W. C. DIEFENBACH.

MACHINE FOR SEWING HOOKS AND EYES AND LOOPS ON CARDS.

APPLICATION FILED APR. 15, 1911.

1,121,901.

Patented Dec. 22, 1914.

11 SHEETS—SHEET 1.

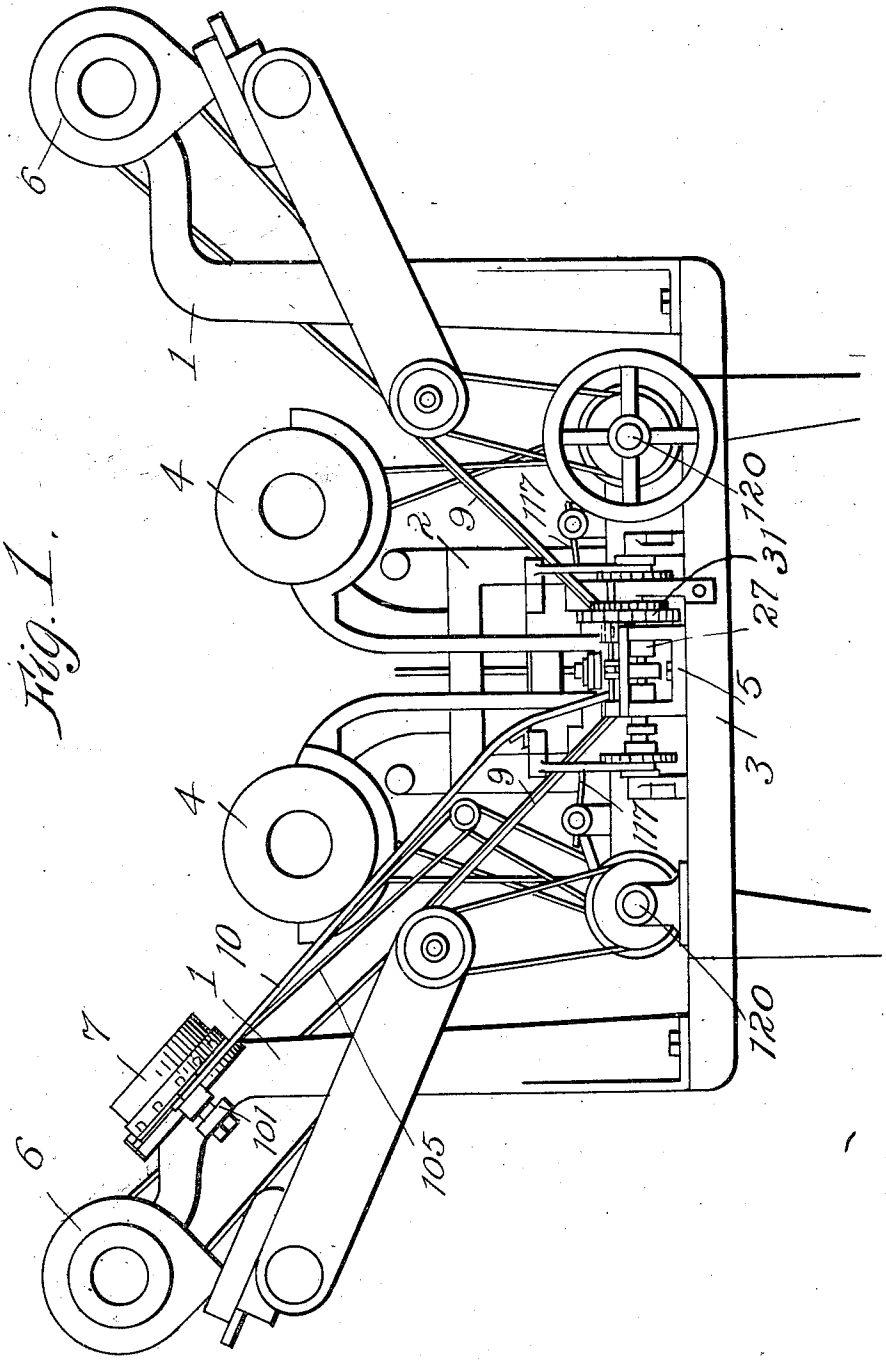


Fig. 1.

Witnesses:
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H. Alfred Jaulke

Inventor
William C. Diefenbach
By his Attorneys

W. C. DIEFENBACH.

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11 SHEETS—SHEET 2.

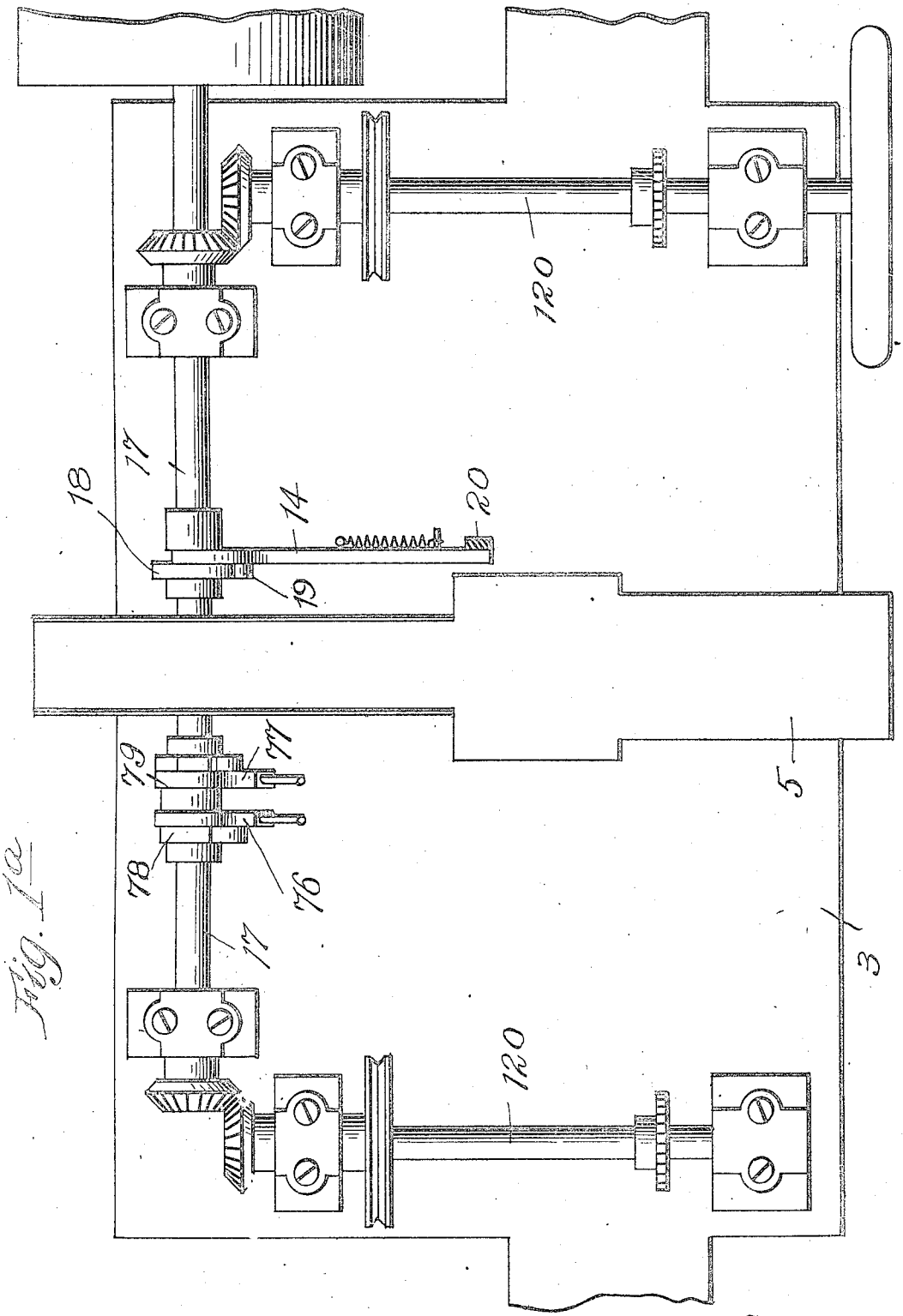


Fig. 12.

Witnesses:
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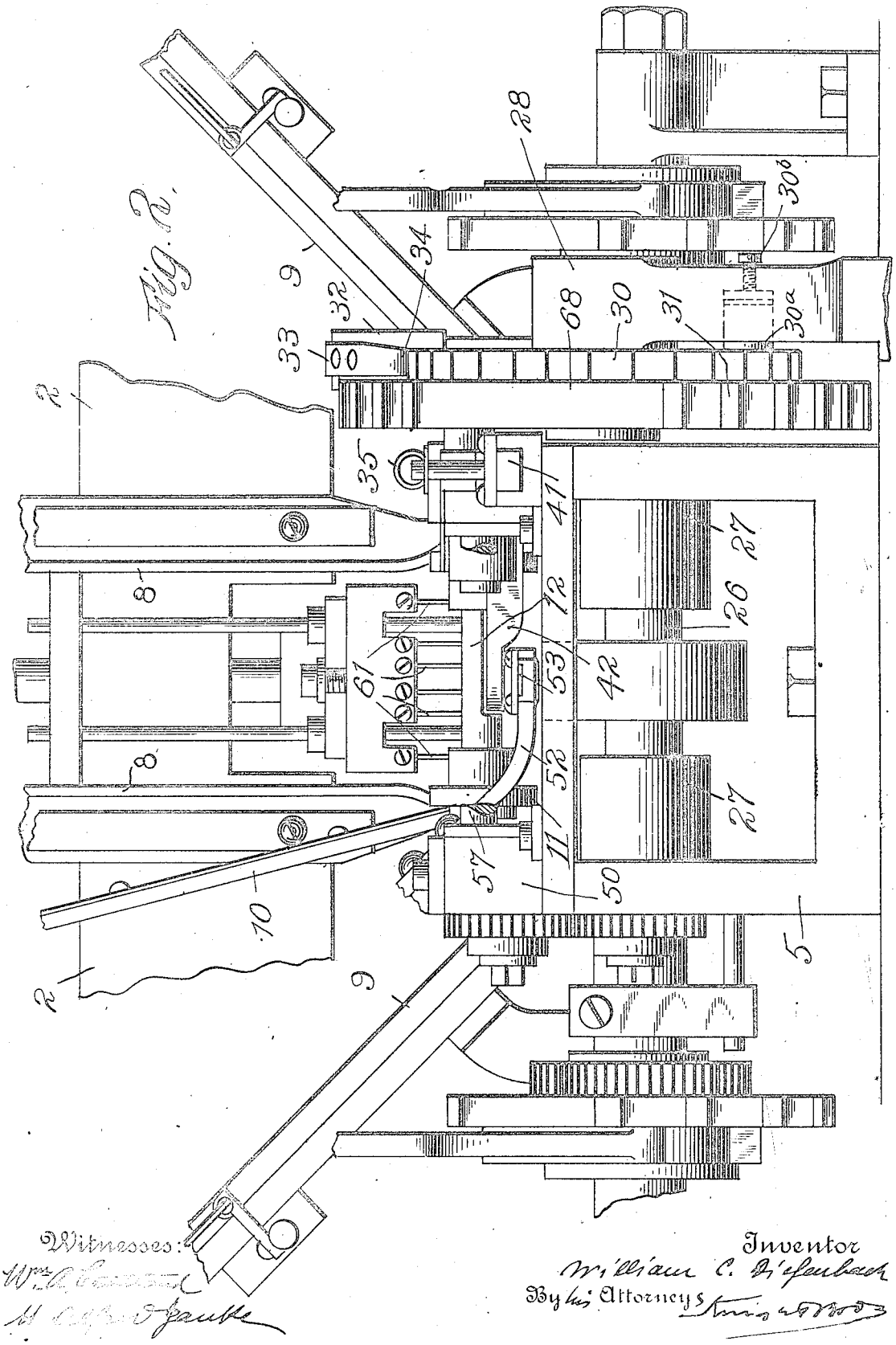
W. C. DIEFENBACH.

MACHINE FOR SEWING HOOKS AND EYES AND LOOPS ON CARDS.

APPLICATION FILED APR. 15, 1911.

1,121,901. Patented Dec. 22, 1914.

11 SHEETS—SHEET 3.



Witnesses:

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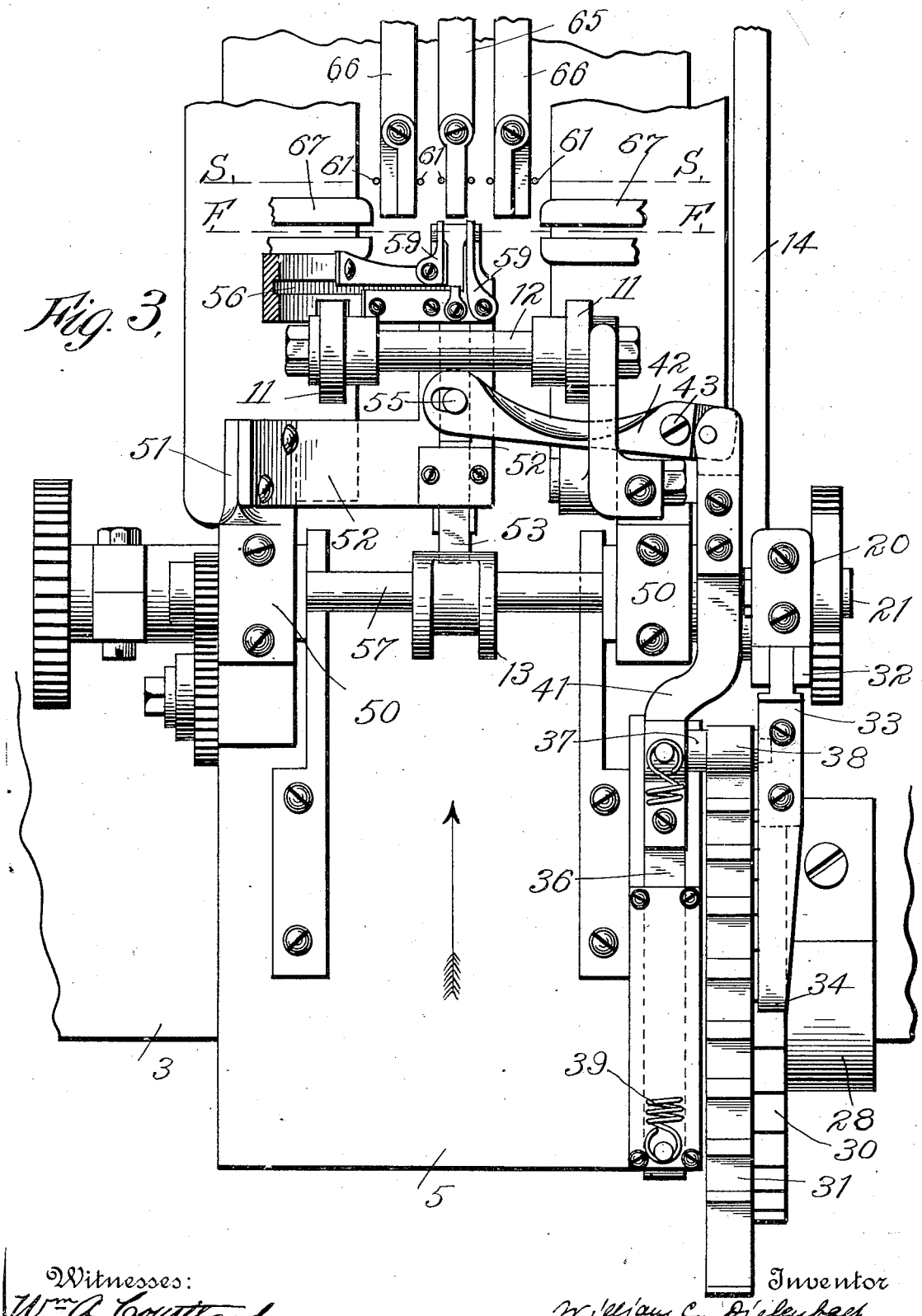
MACHINE FOR SEWING HOOKS AND EYES AND LOOPS ON CARDS.

APPLICATION FILED APR. 15, 1911.

1,121,901. **Patented Dec. 22, 1914.**

11 SHEETS—SHEET 4.

Fig. 3.



Witnesses:
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Kenyon & Kenyon

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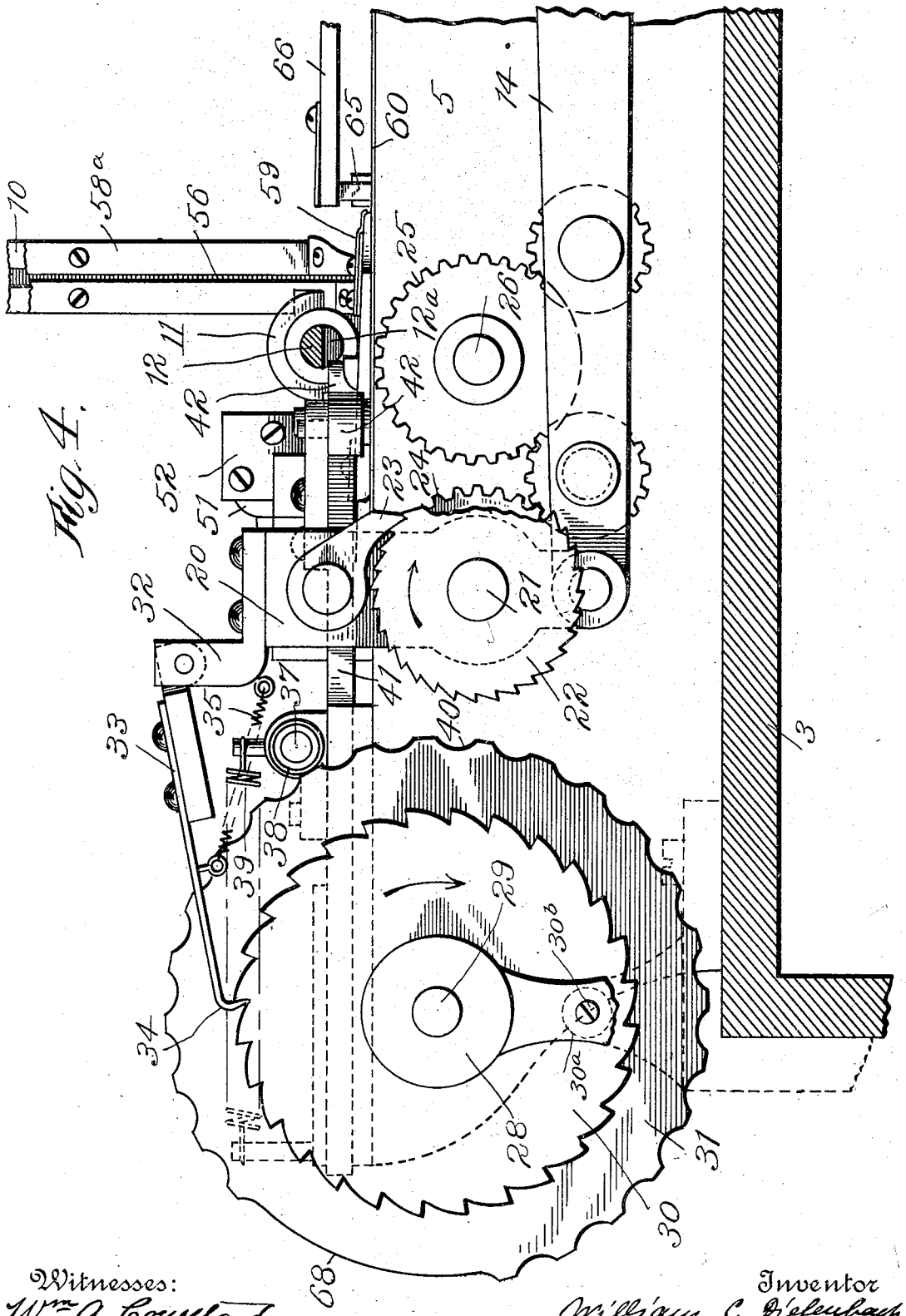
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1,121,901. Patented Dec. 22, 1914.

11 SHEETS—SHEET 5.

Fig. 4.



Witnesses:

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By his Attorneys

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MACHINE FOR SEWING HOOKS AND EYES AND LOOPS ON CARDS.

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1,121,901. Patented Dec. 22, 1914.

11 SHEETS—SHEET 6.

Fig. 5.

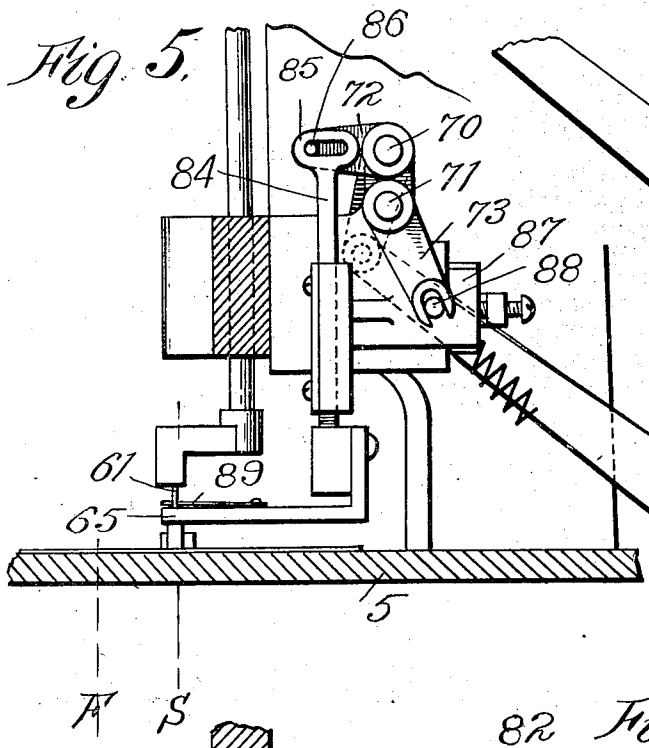


Fig. 5a

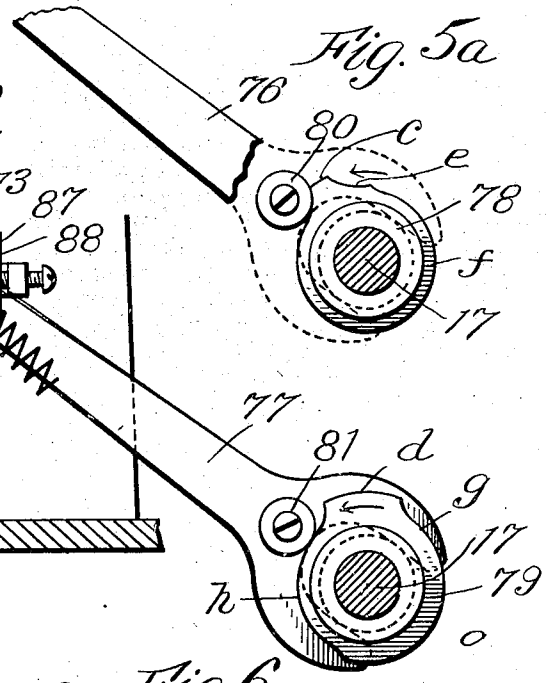


Fig. 6.

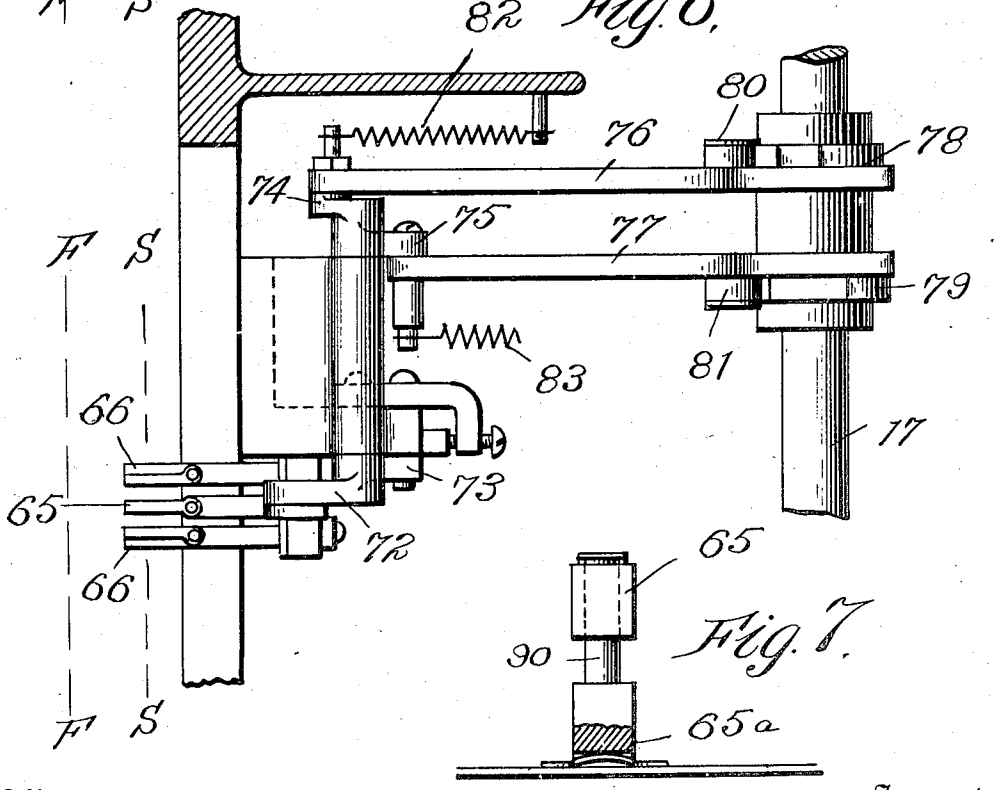


Fig. 7.

Witnesses:
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By his Attorneys Howson & Howson

W. C. DIEFENBACH.

MACHINE FOR SEWING HOOKS AND EYES AND LOOPS ON CARDS.

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1,121,901. Patented Dec. 22, 1914.

11 SHEETS—SHEET 7.

Fig. 8.

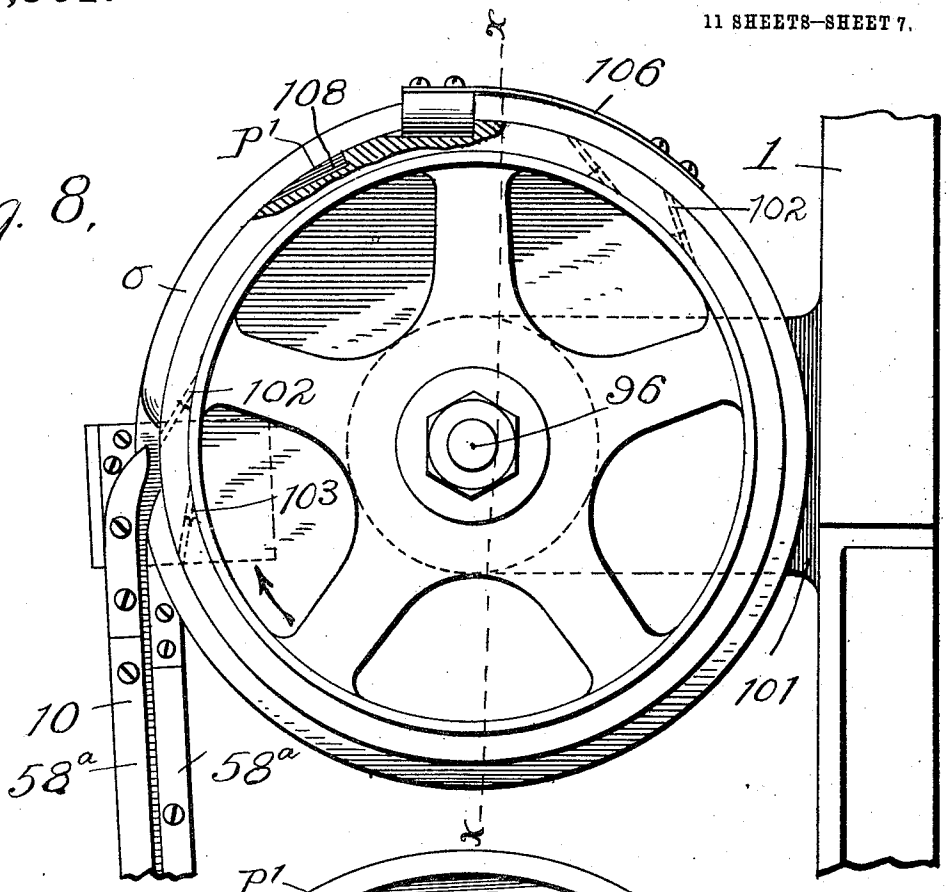
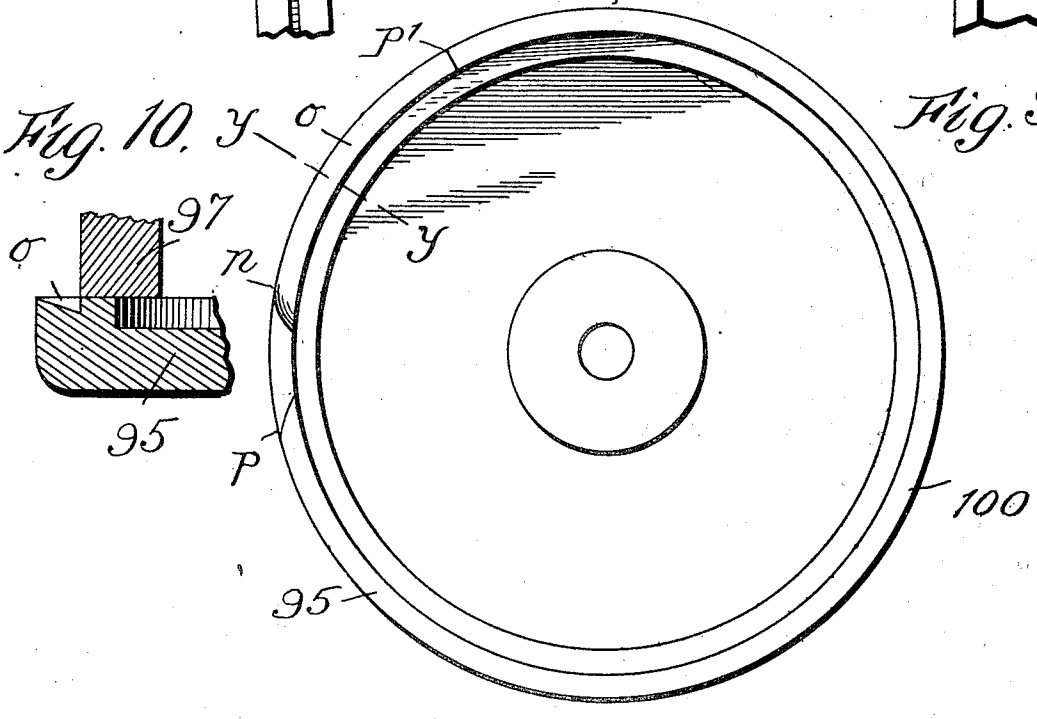


Fig. 9.

Fig. 10.



Witnesses:
Wm. A. Coulland
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By his Attorneys
Fenwick & Woodhouse

W. C. DIEFENBACH.

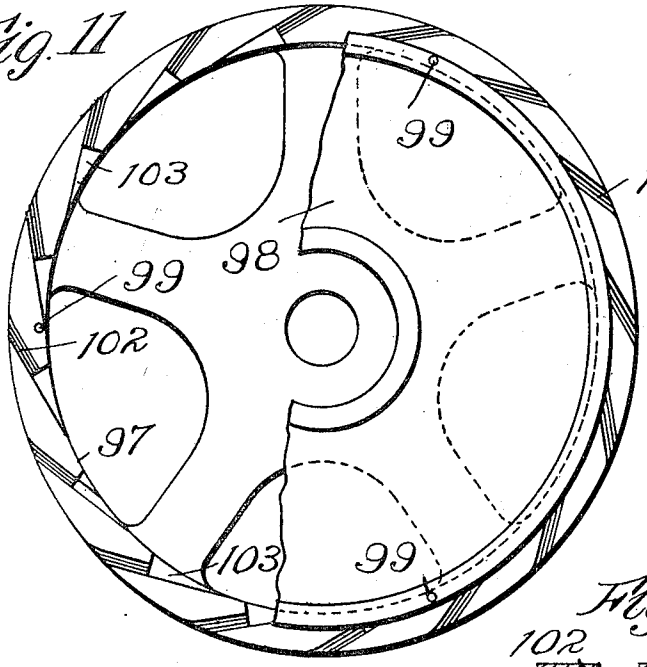
MACHINE FOR SEWING HOOKS AND EYES AND LOOPS ON CARDS.

APPLICATION FILED APR. 15, 1911.

1,121,901. Patented Dec. 22, 1914.

11 SHEETS—SHEET 8.

Fig. 11



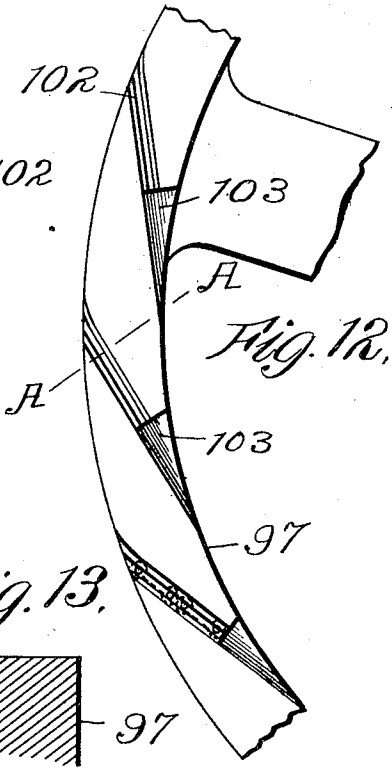
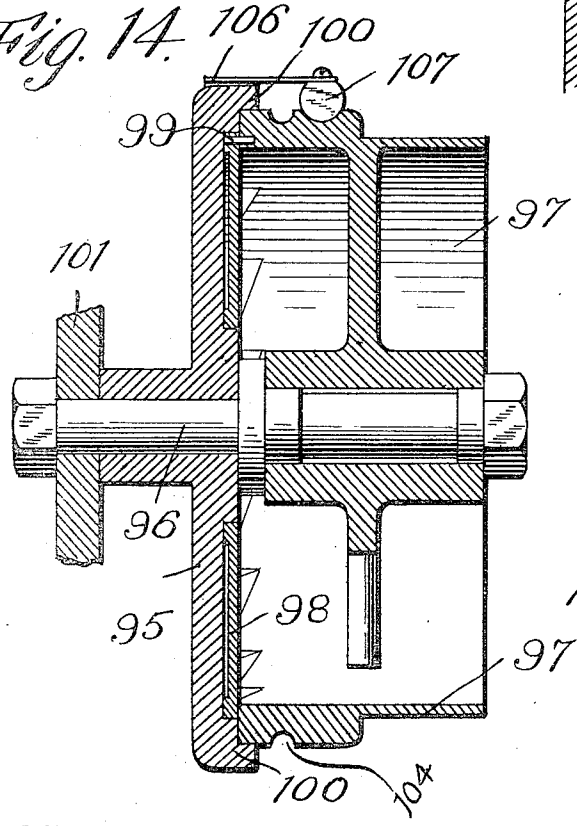


Fig. 12.

Fig. 13.

Fig. 14.



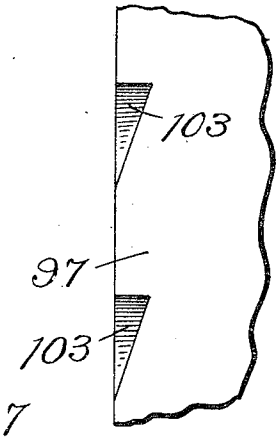


Fig. 15.

Witnesses:
Wm. A. Courtland
H. Alfred Janke

Inventor
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By his Attorneys Howson & Howson

W. C. DIEFENBACH.

MACHINE FOR SEWING HOOKS AND EYES AND LOOPS ON CARDS.

APPLICATION FILED APR. 15, 1911.

1,121,901. Patented Dec. 22, 1914.

11 SHEETS—SHEET 9.

Fig. 16.

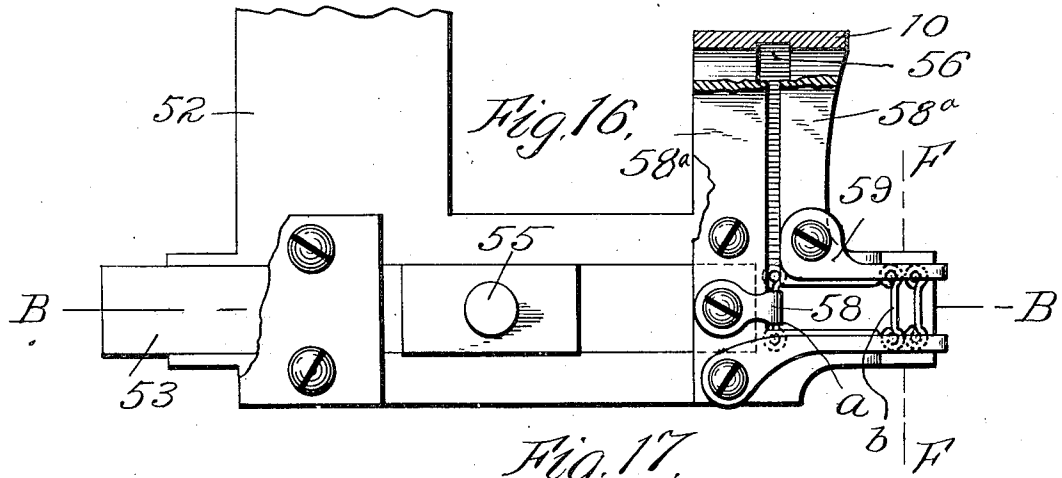


Fig. 17.

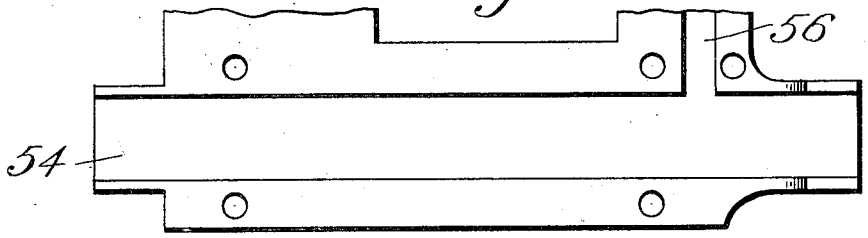


Fig. 18.

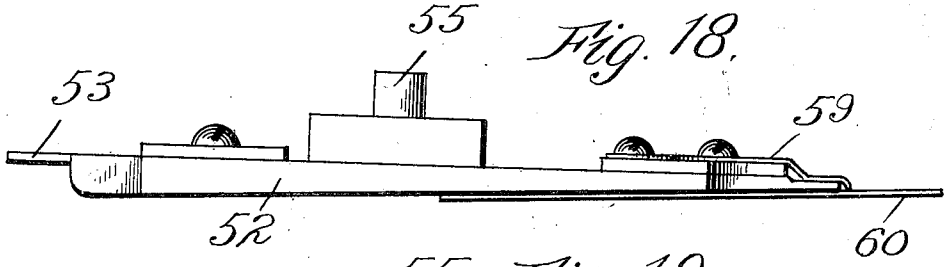


Fig. 19.

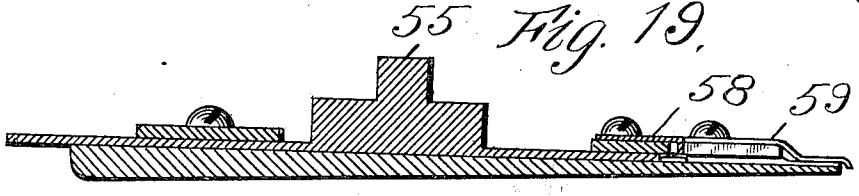


Fig. 20.

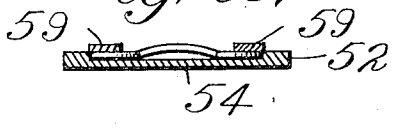
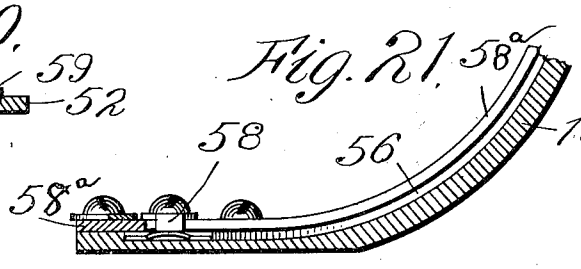


Fig. 21.



Witnesses:
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MACHINE FOR SEWING HOOKS AND EYES AND LOOPS ON CARDS.

APPLICATION FILED APR. 15, 1911.

1,121,901. Patented Dec. 22, 1914.

11 SHEETS—SHEET 10.

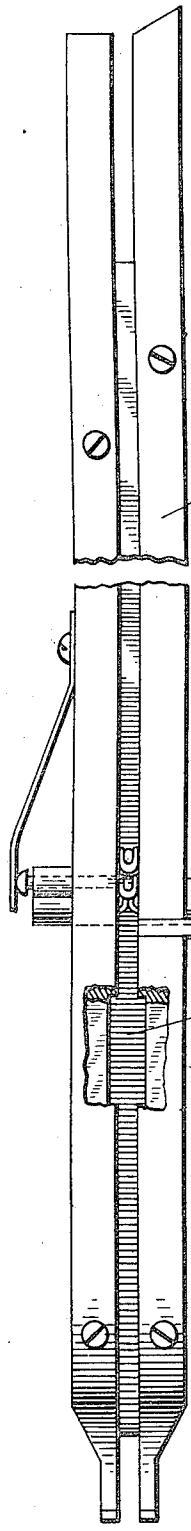


Fig. 22.

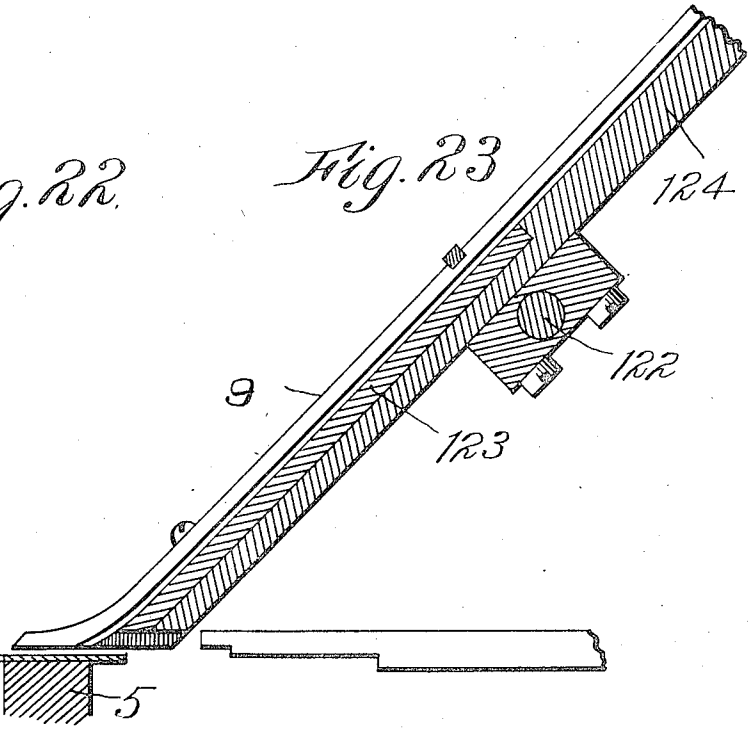


Fig. 23.

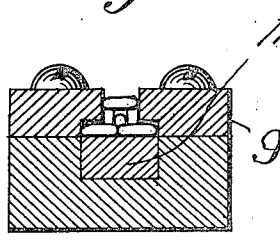


Fig. 24.

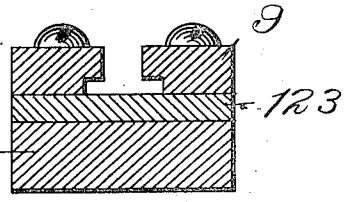


Fig. 25.

Witnesses:
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By his Attorneys Knight Bros

W. C. DIEFENBACH.

MACHINE FOR SEWING HOOKS AND EYES AND LOOPS ON CARDS.

APPLICATION FILED APR. 15, 1911.

1,121,901. Patented Dec. 22, 1914.

11 SHEETS—SHEET 11.

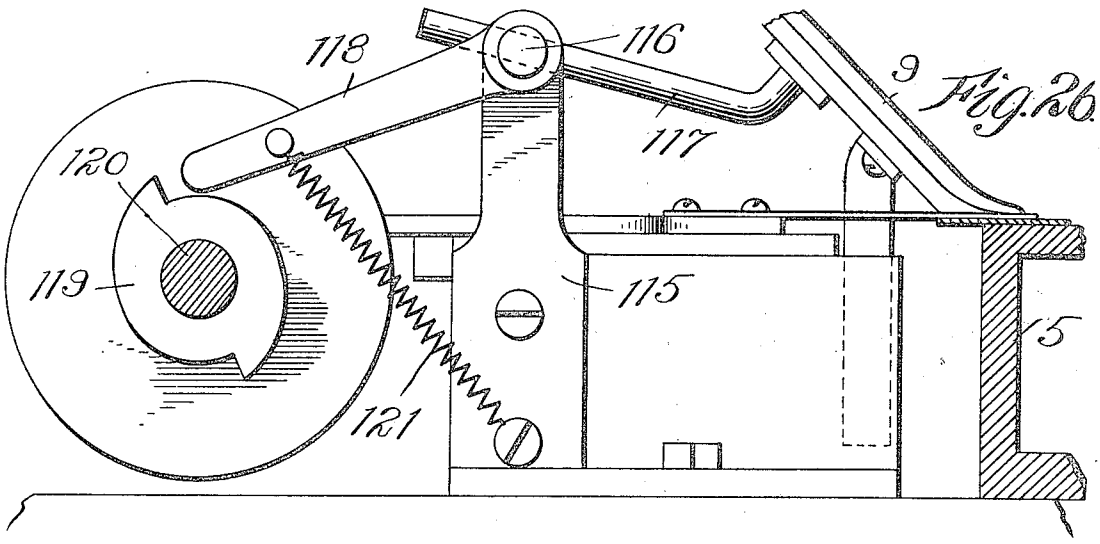


Fig. 26.

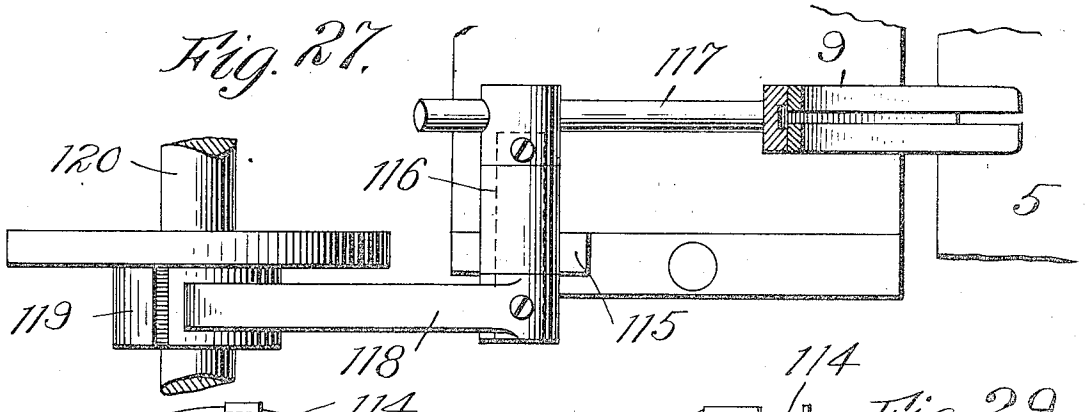


Fig. 27.

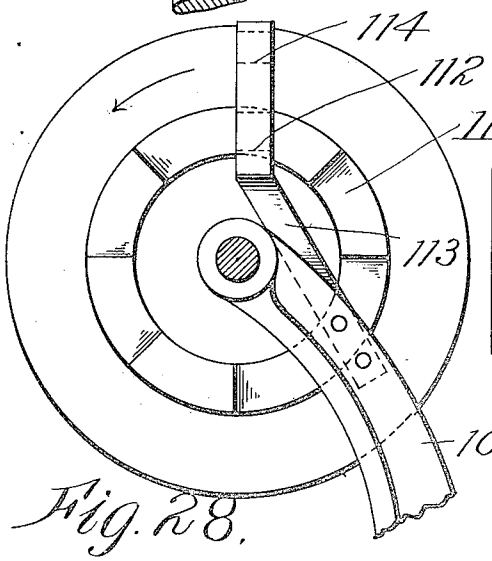


Fig. 28.

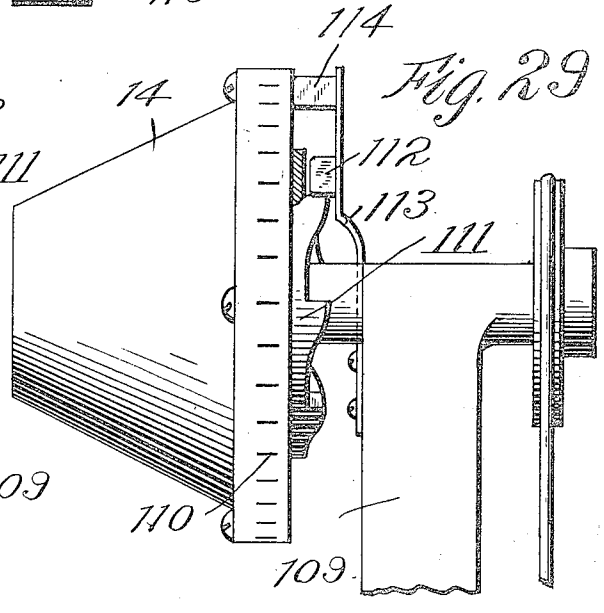


Fig. 29.

Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM C. DIEFENBACH, OF SHELTON, CONNECTICUT, ASSIGNOR TO CONNECTICUT HOOK AND EYE COMPANY, OF WATERBURY, CONNECTICUT, A CORPORATION OF CONNECTICUT.

MACHINE FOR SEWING HOOKS AND EYES AND LOOPS ON CARDS.

1,121,901. Specification of Letters Patent. Patented Dec. 22, 1914.

Application filed April 15, 1911. Serial No. 621,258.

To all whom it may concern:

Be it known that I, WILLIAM C. DIEFENBACH, a citizen of the United States, and residing at Shelton, county of Fairfield, State of Connecticut, have invented certain new and useful Improvements in Machines for Sewing Hooks and Eyes and Loops on Cards, of which the following is a specification.

My invention relates in general to machines for feeding and sewing articles such as hooks and eyes or the like on cards.

It relates to the type of machine such as is for instance shown and described in the patent to George Rowbottom, No. 710,517, of October 7th, 1902. The machine to which the aforesaid patent refers has the purpose of sewing hooks and eyes engaged in pairs onto cards in suitable number on each card as required in commercial use.

It is well known that nowadays not only eyes are used in connection with hooks for attaching garment pieces to each other but almost as many socalled loops are used so that it has become necessary for the manufacturer of these articles to attach a corresponding number of loops to the cards which carry the engaged hooks and eyes to satisfy the demand.

The present invention relates in particular to a device forming an integral portion of the type of machines such as described in the above named Rowbottom patent by which simultaneously with the engaged hooks and eyes, loops are fed to the cards and sewed onto them so that the finished card contains an equal number of loops and eyes. In the accompanying drawings I have illustrated in which manner this function of the machine is performed.

In these drawings Figure 1 is a front elevation of the machine in its entirety shown more or less diagrammatically in order to show the location of the several parts. Fig. 1ª is a plan view of the diagram shown in Fig. 1 illustrating the power transmission only, for driving the several mechanisms of the machine. Fig. 2 is an enlarged detail front elevation of the central portion of the machine showing the intermittent feeding mechanism and the general arrangement of the eye feeding rail, hook and loop feeding chutes. Fig. 3 is a plan view of a portion of the same parts with the superstructure removed and showing how and where the loop is placed in position to be sewed on the card. Fig. 4 is a detail side elevation of the means for intermittently feeding the loops forward to position to be received by the presser foot. Figs. 5, 5ª, and 6 are detail views showing the means for advancing the presser foot to position to receive the hooks and eyes and drawing same back to stitching position. Fig. 7 is an enlarged detail view of that portion of the presser foot which seizes and holds the loop in position to be sewed on the card. Fig. 8 is a plan view of the loop feeding hopper and a portion of the chute showing how the loops are taken from the hopper and dropped down said chute. Fig. 9 is a plan view of the stationary portion or base plate of the hopper. Fig. 10 is an enlarged detail section of said base plate on the line *y—y*, Fig. 9. Fig. 11 is a bottom view of the rotatable member of the loop hopper showing the grooves through which the loops pass in order to reach the loop chute. Fig. 12 is an enlarged detail view of a portion of the same. Fig. 13 is a detail section on the line A—A Fig. 12. Fig. 14 is a vertical section of the loop hopper on the line *x—x* Fig. 8. Fig. 15 is a detail view of the side wall of the rotatable member of the loop hopper. Fig. 16 is a detail plan view of the lower end of the loop chute showing how the loops slide down and are held in position to be driven forward by the plunger to position to be taken away by the presser foot. Fig. 17 is a similar plan view with the slide and parts removed. Fig. 18 is a side elevation of the parts shown in Fig. 16. Fig. 19 is a section on the line B—B, Fig. 16, showing the plunger withdrawn and ready to move the loop forward to position to be received by the presser foot. Fig. 20 is an enlarged detail view showing how the loop is held in position to be seized by the presser foot under the friction springs placed at the discharging end of the chute. Fig. 21 is a sectional view in detail showing the groove of the chute and how the loop passes down to position to be discharged by the plunger and also shows how it is held in position by friction springs. Fig. 22 is a detail plan view of the hook chute in the bottom of which is inserted a non-magnetic strip of metal used to pre-

vent hooks from clogging in the chute when said hooks are made of material capable of being magnetized. Fig. 23 is a vertical section of the same showing the strip in position. Fig. 24 is a transverse section of the chute. Fig. 25 is a modified form showing the strip extending across the full width of the chute. Fig. 26 is a detail view of a cam operated hammer for striking the bottom of the hook chute to prevent the hooks from clogging in said chute. Fig. 27 is a plan view of the same. Fig. 28 is a detail view of a cam operated hammer adapted to strike against the back of the eye hopper in order to prevent eyes from sticking in the discharge opening through which they are fed to the eye rail. Fig. 29 is a side elevation of the same.

The general arrangement of the machine is diagrammatically illustrated in Fig. 1 and is similar to that shown in the above named Rowbottom patent. 3 represents the main table which carries on either side uprights 1, 1 on each of which a hook hopper 6 is mounted, which may also be of the same construction as shown and described in the aforesaid patent. It may be stated previous to the detail description of the machine that two rows of hooks and eyes are sewed onto a card so that both sides of the machine shown in Fig. 1 correspond in construction with the exception of the loop hopper 7 of which only one is provided on one side of the machine (left side in Fig. 1), only one row of loops being sewed on the cards, which row is located between the two rows of hooks and eyes. 2 is a frame rising from the central portion of the table, and this frame carries the two eye hoppers 4 and the sewing mechanism, the latter being more clearly shown in Fig. 2. The eyes are carried from the hopper to the sewing mechanism by means of rails 8—8 and the hooks are fed to engage with the eyes by means of chutes 9—9. The detail construction of all these elements including the sewing mechanism, has been omitted in the drawings since these elements do not form any part of this invention, and they have been illustrated in detail only so far as they constitute improvements and so far as they are necessary to marke clear the operation of the loop feeding mechanism. The loops are conveyed from the loop hopper 7 to the sewing mechanism by means of chute 10 which will be described in detail later on.

The following detail description of the machine is subdivided into the following sections: the loop feeding mechanism, which intermittently feeds loops to the presser foot; the loop presser foot which receives the loops thus fed and places them in proper position on the cards ready for sewing; the loop hopper and chute by which the loops are carried to the intermittent feeding mechanism; the hammer mechanisms which aid the proper feed of loops from the loop hopper and of hooks from the hook chute; and, lastly, a non-magnetic hook chute which permits feeding hooks of magnetic material.

Loop feeding mechanism.—This mechanism is contained in the central portion of the machine illustrated in Fig. 1. This central portion is shown in larger scale in the same view in Fig. 2 and a plan view thereof in Fig. 3. As shown in Fig. 2, a sewing table 5 is mounted in the center of the machine on which the loop feeding mechanism is mounted. A plan view of a portion of this table is shown in Fig. 3 and a side elevation of the same portion in Fig. 4. This sewing table is of similar character as shown in the aforesaid Rowbottom patent and on it the cards are placed and fed into the machine in the direction of the arrow shown in Fig. 3 by means of feeding rollers, in the manner described in aforesaid patent. In the present drawings only the first pair of feed rollers 11 are shown which are mounted on a fixed axle 12 and which cooperate with positively driven feeding rolls mounted underneath the table (not shown) in the manner described in aforesaid patent. Moreover the socalled pickup roll 13 is mounted in front of feeding rolls 11 which roll is for the same purpose as the pick up roll shown as mounted in frame 68 of Fig. 4 in aforesaid Rowbottom patent. This roll has a cam surface which coöperates with a roll mounted underneath it, which cam portion rotates in timed relation to the sewing mechanism so that cards are picked up by it only at predetermined intervals and fed into the machine. The feeding rolls are operated in the present machine step by step by means of rocking arm 14 which is driven from main shaft 17 of the machine shown in Fig. 1a. Arm 14 has a forked portion with which it partially embraces shaft 17 (only shown in top view in Fig. 1a) and adjacent to this portion a cam 18 is mounted on shaft 17 which coöperates with a roller 19 fastened on arm 14 so that thereby an oscillating motion is imparted to arm 14. The other end of arm 14 is pivotally attached to rocking lever 20 which is loosely mounted on shaft 21 (Fig. 4) which shaft extends through table 5, wherein it is journaled, to the other side (Fig. 2) where by suitable gear transmission the intermittent rotation of shaft 21 is imparted to pick up roll 13. Also suitable gear transmission is provided as shown in Fig. 4, by means of which the feeding rolls for feeding the cards through the machine are operated. This mechanism forms no part of the present invention and has been therefore illustrated only partially. It may be pointed out, however, that on shaft 21 a ratchet wheel 22 is mounted which en-

gages with pawl 23 pivotally attached to rocking lever 20, so that when arm 14 rocks pawl 23 intermittently feeds ratchet wheel 22 forward in the direction of the arrow and thereby operates shaft 21 on which a gear wheel 24 is mounted. The latter gear wheel transmits motion to gear wheel 25 mounted on shaft 26 which operates the underfeed rolls 27 which coöperate with card feeding rolls 11 (Figs. 2 and 4).

Laterally of the front end of sewing table 5 is mounted journal block 28 which carries a stud 29 on which a ratchet wheel 30 and a notched wheel 31 are mounted, both being fastened together. To the other end of rocking lever 20, Fig. 4, is fastened a bracket 32 in which a feeding pawl 33 is pivoted. The curved end 34 of this pawl engages with ratchet wheel 30 and the pawl is held in engagement with this wheel by spring 35. It will be noted from Fig. 4 that when lever 20 rocks, this pawl feeds ratchet wheel 30 in the direction of the arrow so that simultaneously intermittent motion is imparted to notched wheel 31. Adjacent to notched wheel 30 and parallel with its plane, a spring-controlled slide 36 is mounted on table 5 which carries a stud 37 with a contact-roller 38. Stud 37 extends laterally into the plane of notched wheel 31 so that under the influence of spring 39 of slide 36 the roller 38 is held in contact with notched wheel 31 whereby when this latter wheel is rotated, the roller will fall into the notches 40 of wheel 31 whereby the slide 36 is reciprocated. The end of slide 36 facing the machine has an offset portion 41 which extends toward the main portion of the machine and which is pivotally attached to rocking arm 42, the latter being pivoted at 43 to the sewing table. Thus rocking motion is imparted to arm 42 when wheel 31 operates intermittently whereby, owing to its considerable length, the free arm of arm 42 has a considerable throw. 30^a is a friction member mounted in journal block 28 and bearing against wheel 30 to prevent overthrowing. It can be adjusted by screw 30^b.

The bearing block 50 in which shaft 57 of pick up roll 13 is mounted has an extension 51 to which the pusher frame 52 is attached as shown in Figs. 2 and 3. This frame 52 extends from the side of the table to its center line, where pusher 53 is mounted in frame 52 in line with the center line of the table. This frame and pusher are illustrated in larger scale in different views in Figs. 16 to 19. Fig. 16 is a plan view of the pusher mechanism similar to that shown in Fig. 3 and the frame without the slide is shown in plan view in Fig. 17. This frame has a slideway 54 in line with the central axis of sewing table 5 in which pusher 53 is slidingly disposed. The pusher has a vertical stud 55 which engages with the free end of arm 42 previously referred to, so that when arm 42 is rocked in the manner described pusher 53 is reciprocated in slideway 54 for the purpose which will be described presently. Frame 52 has a second lateral extension parallel with the one by which the frame is fastened to block 50, which second extension forms the terminal of loop chute 10. This chute will be described in detail later on, but it may be pointed out for the present that this chute has a central longitudinal groove 56 partially covered by guide plates 58^a which are spaced apart in such manner that a slot in line with the middle line of groove 56 remains which permits access to the groove 56 so that the proper passage of loops through the groove may be controlled by the operator. Fig. 17 illustrates where groove 56 terminates in slideway 54, and from Fig. 16 it will be noted that the left guide plate 58^a bridges slideway 54 and extends partway to the right, whereas the right hand guide plate 58^a extends to the right on the opposite side of slideway 54. The loops slide through groove 56 in the position in which they are shown in Fig. 16 and land in slideway 54 transversely thereto, as is also illustrated in Fig. 16. When pusher 53 is withdrawn to its extreme left hand position it extends close to the point where a loop lands in slideway 54 and a loop positioned in the slideway as shown at *a* will be conveyed into the position shown at *b* when the pusher is thrown forward into its extreme right hand position by the mechanism previously described. A loop delivered from chute 10 into slideway 54 is likely to be tilted over into the wrong position by pusher 53 when the latter tends to convey the loop from the position *a* into position *b*, whereas the loop should remain with its convex side or hump facing upward as shown for instance in Figs. 20 and 21, in which position the loop must be sewed onto the card. To prevent the loop from tipping over when the pusher operates I have provided a spring 58 shown in Figs. 16, 19 and 20. This spring is fastened to the left hand guide plate 58^a and has a downward bent end which terminates close to the apex of the loop without, however, touching it with sufficient friction to prevent the loop from easily sliding from the chute into the slideway 54. Spring 58, on the other hand, prevents the loop from tipping over with the concave middle portion upward when the pusher 53 touches it. Immediately after the loop has left spring 58 on its way to position *b* (Fig. 16) its sewing eyes have slipped under the right hand extensions of guide plates 58^a so that the loop is now prevented by these guide plates from tipping over under the pushing action of pusher 53. The right hand exten-

sions of guide plates 58ª terminate a distance from the end of slideway 54, the last portion of this slideway being covered instead by two springs 59 shown in Figs. 16, 18 and 19 and 20, which springs gently press the loop with its sewing eyes onto the bottom of the slideway where they remain until removed therefrom by the presser foot which will be described presently. The ends of springs 59 as will be noted from Figs. 18 and 19 are slightly bent downward so that a slight resistance is offered to the removing of the loops from the slideway in order to retain the loops safely in the presser foot while they slide from the edge of the slideway down onto the card which is fed onto the sewing table under the frame portion 52 of the slideway (Fig. 18). Referring to Figs. 3 and 4 it may be stated that during the forward movement of pusher 54 the stud 55 moves in line with axle 12 of feeding rolls 11 and for this purpose this axle is cut partly away on its underside as shown at 12ª.

As previously explained the particular machine illustrated in the present application is substantially of the character of the machine illustrated in the above named patent and it will be noted that the machine in said patent feeds one pair of engaged hooks and eyes from either side of the card onto the latter. Such hooks and eyes as is known, each have two sewing eyes so that in order to sew these articles onto the cards two successive stitches must be made by the needles 61 shown in Fig. 2, one for each sewing eye. Therefore to the sewing needles which attach the loops, which have only one sewing eye at each end, two loops should be fed to each two pairs of engaged hooks and eyes delivered onto the feeding line of the card so that the sewing eyes of the two loops at either end are in line with the sewing eyes of all the hooks and eyes simultaneously fed by the machine onto the feeding line. The presser foot 65, Figs. 3 and 4, which takes off the loops delivered by the pusher to the end of the guide way under the springs 59, must therefore take off two loops at a time and deliver them to the cards underneath. The adjoining presser feet 66, 66 with which the loop presser foot is rigidly connected so that they operate simultaneously with presser foot 65, take hold of a pair of engaged hooks and eyes delivered from either side of the card onto it by means of grippers 67, 67 (only a small portion of which is shown in Fig. 3 since they may be of the form described in the aforesaid patent). The present machine is therefore timed so that at each delivery stroke of presser foot 65 which will be presently described, two delivery strokes must be made by pusher 53 in order to deliver two loops under springs 59 whence they are taken by the presser foot 65. The present machine sews two parallel rows of engaged hooks and eyes onto the card, each row containing 12 pairs of hooks and eyes and therefore the loop feeding device described above must make twenty-four feeding strokes to deliver the desired number of loops to the presser foot 65. Consequently 24 notches 40 are provided in the notched disk 31 and also twenty-four teeth on ratchet wheel 30 so that at each feeding stroke pusher 53 makes one complete forward and backward stroke. As will be noted one portion 68 of notched wheel 31 is formed as one long notch so that when roller 38 falls into this large notch no reciprocating motion is imparted to it during a number of forward steps of notched wheel 31. This resting period of the pusher occurs during the period in which the sewing of one card has been completed and the sewing of the next card is started whereby the needles must perform four idle stitches, two stitches in the completed card and two stitches in the next card to properly fasten the thread on the card. During this period no articles should be fed onto the cards and the above mentioned patent clearly describes a device which prevents the feeding of hooks and eyes during such period. The device just described serves for interrupting feeding of loops during this period and it will be noted that during this intermission the pusher remains at rest in its extreme forward position so that thereby loop chute 56 is closed by pusher 53 and no loop can slide onto slideway 54.

The loop presser foot.—In order to avoid crowding of feeding elements about the place where the articles are sewed onto the card, it is desirable to have the feeding of the articles to the card and the sewing thereon take place on two different transverse lines so that the needles 61 may operate on a line remote from the feeding line in the direction of the arrow shown in Fig. 3. These two lines I shall call hereinafter the feeding line, and the sewing line and they are marked in Figs. 3 and 17 at F—F and S—S. Therefore it is necessary for the presser feet to perform a compound motion as follows: The presser foot for each article should move into the feeding line, then descend upon the article, then remove the article from the feeding line on the sewing line, then hold it on the card during the sewing operation, then rise to let go the article sewed to the card with a subsequent motion into the feeding line to receive another article, as described. This motion of loop presser foot 65 is obtained simultaneously with the hook and eye presser feet 67 on either side of it as follows: On central frame 2 of the machine, the location of which is clearly shown in Fig. 1, are journaled two rocking shafts 70, 71, Fig. 5. To one end of each shaft are attached crank arms 72

and 73 respectively, while to the other ends of these shafts are attached crank arms 74, 75 respectively (Fig. 6). To crank arms 74 and 75 are pivotally attached connecting bars 76 and 77 respectively, the other ends of which are operatively connected with main shaft 17 in the manner shown in Figs. 5, 5ª and 6. The ends of these bars which coöperate with shaft 17 are forked as shown in Figs. 5, 5ª and adjacent to each bar is fastened on shaft 17 a cam 78 and 79 respectively, which cams coöperate with cam rolls 80 and 81, respectively, fastened on bars 76 and 77. The connecting bars are held in permanent contact with their cams by means of springs 82 and 83 as shown in Fig. 6. Presser foot 65 extends rearwardly and is attached to sliding bar 84, mounted on carriage 87 which in turn is mounted in the machine frame so as to permit its sliding horizontally. This bar 84 is provided with a transversely slotted head 85. In this slot a pin 86 fastened to arm 72 engages so that when arm 72 rocks reciprocating motion is imparted to bar 84 and thus vertical motion is imparted to presser foot 65. Arm 73 is forked at its free end so as to operatively engage stud 88 fastened to carriage 87. Thus when arm 73 rocks, horizontal sliding motion is imparted to carriage 87 and thus to presser foot 65. The degree to which these two shafts rock and thus operate the presser foot either horizontally or vertically, is controlled by the surface of cams 78 and 79. In Fig. 5 cam 78 is in line back of cam 79 and therefore this cam is separately illustrated in side view in Fig. 5ª. Both cams revolve in the direction shown by the arrows and they are shown in Figs. 5, and 5ª in a position relatively to each other so that they will operate the presser foot as desired. The position in which they are shown relatively to their connecting bars is such that the presser foot 65 is just about to rise from the sewing table 5 on the sewing line S and move to the right, back into the feeding line. It will be noted that the highest portion *c* of cam 78 is just about to engage its roll 80 so that thereby connecting bar 76 is thrown forward, whereby through the mechanism described before it lifts presser foot 65 from the table. Immediately after cam surface *c* has moved its bar, cam surface *d* on cam 79 engages with its cam roll 81 and throws connecting bar 77 forward, which by the mechanism described, throws slide 87 to the left and thus moves presser foot 65 to the left until this foot is in line with the feeding line F—F. Cam surface *c* of cam 78 is comparatively short so that soon after the presser foot has arrived on the feeding line F—F cam roll 80 rolls off surface *c* onto the lower cam surface *e* which causes the presser foot to partly descend toward the table. When this occurs the operative end 65ª of the presser foot which is shown in detail in larger scale in Fig. 7, settles over the middle portion of the two loops which have been delivered by pusher 53 onto the feeding line as shown in Fig. 16. Thereupon feeding roll 80 rolls off cam surface *e* onto cam surface *f* and simultaneously cam roll 81 of cam 78 rolls off cam surface *d* onto surface *g* which moves presser foot 65 back on to the sewing line and also causes it to further descend onto the card. This last short downward step of the presser foot is necessary because of the thickness of the feeding end of the loop feeding device as shown at the right hand end in Figs. 18 and 19 and the presser foot thus in its last downward step descends from the end of the loop feeding device down onto the card and then moves together with the two loops back into the feeding line. While cam roll 81 is in contact with cam surface *g* the sewing eyes of the first loop held by the presser foot are in line with the needles. Cam roll 81 after a half revolution of cam 79 further descends from cam surface *g* to cam surface *h* which causes presser foot to move a short step backward so as to bring the sewing eyes of the second loop in line with the needles. After the necessary time, during which the second loop is sewed onto the card, has elapsed, roll 81 has passed over cam surface *h* and arrives again at cam surface *d* to repeat the cycle described above. During the passage of cam roll 81 over surfaces *g* and *h* roll 80 of cam 78 remains in contact with the circular cam surface *f* so that the presser foot remains in its lowermost position. In order to yieldingly press the foot portion 65ª of the presser foot against the loops and the card, this foot portion is slidingly disposed in the main portion 65 of the presser foot and a spring 89 presses onto the upper end of stem 90 of foot 65ª thereby securing the yielding contact as desired.

The loop hopper.—This element of the machine is located as shown at 7 in Fig. 1 and rotates in a plane at an angle of about 45° to the horizontal and serves for feeding loops, delivered in bulk into it, singly into the loop chute 10 which, as has been previously described, terminates in the loop feeding device illustrated in Figs. 16 to 21. The detail construction of the loop hopper is shown in Figs. 8 to 15. It consists of a stationary base plate 95, Fig. 14, which is attached to a bracket 101 of upright frame 1 by means of stud 96. Rotatably mounted on stud 96 is the loop container which consists of cylindrical portion 97 open at the top to which a bottom piece 98 is attached as for instance by screws 99 as shown at the upper end of Fig. 14. Base plate 95 is shown in plan view in Fig. 9 and it will be noted that it has an elevated outer rim por-

tion 100 within which the hopper cylinder 97 is seated as shown in cross section in Fig. 14. This rim 100 extends to slightly more than three quarters of the periphery of the base plate whereas the remainder of the periphery between the points p, p' is flush with the lower edge of the rotatable cylinder 97 as shown in Fig. 10. Moreover the periphery portion between the points n and p' is beveled inwardly in the manner shown in Fig. 10 at o. The purpose of this beveled portion will be explained later on. The outer portion of the base plate between the points p and n is level. The underside of hopper cylinder 97 which faces base plate 95 is provided with grooves 102 of the cross section shown in Fig. 13 which grooves run substantially tangentially to the inner periphery of cylinder 97 as shown in Figs. 11 and 12 which both represent views of the underside of cylinder 97. The cross section illustrated in Fig. 13 is taken on the line A—A in Fig. 12. However, grooves 102 do not terminate directly in the inner periphery of cylinder 97 but the periphery is notched out adjacent to such places where a groove 102 terminates as shown at 103. A view from the inside of cylinder 97 showing these notched portions 103 in full view is illustrated in Fig. 15. The purpose of these notched portions 103 is to have a scooping action on the bulk of loops contained in the cylinder and the depth of such notches in the direction of grooves 102 is such that not more than two loops in line with each other may be contained in a groove 102 Fig. 12. As will be seen from Fig. 13 the shape of grooves 102 is such that the loops can pass from within cylinder 97 outwardly through these grooves only in one position which is with their convex or hump portions upwardly (the groove 102 is shown upside down in Fig. 13). Rim 100 of base plate 95 within which cylinder 97 rotates is of such height that no loops which may have slid into grooves 102 can escape outwardly from the hopper except between the points p and p' Fig. 9, between which the rim is cut away so that between these points the openings of grooves 102 are fully uncovered. Between points p and n the upper end of the loop chute 10 is attached to base plate 95 and the inner edges of the guide plates 57 described already with reference to Fig. 16 are shaped at their upper ends adjacent to the periphery of cylinder 97 so that they are flaring outwardly to facilitate the entering of a loop under these plates. The upper end of chute 10 is attached to base plate 95 at such point at which grooves 102 point substantially downward so that any loops which might have been scooped up by notches 103 and might have entered grooves 102 in the right position, can be discharged from grooves 102 into chute 10 wherein they descend for instance by gravity as assumed in the present case and land in the lower end of the chute near the loop feeding device. In this lower end they gather in a long row and are released one by one by pusher 53 which feeds them to the presser foot in the manner described. It sometimes happens that while the grooves 102 pass the upper opening of chute 10 the loops are not readily discharged but the discharging takes place slightly later when the groove 102 has passed the opening of chute 10. Such loops in order to prevent their falling over the edge of base plate 95 are caught by the inward beveled portion o previously described whence they may be easily removed by the operator. The hopper is driven by means of a belt 105 from a suitable portion of the power transmission of the machine, the belt passing around groove 104 provided in the cylinder 97 as shown in Fig. 14.

The loops of the character described are articles of exceedingly light weight and thus the slightest friction in any of the passages 102 of hopper cylinder 97 causes them to stick and clog up such passage. When the tangential slots 102 have passed through the inwardly beveled portion o their position is such that no more loops which might be left in slots 102 can be discharged by gravity. They will be carried around and should be again discharged into the hopper since they may have located in the grooves 102 in the wrong position. Such inward discharge is of course facilitated by the direction in which the grooves point when they rotate through the right hand half of the hopper cylinder (Fig. 8). This, however, is found to be insufficient to secure a discharge of the loops into the interior of the hopper. For this purpose and for the purpose of discharging the looper outwardly, a small hammer has been provided which knocks at suitable intervals against the cylinder of the hopper whereby such loops which would be discharged inwardly are loosened in the slots and also a prompt discharge of the loops outwardly into the loop chute is facilitated thereby. This hammer consists of a spring 106 attached to fixed base plate 100 (Figs. 8 and 14) the free end of which extends over a portion of hopper cylinder 97 and carries at its end a hammer head 107. A suitable number of notches 108 are provided in the outer periphery of hopper cylinder 97 into which head 107 falls when the hopper rotates. The hammer, by thus striking at suitable intervals against the hopper wall, loosens the loops in the slots and facilitates their discharge outwardly or inwardly.

The hammer mechanism for the eye hopper and hook chute.—The hammer mechanism for the eye hopper is illustrated in Figs. 28 and 29 and serves a similar pur-

pose as the hammer mechanism for the loop hopper just described. The eye hopper has been described and claimed in its detail features in a copending application and its construction is shown in the present application only in so far as it relates to the hammer mechanism and so far as it is necessary to make the invention understood. The eye hopper body 4 is cone shaped and rotatably mounted on a suitable bracket 109. It is provided on its periphery with slots 110 through which the eyes are discharged. In order to prevent the eyes which are equally as light as the loops from sticking in the slots in the wrong or in the right position, I have provided an annular cam surface 111 on the face of the hopper shown in Figs. 28 and 29 with which block 112 engages, which block is fastened to spring 113 attached to bracket 109. The upper end of spring 113 carries hammer 114 so that when block 112 glides over annular cam surface 111 hammer 114 strikes against the periphery of the eye hopper wherein the slots are disposed in the manner which is clear from the drawings. It will be noted from Fig. 29 that block 112 does not touch the bottom of the cams so that hammer 114 is able to strike a free blow against the hopper. A knocker which prevents the sticking of hooks in hook chute 9 is illustrated in Figs. 26 and 27. Laterally of sewing table 5 a portion of which is shown at the right hand side of Figs. 26 and 27, hook chute 9 is disposed from the end of which hooks are removed by the means more fully described in the Rowbottom patent above referred to. The cross section of the hook chute is shown in Fig. 27. The hammer mechanism comprises an upright bracket 115 in which a rock shaft 116 is journaled. To one end of this shaft is attached knocker arm 117 and to the other end a cam lever 118 the free end of which coöperates with cam 119 mounted on subshaft 120 the location of which clearly appears from the plan view of the power transmission shown in Fig. 1ª. Cam lever 118 is held in engagement with cam 119 by means of spring 121 so that when shaft 119 rotates the knocker strikes hook chute 9 twice at every revolution of shaft 120 which is in synchronism with the single hook release described in the Rowbottom patent.

Non magnetic hook chute.—The hook chute is illustrated in Figs. 22 to 25 and is substantially of the form shown and described in the Rowbottom patent named, which patent shows in Fig. 14 a device for singly releasing the hooks gathered in the chute so that only one hook arrives at a time at the lower end of the chute. A similar device is shown at 122 but the description thereof is omitted since it does not pertain to the present invention. It frequently happens that the iron of which the chute is made becomes magnetized through some cause so that when hooks made of iron wire are fed through the chute they are likely to stick therein when they are singly released to pass through the lower end of the chute where there is no pressure of the subsequent hooks which may overcome the friction caused by the magnetism. In order to overcome this defect I insert into the bottom of hook chute 9 a piece of non magnetic material as shown at 123 in Figs. 23 and 24 which extends upwardly slightly beyond the point at which the hooks are released singly. This non magnetic material may either extend only over the width of the groove in which the hooks slide as shown in Fig. 24 or also this material 123 may extend over the whole width of the bar 124, which forms the main body of the hook chute. In either case I thereby avoid the sticking of hooks in the lower portion of the chute.

I have shown in the present application the detail features of the loop hopper and means for feeding the loops into the sewing line in order to clearly show how hooks and eyes and loops can be simultaneously supplied to a card, simultaneously received by suitable means at the point on the card to which all these articles are fed, and held on the card in sewing position and simultaneously sewed onto the card. The detail construction, however, of such loop hopper is claimed in a copending application.

What I claim is:

1. In a machine for sewing articles onto cards, the combination of means for automatically supplying hooks, loops and eyes to alined positions adjacent to a card, means for receiving said loops, hooks and eyes and holding them on the card in sewing position and means for simultaneously sewing said loops, hooks and eyes onto said card while a subsequent set of loops, hooks and eyes is supplied adjacent to the card.

2. In a machine for sewing articles onto cards, the combination of means for automatically supplying hooks and eyes to alined positions adjacent to a card, means for automatically simultaneously supplying loops to said alined positions, means for simultaneously receiving said loops, hooks and eyes and holding them on the card in sewing position and means for simultaneously sewing said loops, hooks and eyes onto said card, while a subsequent set of loops, hooks and eyes is supplied to the card.

3. In a machine for sewing articles onto cards, the combination of means for automatically supplying hooks and eyes to alined positions adjacent to a card, means for automatically supplying loops to said alined positions, presser feet for simultaneously receiving said loops, hooks and eyes and holding them on the card in sewing position, and means for simultaneously sewing said loops,

hooks and eyes onto said card while a subsequent set of loops, hooks and eyes is supplied to the card.

4. In a machine for sewing articles onto cards, the combination of means for supplying hooks and eyes to alined positions transverse to a card, means for supplying loops to said alined positions, presser feet adapted to simultaneously receive two pairs of hooks and eyes and two loops in said alined positions and to convey said loops, hooks and eyes into and hold them in sewing position and means for simultaneously sewing said loops, hooks and eyes onto the card.

5. In a machine for sewing articles onto cards, the combination of means for supplying simultaneously a pair of hooks and eyes from each side adjacent to a card in a line transverse to the card, a loop pusher for supplying successively two loops between said two pairs of hooks and eyes onto said line while said hooks and eyes are supplied, presser feet for simultaneously receiving the loops, hooks and eyes on said line and for presenting them in sewing position, and means for simultaneously sewing said loops, hooks and eyes onto said card.

6. In a machine for sewing articles onto cards, the combination of means for supplying simultaneously a pair of hooks and eyes from each side adjacent to a card in a line transverse to the card, a loop pusher for supplying successively two loops between said two pairs of hooks and eyes onto said line while said hooks and eyes are supplied, presser feet for simultaneously receiving the loops, hooks and eyes on said line and for conveying them into and holding them in sewing position, and means for simultaneously sewing said loops, hooks and eyes onto said card.

7. In a machine for sewing articles onto cards, the combination of means for supplying simultaneously a pair of hooks and eyes from each side adjacent to a card in a line transverse to the card, a loop pusher for supplying successively two loops between said two pairs of hooks and eyes onto said line while said hooks and eyes are supplied, presser feet for simultaneously receiving the loops, hooks and eyes on said line and for conveying them into and holding them in sewing position, said presser feet having in common two cams with suitably shaped surfaces and intermediate lever mechanism for causing them to descend on the loops, hooks and eyes fed onto said line to convey them onto the card and into sewing position and to rise from the card after the sewing operation, a cam for said loop pusher having a suitably shaped surface and intermediate mechanism between the pusher and the cam causing the pusher to deliver two loops into said transverse line during one cycle of operation of said presser feet, and means for simultaneously sewing said loops, hooks and eyes held by said presser feet onto said card.

8. In a machine for sewing articles onto cards, the combination of means for supplying a pair of hooks and eyes from each side adjacent to a card in a line transverse to the card, a loop supplying device comprising a loop chute for feeding loops in a direction transversely to the cards, a slideway disposed in close proximity to and above said cards and between said hook and eye feeding means to which slideway the loops are successively supplied by said chute, a pusher in said slideway suitably operated for pushing a loop thus supplied in a direction longitudinally of the card onto said hook and eye feeding line, and means for simultaneously receiving hooks, eyes and loops thus supplied onto said line and holding them in sewing position on the card, and means for simultaneously sewing these articles onto the card.

9. In a machine for sewing articles onto cards, the combination of means for supplying a pair of hooks and eyes from each side adjacent to a card in a line transverse to the card, a loop supplying device comprising a loop chute for feeding loops in a direction transverse to the cards, a slideway disposed in close proximity to and above said cards and between said hook and eye feeding means to which slideway the loops are successively supplied by said chute, a pusher in said slideway for pushing a loop thus supplied in a direction longitudinally of the card onto said hook and eye feeding line, a rocking lever and a notched wheel operatively connected therewith for imparting reciprocating motion to said pusher, presser feet adapted to simultaneously receive hooks and eyes and loops delivered on said line and to convey them to and to hold them in sewing position on the card, said notched wheel having a suitable number of notches to cause the pusher to perform two cycles of operation to one of said presser feet to deliver two loops to said line in succession to be simultaneously received by said feet and means for simultaneously sewing said hooks, eyes and loops held by said feet onto the card.

10. In a machine for sewing loops onto cards, a loop feeding device comprising a pusher slideway, a pusher disposed therein and adapted to have reciprocating motion, a loop chute disposed laterally of said slideway and terminating therein, permitting one loop at a time to glide transversely into said slideway and in front of said pusher, a guard disposed above said slideway where said loop is supplied from said chute and terminating in close proximity to the middle portion of the loop to prevent its tilting when said pusher contacts with said loop

to move it forward, and means for operating said pusher to push said loop forward onto a predetermined line.

11. In a machine for sewing loops onto cards, a loop feeding device comprising a pusher slideway, a pusher disposed therein and adapted to have reciprocating motion, a loop chute disposed laterally of said slideway and terminating therein, permitting one loop at a time to glide transversely into said slideway and in front of said pusher, a guard disposed above said slideway where said loop is supplied from said chute and terminating in close proximity to the middle portion of the loop to prevent its tilting when said pusher contacts with said loop to move it forward, means for operating said pusher to push said loop forward onto a predetermined line and a spring on either side of the forward end of said slideway under which the sewing eyes of the loops are pushed on the forward movement of the loop to hold the loop on said predetermined line.

12. In a machine of the character described, a rotary eye hopper adapted to discharge eyes singly through slots at its periphery, said hopper having a hammer mechanism comprising an annular cam surface provided with a suitable number of steps, a yielding hammer mounted adjacent to the hopper with its head in line with said periphery and having a gliding block intermediate its two ends which coöperates with said cam surface whereby intermittent motion is imparted to said hammer head to intermittently strike said periphery to facilitate the discharge of eyes therefrom.

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Witnesses:
WM. A. COURTLAND,
GEO. E. BARBER.