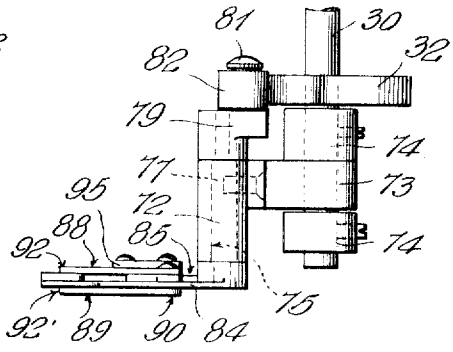


FIG. 12

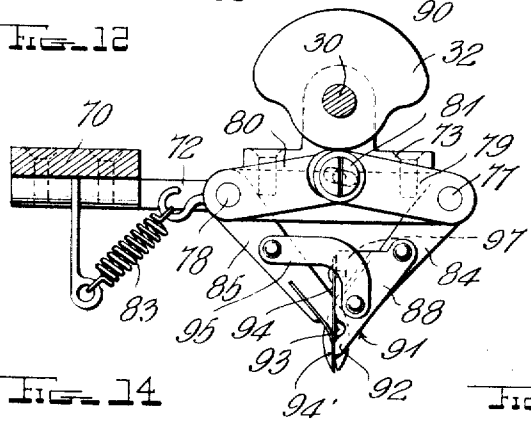


FIG. 13

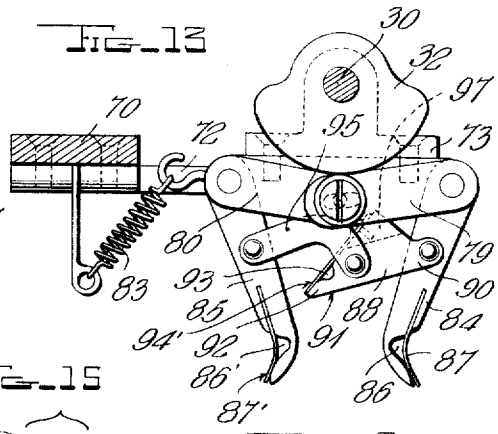


FIG. 14

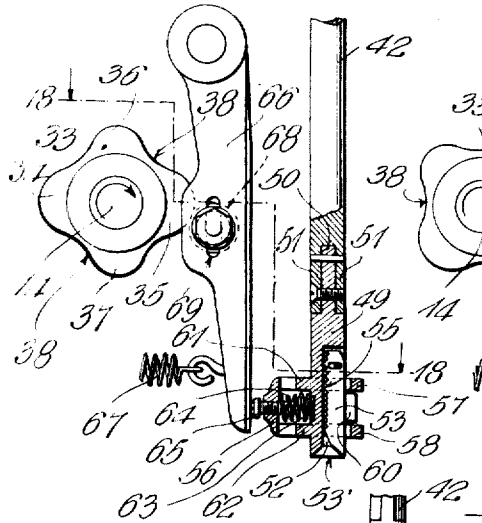


FIG. 15

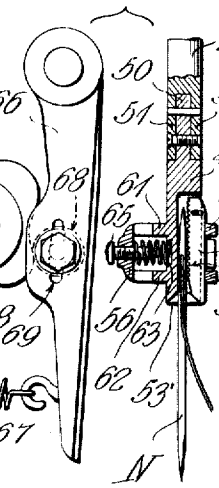


FIG. 17

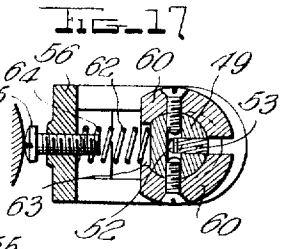


FIG. 18

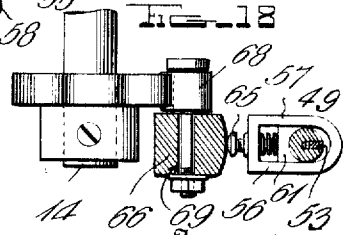
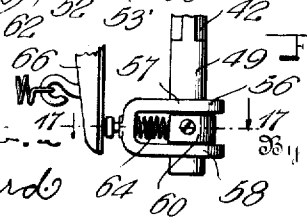


FIG. 16



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5 SHEETS—SHEET 5.

Fig. 19

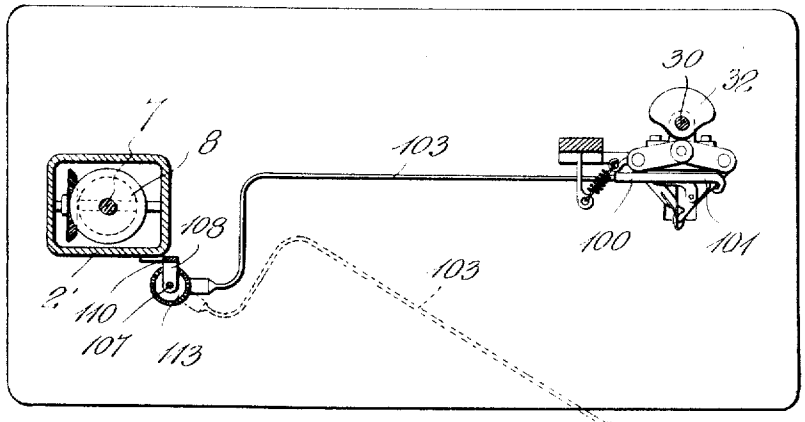


Fig. 20

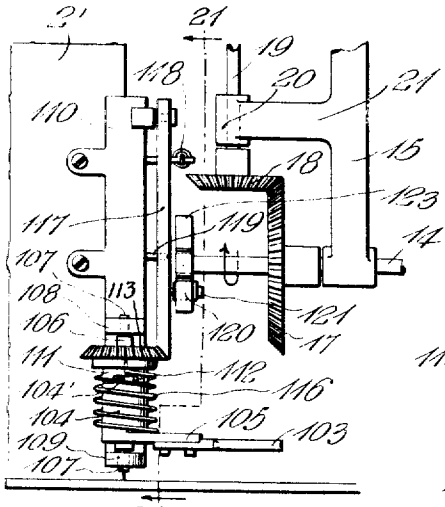


Fig. 21

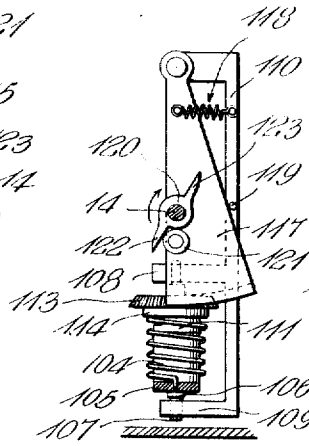


Fig. 24

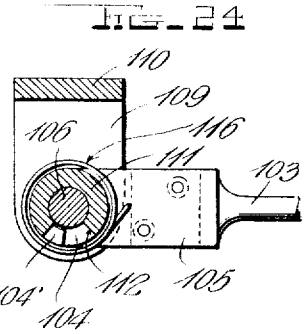


Fig. 22

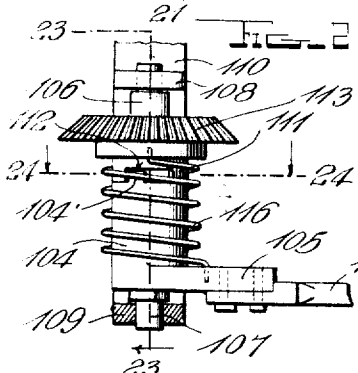


Fig. 23

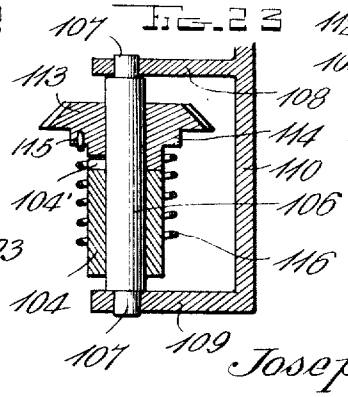
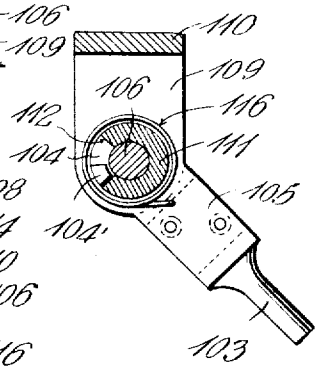


Fig. 25



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UNITED STATES PATENT OFFICE.

JOSEPH FORMAN, OF BALTIMORE, MARYLAND.

MACHINE FOR MAKING HAND BUTTONHOLE-STITCHES.

1,269,415. Specification of Letters Patent. Patented June 11, 1918.

Application filed May 20, 1915. Serial No. 29,372.

To all whom it may concern:

Be it known that I, JOSEPH FORMAN, a citizen of the United States, residing at Walbrook, in the city of Baltimore and State of Maryland, have invented certain new and useful Improvements in Machines for Making Hand Buttonhole-Stitches; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to improvements in sewing machines and more particularly to that class in which the needle has a lateral as well as a vertical reciprocal motion for the purpose of forming buttonhole and other fancy stitches.

The main object of the invention is to provide a simply constructed sewing machine of this character which employs a single thread only and which is constructed to form in a simple and efficacious manner a buttonhole stitch identical with that made by hand.

Another object is to provide improved means for gripping and releasing the needle and for transferring it from one needle bar to the other.

Another object is to provide simple and efficient loop forming mechanism for machines of this character.

Another object is to provide a simple and efficient thread drawing or tightening attachment for machines of this character.

With these and other objects in view, the invention consists of certain novel features of construction, and the combination and arrangement of parts as will be more fully described and claimed.

In the accompanying drawings:

Figure 1 represents a side elevation of a machine equipped with this invention;

Fig. 2 is a front elevation thereof with the parts shown in the position assumed when transferring a needle from the upper needle bar to the lower;

Fig. 3 is a side elevation taken from the side opposite to that on which Fig. 1 is taken;

Fig. 4 is an enlarged detail perspective view showing the stitch forming mechanism with the needle positioned in its extreme uppermost position preparatory to its descent for forming a stitch;

Fig. 5 is a similar view showing the needle in its descent outside the edge of the cloth preparatory to its engagement with the cloth;

Fig. 6 is a similar view showing the needle in its passage upward through the cloth;

Fig. 7 is a similar view showing the needle rising and the jaws of the stitch forming device in open position holding the thread in looped form for the passage therethrough of the needle carried portion of the thread;

Fig. 8 is a similar view showing the stitching or tightening means in the act of removing the stitch or loop from the mechanism on which it is formed;

Fig. 9 is a similar view showing the tightening device in its outward movement for tightening the thread to complete the stitch;

Fig. 10 is a front elevation of the stitch forming mechanism with parts broken off;

Fig. 11 is a side elevation thereof;

Fig. 12 is a horizontal section taken on the line 12—12 of Fig. 10 with the jaws in closed position;

Fig. 13 is a similar view of the jaws in open position;

Fig. 14 is an enlarged end view with the needle bar partly in section showing the upper needle bar ready to receive the needle;

Fig. 15 is a similar view showing the parts in the position which they assume after the needle has been received and gripped by said bar;

Fig. 16 is an enlarged side elevation of the lower end of the upper needle bar;

Fig. 17 is a horizontal section taken on the line 17—17 of Fig. 14;

Fig. 18 is a similar view taken on the line 18—18 of Fig. 14;

Fig. 19 is a horizontal section taken on the line 19—19 of Fig. 3 showing the thread tightening mechanism and the means for operating it, the thread tightener being shown in position ready for engaging a thread in full lines and in its outwardly projected thread tightening position in dotted lines;

Fig. 20 is a detail front elevation showing the operating mechanism for the stitch cast-off or tightening device;

Fig. 21 is a vertical section taken on the line 21—21 of Fig. 20;

Fig. 22 is an enlarged detail showing the gear carrying sleeves for actuating said tightener;

Fig. 23 is a vertical section taken on the line 23—23 of Fig. 22;

Fig. 24 is a transverse section taken on the line 24—24 of Fig. 22, showing the lug and recess connection of the two sleeves with the lug at the extreme end of said recess;

Fig. 25 is a similar view showing the lug at the opposite end of the recess.

In the embodiment illustrated duplicate needle operating mechanism is shown arranged above and below the bed plate or work table 1, the construction of which is exactly alike and hence the upper mechanism only will be described in detail. Each mechanism comprises a hollow L-shaped bracket or arm such as is usually employed in machines of this character having a head 3 cast upon one end of the horizontal arm 2 thereof, and a main shaft 4 mounted in suitable bearings within said horizontal arm, a bevel gear 5 being fixed to said main shaft preferably near its rear end. A band or driving wheel 6 is secured to the rear end of the upper main shaft 4 which latter projects through one end of the arm 2 and whereby motion is imparted to said upper main shaft 4 from any suitable source (not shown). A vertical shaft 7 is rotatably mounted in suitable bearings in the hollow communicating upright arms 2′ of the brackets of the two mechanisms and is provided at its opposite ends with bevel gears 8 positioned to mesh with the bevel gears 5 on the rear ends of the upper and lower main shafts 4 whereby motion is transmitted from the upper main shaft to the lower main shaft as is clearly shown in Fig. 1.

Mounted on the front ends of these main shafts 4 within the heads 3 are large bevel gears 9 which mesh with similar smaller gears 10 mounted in suitable vertically disposed bearings 11 in the heads 3 and which are here shown in the form of castings secured to said heads, said castings being also provided with horizontally disposed bearings 12 in which are revolubly mounted smaller bevel gears 13 which mesh with the gears 10 for a purpose to be described.

Arranged parallel with the main shaft 4 and in a plane below it is a shaft 14 adapted to carry mechanism for controlling the release of the needle by the upper needle bar to be described. This shaft 14 is mounted in suitable bearings carried by brackets 15 and 16 mounted respectively on the arm 2 and head 3. A bevel gear 17 is fixed to the rear end of the shaft 14 and meshes with a similar smaller gear 18 carried by an upright shaft 19 mounted in suitable bearings 20 carried by brackets 21 being here shown as lateral extensions of the brackets 15 and 15′ which extend in opposite directions from arm 2. This upright shaft 19 is provided intermediately of its ends with a worm gear 22 which meshes with a similar gear 23 on the main shaft 4 and by means of which motion is imparted to said shaft 19 and through the gears 18 and 17 to the shaft 14 for a purpose to be described.

A worm gear 23′ is carried by the upper end of the upright shaft 19 and meshes with a similar gear 24 on a horizontally disposed shaft 25 mounted in bearings 26 and 27 carried by brackets supported on the arm 2 and head 3 respectively. This horizontally disposed shaft 25 carries at its front end another worm gear 28 which meshes with a similar gear 29 secured to an upright rod or cam shaft 30 disposed at the front of the machine, said cam shaft 30 having spaced cams 31 and 32 thereon, the purpose of which will hereinafter appear.

Fixed to the front of the shaft 14 is a cam wheel 33 shown provided with two large cams 34 and 35 and two smaller cams 36 and 37 disposed diametrically opposite to each other with recesses 38 formed between the large and small cams for a purpose to be described.

The gear 13 has a disk 39 secured thereto to which is pivoted one end of a pitman 40, the other end of which latter is pivoted to a collar 41 carried by a needle bar 42 whereby said bar and consequently the needle when engaged therewith will be reciprocated vertically as the disk 39 is revolved by the main shaft 4.

A frame 43 is pivoted at 44 to the head 3 and in which the needle bar 42 is mounted. The collar 41 has a laterally extending arm with a semi-circular bearing 45 thereon which is slidably engaged with a fixed upright 46. An arm 47 extends laterally from the free edge of the frame 43 and extends in the path of the cam 31 carried by the shaft 30 by means of which on the turning of said shaft 30, the cam 31 operates to open and close the frame 43, thereby causing the needle bar 42 to reciprocate laterally back and forth, the cam being so positioned and timed that this lateral movement of the frame will occur at predetermined intervals to position the needle carried by the bar for passage through the cloth to be buttonholed or through the space outside said cloth in a manner hereinafter to be described. A coiled spring 48 is connected at one end with the arm 47 and at its other end to the head 3 and operates to return the frame to closed position after it has been swung outwardly by the cam 31 and which serves to yieldably hold said arm in engagement with said cam. The needle bars 42 are each provided with needle receiving and clamping means here shown in the form of a detachable head 49 having a reduced extension 50 at its inner or upper end which fits between laterally spaced arms 51 formed on the adjacent end of the needle bar and between which said extension 50 is securely held by

suitable fastening elements. This head 49 has a bore 52 extending longitudinally inward and which is provided with a flaring mouth 53′ at its outer end adapted to receive and facilitate the insertion of the needle N which is adapted to be mounted in said bore. A jaw 53 is pivotally mounted at one end of said bore and forms a portion of the wall thereof being adapted to swing outwardly for releasing the needle. This jaw 53 is provided on its inner face with a plurality of gripping teeth 55 which are designed to engage the needle mounted in the bore and firmly clamp it between the fixed and movable walls thereof. The clamping of the jaw in operative position is effected by means of a yoke 56, the vertically spaced arms 57 and 58 of which are shown U-shaped in form and are designed to encircle the head 49 of the needle bar around the jaw carrying portion thereof, blocks 60 being shown secured to said head on opposite sides of said movable jaw, sufficient space being left between them to permit the jaw to swing freely inward and outward. These blocks 60 are of a width equal to the distance between the arms 57 and 58 of the yoke 56 and are adapted to serve as a guide for said yoke and to assist in retaining it in operative position on the head 49. Fixed to the head 49 at the rear thereof are two vertically spaced lugs 61 and 62 which are positioned and shaped to fit between the inner ends of the U-shaped arms 57 and 58 and which coöperate with said arms in retaining the jaw 53 in closed position in a manner soon to be described. The head 49 is provided in its rear edge or face at a point between the arms 57 and 58 of the yoke 56 with a socket 63 which is designed to form a seat for a coiled spring 64 arranged between said head and the cross bar of the yoke and which exerts its tension to hold the connected front ends of the arms 57 and 58 in engagement with the jaw 53, thereby yieldably holding said jaw in closed position for reliably retaining the needle within the bore or socket of the head 49. A screw 65 extends through the cross bar of the yoke 56 and enters the coiled spring 64 forming a guide therefor and assisting in holding it in operative position to prevent wabbling or displacement thereof within the yoke. The head of this screw 65 extends beyond the cross bar of the yoke and is adapted to be engaged by a pivotally mounted depending arm 66 which is positioned to engage said screw and on pressure being exerted thereon to force the screw and the yoke with which it is connected laterally forward against the tension of the spring 64, thereby releasing the jaw 53 from its engagement with the cross bars of the arms 57 and 58 and permitting said jaw to swing laterally outward to release the needle N. A coiled spring 67 is connected with the depending arm 66 and with a fixed support for exerting its tension to normally hold said arm out of engagement with the screw 65 as shown in Fig. 15. A roller 68 extends from one face of the arm 66 and is here shown adjustably mounted in a slot 69 to provide for the changing of the position thereof relatively to the cam wheel 33 in the path of which said roller is designed to be positioned so that on the turning of said cam wheel the various cams thereof will be brought into engagement with this roller for forcing the arm 66 forward at predetermined intervals for releasing the needle, it being obvious that when one of the larger cams 36 or 37 is engaged with said roller as shown in Fig. 14, said arm will be forced forwardly into engagement with the screw 65 and thereby force the yoke 56 out of engagement with the clamping jaw 53 for releasing the needle. This cam is so timed that it will remain in engagement with the roller 68 sufficiently long to permit the needle not only to be released but to be transferred from one needle bar to the other. After the large cam passes out of engagement with the roller 68, the recess or dwell 38 between the cams will be brought opposite the roller 68 and permit said arm 66 under the tension of the spring 67 to swing away from the needle bar and thus permit the spring 64 to bring the cross bars of the arms 57 and 58 into clamping engagement with the jaw 53 and thus reliably lock said jaw in fixed position.

It is of course to be understood that when one of the large cams of one cam wheel is in engagement with the roller of its coöperating arm 66, a small cam of the other wheel must be arranged opposite the roller of the other arm to provide for the opening of the jaw of one needle head and the closing of the jaw of the other needle head to grip and transfer the needle from one bar to the other as is clearly shown in Fig. 2 for a purpose to be set forth.

This releasing action of the jaws of the two needle bars takes place when the needle bars which carry them reach the extreme limit of their stroke in one direction; that is, at the end of their stroke which approaches the work table. In Fig. 2 one of the large releasing cams of the upper mechanism is shown in the act of releasing the needle from the upper needle bar and the lower bar is shown in the position which it assumes after the needle is received and clamped thereby with the lower needle bar raised ready for its down stroke. The dwells or recesses 38 in the cam wheel 33 between the cams thereof serve to receive the roller 68 at predetermined intervals for permitting the arm 66 to be held out of engagement with the needle clamping yoke 56, the

maller cams 35 and 36 serving to open the aws sufficiently to receive the needle to be gripped.

The needle operating mechanism being shown in duplicate and both driven by a single band wheel 6, motion being imparted directly therethrough to the upper main shaft and to the lower main shaft by the vertical main shaft 7 and the bevel gears thereon meshing with the bevel gears on said main shaft, one of said shafts is rotated in one direction and the other in the opposite direction as shown by the arrows in Fig. 2.

The stitch or loop forming mechanism employed herein and constituting a part of this invention comprises the peculiar construction and arrangement of links and jaws shown in Figs. 10 to 13, while operation thereof is clearly illustrated in Figs. 4 to 9 inclusive. This stitch forming mechanism is shown mounted on a bracket 70 secured to the head 3 and being here shown provided with longitudinally extending slots 71 through which the fastening bolts pass to provide for the vertical adjustment of said bracket toward and away from the feed table 1. An arm 72 extends laterally forward from the bracket 70 and is provided with a bearing 73 in which the lower end of the shaft 30 is revolubly mounted, said shaft passing through said bearing and being shown held in operative position by collars 74 secured to said shaft on opposite sides of said bar by set screws or other suitable means. The arm 72 is provided at its opposite ends with vertical bearings 75 and 76 through which extend pintles 77 and 78, to the upper end of which are secured links 79 and 80, said links being pivotally connected at their inner ends to form a toggle-like connection, the pintle 81 which connects them projecting above said links and being provided with a roller 82 which is positioned in the path of the cam 32 and by means of which said links are actuated in a manner hereinafter to be described. A coiled spring 83 is connected with the link 80 and with a fixed support and exerts its tension to normally hold the roller 82 carried by the links yieldably in engagement with the cam 32 so that when said cam is actuated, the links are moved outward by the cam and are retracted by the spring when the actuating portion of the cam passes away from the roller. Two arms 84 and 85 are fixed to the lower ends of the pintles 77 and 78 and are designed to be opened and closed on the opening and closing of the links 79 and 80 for a purpose to be described. These arms 84 and 85 are provided at their free ends with eyes 86 and 86′ respectively which are closed by spring tongues 87 and 87′ secured at one end to said arms 84 and 85 at the inner side of said eyes and with their free ends extending outwardly and closing the eyes at the terminals of these arms, said terminals being here shown hook-shaped or diverging away from each other, and the arms are so mounted that when in closed position the end of one overlaps the end of the other to position the eyes thereof in vertical alinement.

Two triangular plates 88 and 89 are provided at one corner with apertured arms 90 which are arranged on opposite faces of the arm 84 and are pivotally connected therewith as is shown clearly in Figs. 4 to 13. These plates 88 and 89 are of the same shape and size, being in the form of scalene triangles with the longer or base portions 91 thereof positioned adjacent the arm 84 and adapted to lap said arm on opposite faces thereof. When so positioned, the free points or corners 92 and 92′ thereof will be positioned in overlapping relation to the eye carrying ends of the arms 84 and 85, and these points are provided with corresponding eyes 93 and 93′ closed by the arms 94′ of a spring metal strip 94 so that when the jaws formed by the arms 84, 85, and the superposed plates 88 and 89 are closed, the eyes thereof will be in vertical alinement for the passage of a needle as will be hereinafter more fully described. A substantially right angular link 95 is pivoted at its opposite ends to the arm 85 at a point midway the ends thereof, being here shown pivoted nearer the pivotal end of said arm and the other end of said link is pivotally connected with the triangular plates 88 and 89 at a point adjacent the eye carrying corners thereof, said link being so positioned and proportioned that when the links 79 and 80 are opened to their full extent as shown in Fig. 13, a triangular space will be formed between the three eyes of the two arms 84 and 85, and of the connected plates 88 and 89, said eyes being designed to carry the thread which forms the stitch as will be hereinafter more fully described. These plates 88 and 89 are rigidly connected at their inner corners 96 by means of a block 97 which forms a spacing member for said plates. The right angular link 95 serves to properly position these jaws with the eyes thereof in vertical alinement when closed ready for the passage therethrough of the needle carrying the thread.

From the above description, it will be obvious that on the turning of the shafts 30 which occurs simultaneously, the cams 31 and 32 carried thereby will operate for opening and closing the frames 43 and the loop forming jaws respectively, these cams operating so that when the frame 43 is swung open the jaws formed by the arms and plates above described are closed and vice versa.

By this arrangement the jaws will be held in closed position with the eyes thereof in vertical alinement when the needle bar carrying frame is closed, thereby positioning the needle in alinement with said eyes to adapt it to pass therethrough when forming the stitch as is shown clearly in Figs. 4 and 5.

When the two needle bars move toward each other the needle N carrying the thread T approaches and passes downward through the registering eyes of the jaws of the needle forming mechanism as shown in Figs. 4 and 5, the swinging bar carrying frames 43 being in closed position and the thread passes through said eyes and the needle is transferred from the upper to the lower bar in the manner above described. The shafts 30 continue to turn bringing the cam 32 of the upper shaft into engagement with roller 82 and the two cams 31 into engagement with arms 47 of the swinging needle bar frames thereby opening said jaws and moving the needle bars laterally to position the needle N under the cloth C, ready to be passed up therethrough into the position shown in Fig. 6. This opening of the jaws forms a triangular loop L in the thread ready for the passage of the needle therethrough. The loop carrying jaws and frames 43 remain in this position until after the needle has passed up through the triangular loop L formed between the eyes of the jaws as shown in Fig. 7 and said needle has been transferred to the upper needle bar. Then the continued turning of the shafts 30 and the cams 31 and 32 carried thereby gradually closes the loop carrying jaws and the frames 43, Fig. 8 showing the jaws in the act of being closed. The frames 43 close simultaneously with the closing of the jaws to position the two needle bars and the overlapping eyes of the jaws in vertical alinement ready for the next downward passage of the needle. Prior to the closing of the jaws and frames a stitch tightener 100 to be described operates to draw or cast off the stitch from the eyes of the jaws as shown in Figs. 8 and 9.

During the closing action of the jaws, the thread tightening device 100 moves outwardly by means hereinafter to be described, and grasps the thread carried by the needle which is passed through the triangular loop on opposite sides of the jaws, said device being provided with two hook shaped arms 101 and 102, and thus sweeps the thread with the stitch formed therein off said jaws, disengaging it therefrom by taking it out of the spring closed eyes thereof, leaving the jaws in the position shown in Fig. 9, said jaws having been closed by the spring 83 connected therewith and which comes into operation when the cam 32 moves out of engagement with the roller 82. The continued outward sweep of the tightener 100 exerts a pulling action on the thread T and thus tightens up the stitch into the position shown in Fig. 9, thereby forming the twisted stitch of the ordinary hand-made buttonhole type.

After the stitch has been tightened to properly position it in relation to the other stitches of the buttonhole, the tightening device 100 moves back into normal position as shown in Fig. 7 ready again for the next operation, the needle being raised and held by the upper needle bar again ready to form the next stitch as is shown in Fig. 4. This operation is continuously repeated until the desired number of stitches have been formed, as is usual with devices of this character.

The thread drawing or tightening attachment 100 which is shown constructed with two hooked arms 101 and 102 spaced vertically apart a distance sufficient to enable them to pass over the overlapping jaws formed by the arms 84, 85, and the plates 88 and 89, is connected with a bar which is mounted on a heavy wire or rod 103 which is preferably but not necessarily resilient, said rod 103 being shown in Fig. 19 and having its rear end offset and connected with one end of a tubular casting or sleeve 104 by means of an arm 105 extending laterally from its lower end. This sleeve 104 is revolubly mounted on a stub shaft 106 having reduced ends 107 mounted in bearings carried by laterally extending arms 108 and 109 of a bracket 110 mounted on the housing.

This sleeve 104 has a lug 104′ extending longitudinally from its upper end and which is designed to engage a recess 112 formed in the adjacent end edge of another sleeve 111 also revolubly mounted on said shaft 106.

This sleeve 111 has a bevel gear 113 fixed thereon with an annular shoulder 114 at its inner end which has an aperture 115 in its lower face to receive one end of a coiled spring 116 which encircles both of said sleeves and has its other end fixed to the arm 105.

This bevel gear 113 meshes with a gear segment 117 which is pivotally mounted at its small end on the bracket 110, a coiled spring 118 connecting said segment with the bracket to yieldably hold the segment in retracted position, a stop 119 being shown to limit its movement in this direction.

This segment 117 is connected with the driving shaft by means of a catch or cam member 120 engaged with a roller 121 carried by said segment (see Figs. 20 and 21). This catch is shown in the form of a collar having arms or cams 122 and 123 extending at diametrically opposite points therefrom and which are designed on the turning of said shaft to engage said roller at predetermined intervals and swing said segment

against the tension of spring 118 thereby turning gear 113 and sleeve 104, thus causing arm or rod 103 and the attachment 100 carried thereby to swing out into the dotted line position shown in Fig. 19.

The lug and recess connection of sleeves 104 and 111, the recess being larger than the lug, in connection with spring 116, provides for a cushioned movement of rod 103 when the segment is actuated thereby prevented danger of breakage of the thread when the loop is cast off.

When the tightening device 100 is moved away from the stitch forming mechanism it exerts sufficient tension on the thread which it engages to tighten the stitch in the manner shown in Fig. 9. It is to be noted that the double pointed needle N has its eye near its upper end so that it is within the upper needle chuck when the needle is clamped by the latter, and hence the stitch tightener 100 will put under tension that portion of the thread between the needle and the last formed stitch. After this tightening operation has been completed, the wire 103 is swung backward by the rearward swing of the gear segment 117 which occurs under the action of spring 118 when the catch 120 releases the segment and the device is then ready for the next tightening operation.

The stitch herein produced, is formed by the concatenation of loops in a single thread one carried by the needle N and the other by the loopers or jaws through which latter the needle carried portion of the thread is passed to form the twisted stitch shown in Fig. 9, the stitch being cast off the loopers and tightened by the tightener 100 and being identical in every respect with a hand made buttonhole stitch. It is well known that numerous machines have been constructed for producing what are known as machine buttonhole stitches, but so far as is known none of them produce a stitch of this type identical with those made by hand.

I claim as my invention:

1. A machine for making a hand button hole stitch comprising in combination a needle, two needle gripping and transferring devices movable toward and away from each other and between which the material is fed, mechanism for forming a loop encircling the path of movement of said needle, and means for tightening said loop.

2. A machine for making a hand buttonhole stitch comprising in combination a needle, two needle gripping and transferring devices movable toward and way from each other and between which the material is fed, mechanism for forming a loop encircling the path of movement of said needle comprising eyes alined when in one position to receive the needle and thread carried thereby during its passage from one needle gripping device to the other, said eyes being laterally movable away from each other to form a loop encircling the path of the needle and adapted to receive the thread on the repassage of the needle and thread, and means for tightening the loop.

3. A machine for making a hand buttonhole stitch comprising in combination a needle, two needle gripping and transferring devices movable toward and away from each other and between which the material is fed, mechanism for forming a loop encircling the path of movement of said needle, including a plurality of thread retaining means adapted to be disposed in vertical alinement at predetermined intervals for the passage therethrough of the needle carrying a thread when said needle is moved in one direction, means for moving said thread retaining means away from each other to form a loop encircling the path of the needle, said loop being adapted to receive the needle and the thread carried thereby on its movement in the opposite direction, and means for tightening said loop around said thread.

4. A machine for making a hand buttonhole stitch comprising in combination a needle, two needle gripping and transferring devices movable toward and away from each other, and between which the material is fed, mechanism for forming a loop encircling the path of movement of said needle comprising a plurality of eyes for detachably receiving a thread, said eyes being alined for the passage of the needle and the thread carried thereby on the movement of the needle in one direction, means for moving said eyes away from each other after the passage of the needle therethrough and preparatory to the movement of the needle in the opposite direction to form a loop encircling the path of movement of said needle, said loop being designed to receive the needle and the thread carried thereby and a swinging member for withdrawing said loop from said eyes and tightening it around the thread carried by the needle.

5. A machine for making a hand buttonhole stitch comprising in combination a needle, two needle gripping and transferring devices movable toward and away from each other and between which the material is fed, mechanism for forming a loop encircling the path of movement of said needle, and means for shifting the needle in a plane at right-angles to its normal path of movement.

6. A machine for making a hand button hole stitch comprising in combination a needle, two needle gripping and transferring devices movable toward and away from each other and between which the material is fed, mechanism for forming a loop

encircling the path of movement of said needle, and means for shifting said needle laterally between its down and up strokes.

7. In a sewing machine, the combination of two alined needle bars carrying needle clamping means, and between which bars the material is fed, a needle adapted to be carried alternately by said bars, a plurality of thread carrying jaws having eyes arranged for vertical alinement when the jaws are in closed position, means for opening and closing said jaws at predetermined intervals, and means for casting off the stitch formed on said jaws.

8. In a sewing machine, the combination of two alined needle bars carrying needle clamping means, and between which bars the material is fed, a needle adapted to be carried alternately by said bars, a plurality of thread carrying jaws having eyes arranged for vertical alinement when the jaws are in closed position, means for opening and closing said jaws at predetermined intervals, and means for casting off and tightening the stitch formed on said jaws.

9. A machine for making a hand buttonhole stitch comprising in combination a needle, two needle gripping and transferring devices movable toward and away from each other and between which the material is fed, cam actuated means for effecting the change of said needle from one device to the other at predetermined intervals, mechanism for forming a loop encircling the path of movement of the needle and a swinging tightener arm for removing the loop from said mechanism.

10. In a sewing machine, the combination of two alined needle bars, and between which bars the material is fed, a needle adapted to be carried alternately by said bars, a needle clamping jaw carried by each needle bar, means for holding said jaw in closed position, a laterally movable arm for releasing said jaw, and a cam wheel positioned to engage said arm and force it into releasing engagement with said holding means at predetermined intervals, said cam wheel having alternately arranged large and small cams with dwells between them to provide for the projection of said cam into engagement with said holding means and its retention in said engagement for varying intervals.

11. In a sewing machine, the combination of two alined needle bars, and between which bars the material is fed, a needle adapted to be carried alternately by said bars, a needle clamping jaw carried by each needle bar, resilient means for holding said jaw in closed position, a pivoted arm extending in the path of said holding means, resilient means for normally retracting said arm, and a cam wheel positioned to engage said arm and force it into releasing engagement with said holding means at predetermined intervals, said cam wheel having pairs of oppositely disposed large and small cams with dwells between them to provide for the projection of said pivoted arm into engagement with said holding means and its retention in said engagement for varying intervals.

12. In a sewing machine the combination of two alined needle bars having needle receiving sockets with flaring mouths, a needle adapted to be carried alternately by said sockets, a laterally movable needle clamping jaw carried by each bar, a spring pressed yoke having U-shaped arms encircling each bar, blocks on said bar between said arms, and means for releasing said yoke against the tension of its spring.

13. In a sewing machine the combination of two alined needle bars having needle receiving sockets with flaring mouths, a needle adapted to be carried alternately by said sockets, a laterally movable needle clamping jaw carried by each bar, a spring pressed yoke having U-shaped arms encircling each bar, blocks on said bar between said arms, arranged on opposite sides of said jaw to provide for the free movement of the jaw between them, and means for releasing said jaw against the tension of said spring pressed yoke.

14. In a sewing machine, the combination of two alined needle bars having needle receiving sockets with flaring mouths, a needle adapted to be carried alternately by said sockets, a laterally movable needle clamping jaw carried by each bar, a spring pressed yoke having U-shaped arms encircling each bar, blocks on said bar between said arms arranged on opposite sides of said jaw to provide for the free movement of the jaw between them, means for releasing said jaw against the tension of said spring pressed yoke, and guide members on said bar arranged between the members of said U-shaped arms.

15. In a sewing machine, the combination of two alined needle bars carrying needle clamping means, and between which bars the material is fed, a needle adapted to be carried alternately by said bars, a pair of longitudinally spaced bearings arranged in front of one of said needle bars, pintles mounted in said bearings and projecting at opposite ends thereof, links fixed at one end to one end of said pintles and pivotally connected at their other ends, a cam disposed opposite said pivotally connected link ends, arms fixed to the other ends of said pintles and having spring closed eyes at their free ends, a member pivoted to one arm and an L-shaped link pivoted to the other arm, said link and member being pivotally connected, said member having an eye at its free end closed by a spring tongue.

16. In a sewing machine, the combination of two alined needle bars carrying needle clamping means, and between which bars the material is fed, a needle adapted to be carried alternately by said bars, a plurality of thread carrying jaws having eyes arranged for alinement when the jaws are in closed position, means for opening said jaws at predetermined intervals and for holding them open until after the needle carrying a thread has been passed therethrough, and means for closing said jaws after the passage of said needle.

17. In a sewing machine, the combination of two alined needle bars carrying needle clamping means, and between which bars the material is fed, a needle adapted to be carried alternately by said bars, means for actuating said bars and clamping means, a plurality of jaws having eyes for removably receiving a thread carried by the needle, means for yieldably retaining the thread in said eyes, said eyes being positioned to aline vertically when said jaws are closed, and automatically controlled means for operating said jaws in timed relation to the needle operating means to permit the threaded needle to pass through the alining eyes of the jaws when the jaws are in closed position and to open said jaws to form a loop for the passage of said threaded needle to form a buttonhole stitch.

18. In a sewing machine, the combination of two alined needle bars carrying needle clamping means, and between which bars the material is fed, a needle adapted to be carried alternately by said bars, a plurality of jaws having eyes for removably receiving a thread, means for yieldably retaining a thread in said eyes, said eyes being positioned, to aline vertically when said jaws are closed, automatically controlled means for operating said jaws and needle to pass the threaded needle through the alining eyes of the jaws when the jaws are in closed position to open said jaws to form a loop and to pass said threaded needle through said loop to form a buttonhole stitch, and means for removing said stitch from said jaws and tightening it into engagement with the fabric being buttonholed.

19. In a stitch forming mechanism for sewing machines, the combination of means for vertically reciprocating a needle, means for moving said needle reciprocating means laterally at predetermined intervals, a loop forming device positioned in the path of said needle and having means for engaging the thread carried by said needle during the passage of the needle in one direction, means for actuating said thread engaging means to form a loop after the passage of said needle, said needle being passed through said loop on its movement in the opposite direction, and means for withdrawing the loop engaged thread from said thread engaging means and tightening it to form a stitch.

20. In a stitch forming mechanism for sewing machines, the combination of means for vertically reciprocating a needle, means for moving said needle laterally at predetermined intervals, a loop forming device positioned in the path of said needle and comprising pivoted laterally opening and closing jaws having thread receiving eyes positioned to lap and aline when the jaws are closed, cam controlled means for opening said jaws, and spring means for closing them, said needle being so actuated and timed in its vertical and lateral movements as to pass through the alined eyes on its vertical movement in one direction and through the loop formed thereby on its vertical movement in the opposite direction.

21. A stitch tightener comprising vertically spaced connected parallel arms arranged in vertical alinement and having hooks at their free ends extending laterally in the same direction, and means for operating said tightener.

22. A machine for making a hand buttonhole stitch comprising in combination a needle, needle gripping and transferring devices movable toward and away from each other and between which the material is fed, mechanism for forming a loop encircling the path of movement of said needle and yieldable means for sweeping the loop from the loop forming mechanism and tightening the stitch.

23. A machine for making a hand buttonhole stitch comprising in combination a needle, needle gripping and transferring devices movable toward and away from each other between which the material is fed, mechanism for forming a loop encircling the path of the needle, said mechanism including a plurality of members having thread receiving eyes movable toward each other to aline their eyes for the passage of the needle therethrough and away from each other to spread the eyes laterally to form the loop and a loop tightener having arms to straddle said eye members and movable in timed relation to the loop forming mechanism.

24. A machine for making a hand buttonhole stitch comprising in combination a needle, needle gripping and transferring devices movable toward and away from each other between which the material is fed, mechanism for forming a loop encircling the path of the needle, said mechanism including a plurality of members having thread receiving eyes movable toward each other to aline their eyes for the passage of the needle therethrough and away from each other to spread the eyes laterally to form the loop, a loop tightener movable toward and away from the loop forming mechanism, ac-

tuating means for said tightener, and yieldable means interposed between the loop tightener and its actuating means.

25. A machine for making a hand buttonhole stitch comprising in combination a needle, needle gripping and transferring devices movable toward and away from each other between which the material is fed, mechanism for forming a loop encircling the path of the needle, said mechanism including a plurality of members having thread receiving eyes movable toward each other to aline their eyes for the passage of the needle therethrough and away from each other to spread the eyes laterally to form the loop, a spring retracted loop tightener movable toward and from the loop forming mechanism, and yieldable cam controlled means for actuating the tightener in timed relation to the loop forming mechanism.

26. A machine for making a hand buttonhole stitch comprising in combination a double pointed needle having near one point an eye which receives a single thread, the latter having one end free and its other end anchored, two needle gripping and transferring devices movable with respect to each other and between which the material is fed, one of said devices being adapted to receive the needle eye, mechanism for forming in said thread between the needle and its anchored ends, a loop encircling the path of the needle, and mechanism for removing the loop from the loop forming mechanism and tightening the stitch.

27. A machine for making a hand buttonhole stitch comprising in combination a needle, needle gripping and transferring devices movable with respect to each other and between which the material is fed, a plurality of members having open thread receiving eyes movable toward each other to aline their eyes for the passage of a threaded needle and away from each other to separate their eyes laterally to form a loop encircling the path of the needle, cam means for controlling said members, means for shifting the needle gripping devices laterally with respect to the edge of the material being operated upon and in timed relation to the operation of said eye members, and means for tightening the loop.

28. A machine for making a hand buttonhole stitch comprising in combination a needle, needle gripping and transferring devices movable toward and away from each other and between which the material is fed, mechanism for forming a loop encircling the path of movement of said needle comprising pivoted members having open thread receiving eyes and movable toward each other to aline their eyes for the passage of the threaded needle therethrough and movable away from each other to separate the eyes laterally to form a loop adapted to receive the thread on the repassage of the threaded needle, and means for tightening the loop.

29. A machine for making a hand buttonhole stitch comprising in combination a needle, a pair of alining reciprocatory needle bars between which the material is fed, means for actuating the needle bars simultaneously toward and away from each other, a needle chuck on each bar to alternately receive the needle, a slidable member on each bar for operating the chuck thereon, swinging members for actuating said slidable members, cam controlled means for operating said swinging members, mechanism for forming a loop encircling the path of the needle, and means for tightening the loop.

30. In a sewing machine, a loop forming mechanism including a plurality of members having open eyes through which a threaded needle may pass when they are alined, and means for actuating said members whereby when they are separated after passage of the needle their eyes are disalined to form a thread loop.

31. In a sewing machine, a loop forming mechanism including a plurality of members having open eyes, connections between said members for simultaneously closing them to aline their eyes for the passage of a threaded needle, and opening them to disaline their eyes after the passage of the needle, and means for actuating the said connection.

32. In a sewing machine, a loop forming mechanism including a plurality of members having open eyes through which a threaded needle may pass when they are alined, toggle link connections for said members for actuating them simultaneously to aline and disaline their eyes, and cam means for actuating said toggle connections.

33. In a sewing machine, a loop forming mechanism including a pair of pivoted members having open eyes through which a threaded needle may pass, means for moving said members simultaneously toward and away from each other to aline and disaline their eyes, a third eye member pivoted on one of the first mentioned members, and a link connecting the other of said pair of members to said third member, whereby the eyes of all three members will be simultaneously alined and disalined upon the operation of said moving means.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOSEPH FORMAN.

Witnesses:
MAX OMANSKY,
WOLF MANEN.