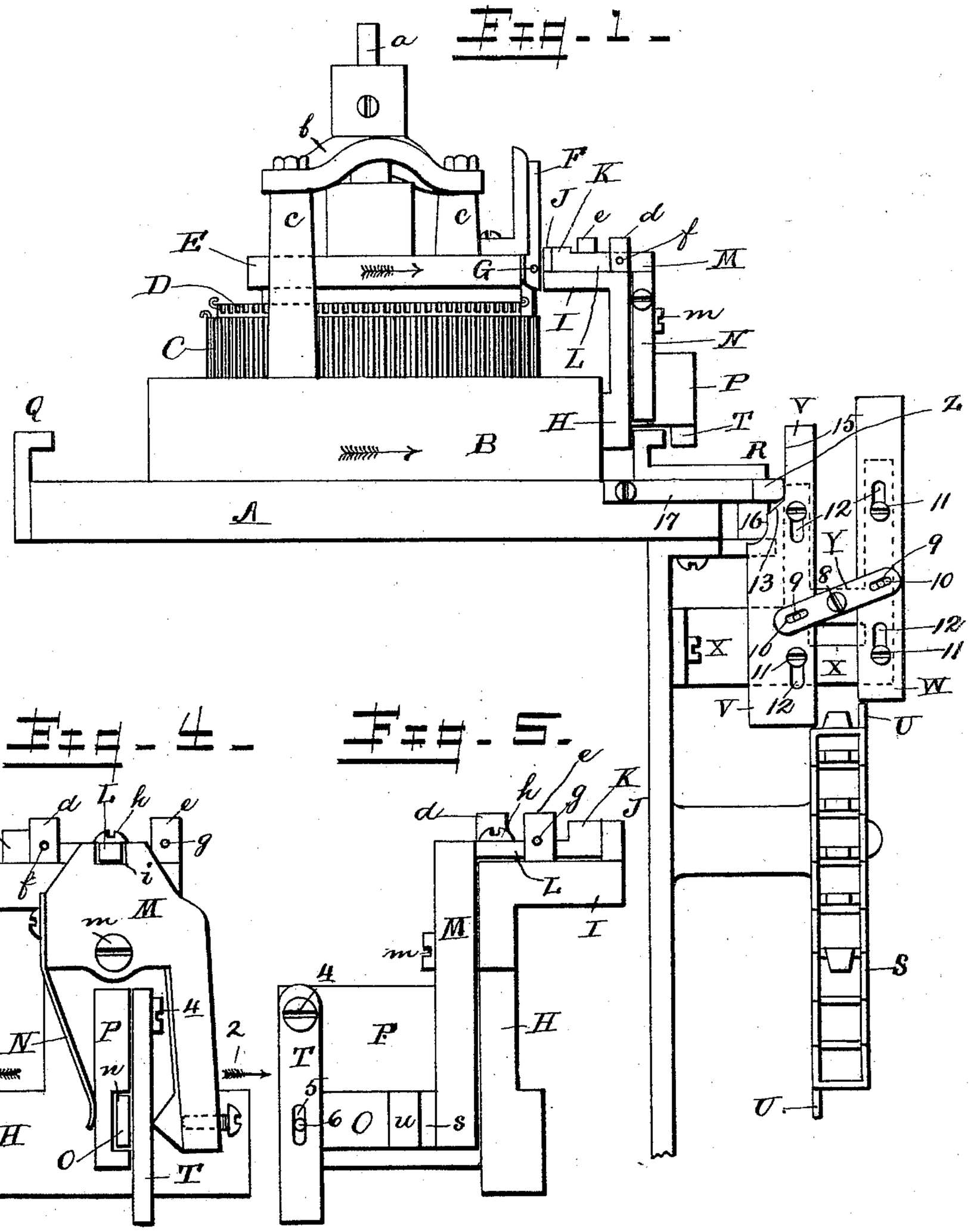
(No Model.) 3 Sheets—Sheet 1.

W. H. PEPPER & A. T. L. DAVIS.

SPLICING THREAD FEED MECHANISM FOR KNITTING MACHINES.

No. 465,881. Patented Dec. 29, 1891.



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(No Model.) 3 Sheets—Sheet 2.

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FIG. 2.

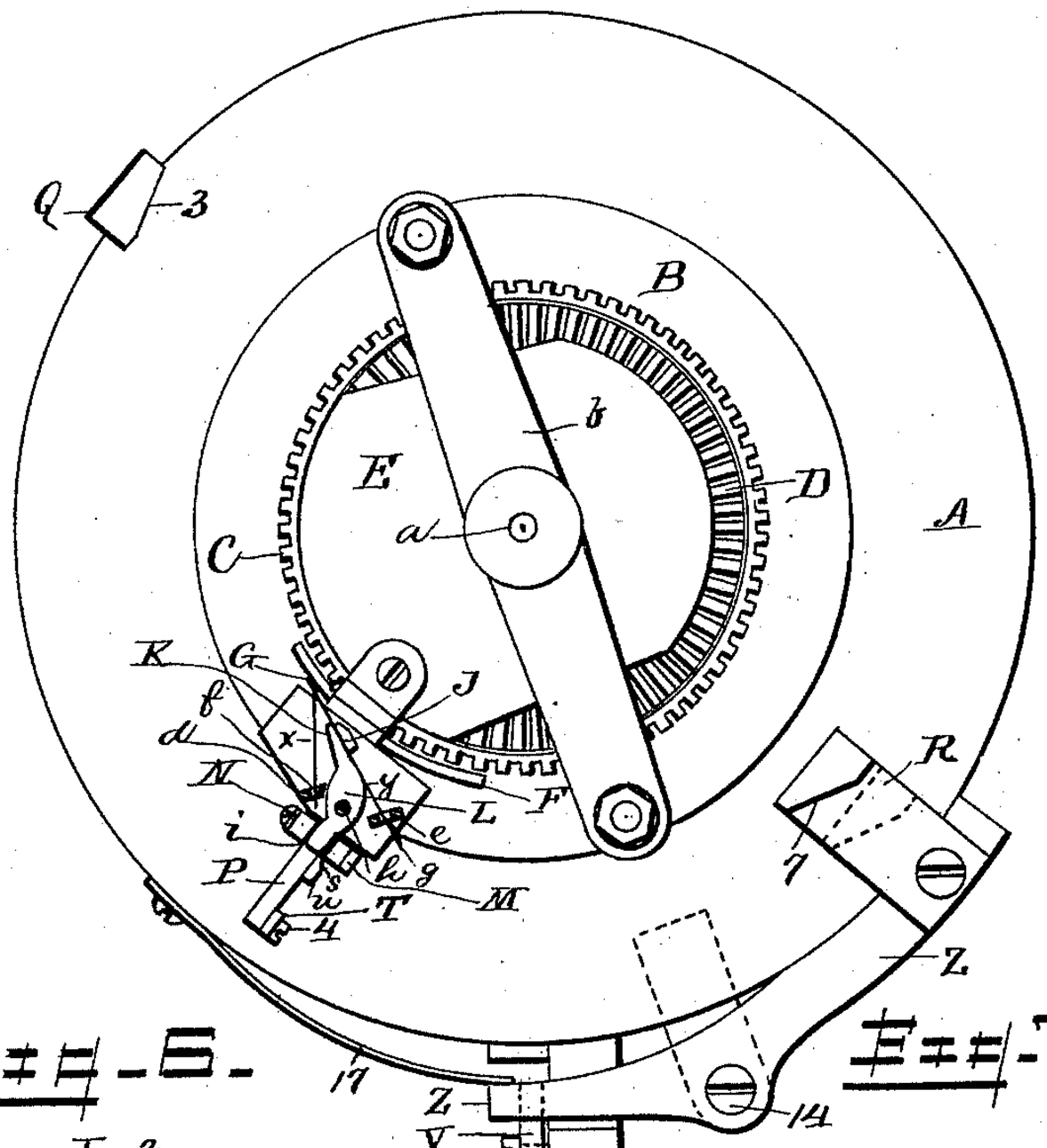
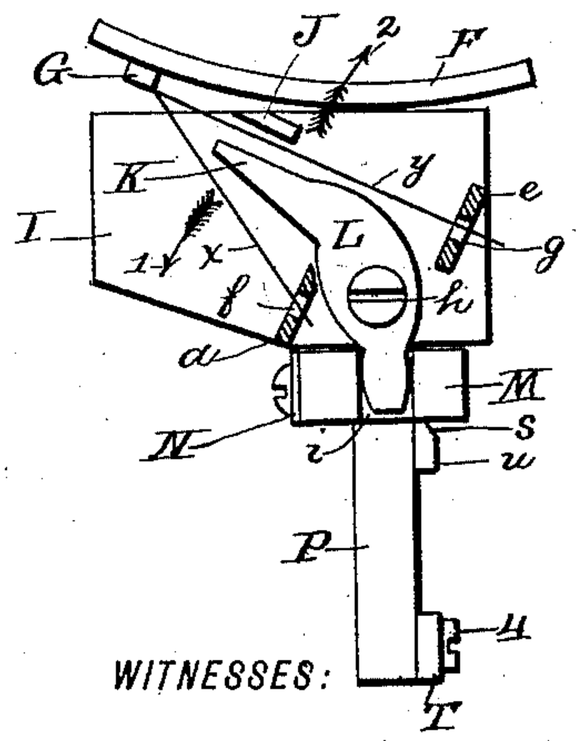


FIG. 6.



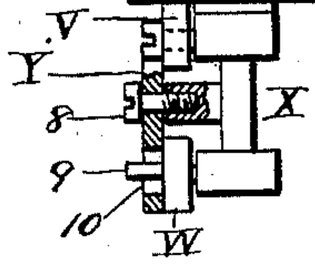
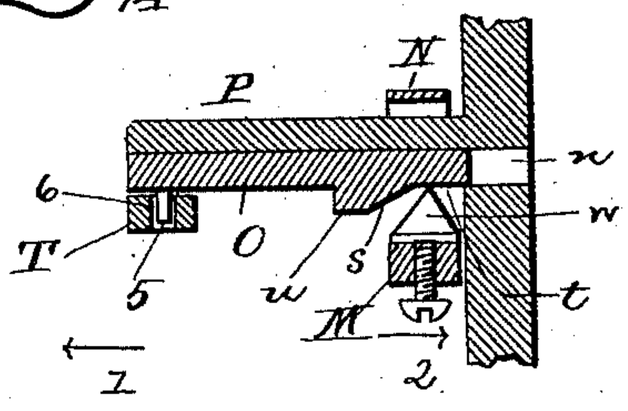


FIG. 7.



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SPLICING THREAD FEED MECHANISM FOR KNITTING MACHINES.

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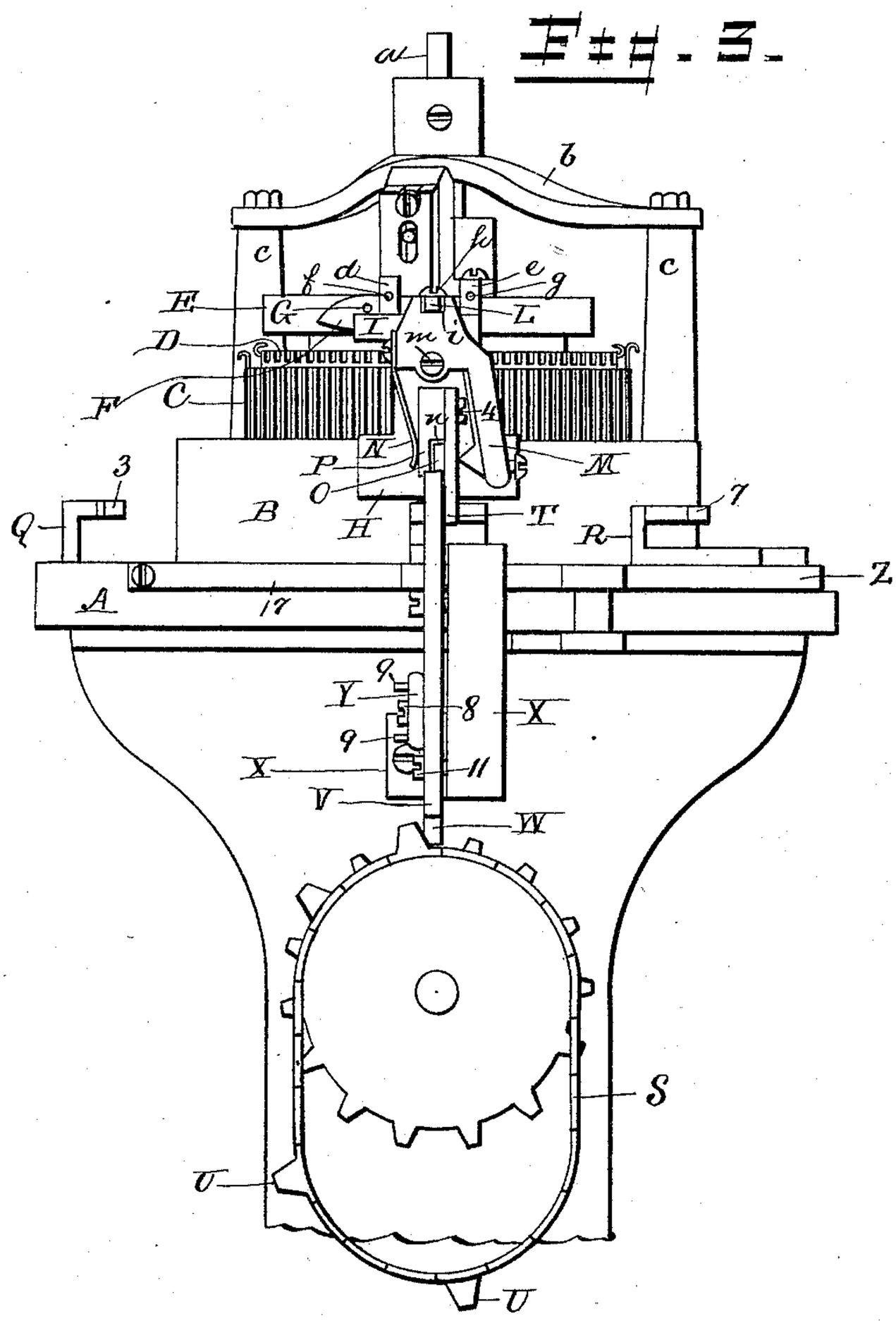
Fig. 3.



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UNITED STATES PATENT OFFICE.

WILLIAM H. PEPPER AND ALBERT T. L. DAVIS, OF LAKE VILLAGE, ASSIGNORS TO THE PITMAN MANUFACTURING COMPANY, OF LACONIA, NEW HAMPSHIRE.

SPLICING-THREAD-FEED MECHANISM FOR KNITTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 465,881, dated December 29, 1891.

Application filed May 18, 1891. Serial No. 393,123. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM H. PEPPER and ALBERT T. L. DAVIS, of Lake Village, in the county of Belknap and State of New Hampshire, have invented certain new and useful Improvements in Splicing-Thread-Feed Mechanism for Knitting-Machines, of which the following is a specification.

The present invention relates to the formation of knitted webs with re-enforcing splices or patches. The formation of such splices or patches in tubular knitted webs is well known in the art, an example of a machine for making such splices or patches being shown in Letters Patent of the United States, dated December 23, 1890, No. 443,462. In that patent is shown and described a circular latch-needle knitting machine for forming knitted ribbed tubular webs in which a re-enforcing patch is automatically knitted into the web, said patch being formed by feeding in a splicing-thread and breaking it off at each round of stitches. In said patent the feeding in of the splicing-thread is controlled by the action of a gripper, which normally grips and holds the splicing-thread, so that it is not fed to the needles. When the splicing-thread is to be fed in, it is released by the gripper and is carried in to the needles by the frictional contact therewith of the main thread, which is fed continuously and from which the body of the web is formed. At each round of stitches during the formation of the patch the gripper clasps the splicing-thread, so that it is broken off and held from feeding, and again releases the splicing-thread at the proper moment. When the patch is completed, the gripper clasps the splicing-thread and holds it until another patch is to be made. Now the knitting-machine provided with the present improvements has the same general mode of operation as the machine in said patent and the splice or patch is formed in the same manner.

The improvements consist in the construction of the gripping mechanism, which alternately clasps and releases the splicing-thread at each round of stitches during the formation of the splice or patch, and in the construction of the mechanism for operating the gripping mechanism.

In the accompanying drawings we have illustrated the present improvements as applied to a well-known type of circular latch-needle knitting machine for knitting ribbed webs.

In the drawings, Figure 1 is a side view of the head of a circular-knitting machine equipped with the present improvements, only so much of the usual parts of the machine being shown as will enable the improvements to be clearly understood. Fig. 2 is a plan view of the same. Fig. 3 is a side view of the same, looking at the machine in a direction at right angles to the point of view in Fig. 1. Figs. 4, 5, 6, and 7 are views of parts in detail.

A is the usual head-plate of the machine.

B is the constantly-rotating cylinder or ring, which operates the cylinder-needles.

C is the stationary needle-cylinder.

D is the stationary dial needle-plate.

E is the constantly-rotating dial cam-plate which actuates the dial-needles, and which moves in unison with the cam ring or cylinder B by reason of its rigid connection therewith through the spindle *a*, cross-bar *b*, and pillars *c c*, and F is the thread-guide plate carried by and rotating with the dial cam-plate E, said guide-plate being provided with the usual leading-in thread-eye G, which carries the threads into the needles.

All of the foregoing parts are of usual and well-known construction and operation.

Rigidly secured to the rotating cam cylinder or ring B is a bracket H, having an inwardly-extending horizontal plate I, the upper flat face of which is in substantially the same plane as the thread-eye G. This plate I carries two thread-guide plates *d e*, having thread-guide eyes *f g*, respectively, for the two threads. The main thread *x*, with which the body of the web is knit, passes through the outer eye *f* and thence to the leading-in thread-eye G, while the splicing-thread *y*, from which is knit the splice or patch, passes through the inner guide-eye *g* and thence to the leading-in thread-eye. Each of the thread-eyes *f g* is shown as located in a sepa-

rate guide-plate. This, however, is not essential, but is a convenient arrangement, since it prevents the threads from becoming entangled on their way from the thread-holding bobbins to the needles. As shown in Fig. 6, the two threads extend from their respective guide-eyes *f g* to the leading-in thread-eye at an angle to each other. The positions of the thread-guide eyes *f g* are fixed relatively to each other and to the leading-in thread-eye G.

In passing from the guide-eye *g* to the leading-in eye G the splicing-thread passes between the jaws J K of the gripper, which controls its passage to the needles. The stationary jaw J is fixed to the plate I close to the guide-plate F and in such position that its gripping-face is parallel with and in close proximity to the path of the splicing-thread between the eyes *g* and G. The movable gripping-jaw K moves to and from the stationary jaw in the space between the paths of the two threads *x y*, as indicated in Fig. 6. The extent of the movement of the movable jaw is such that it never comes in contact with the main thread *x*, and it moves from a position in contact with the fixed jaw to a position (shown in Fig. 6) where it is entirely out of the path of the splicing-thread, so that when the splicing-thread is being fed to the needles it suffers no friction or retardation by reason of the existence of the gripping-jaws. When the movable jaw is in contact with the stationary jaw, the splicing-thread is clasped and prevented from feeding into or being fed to the needles. When, however, the movable jaw is moved from the fixed jaw, as shown in Fig. 6, the splicing-thread is free to be fed into the needles by the frictional contact therewith of the constantly-moving main thread. Consequently, as in the Patent No. 443,462, above referred to, the formation of the splice or patch is controlled by the movements of the movable gripping-jaw K.

The movable gripping-jaw K is carried on the inner end of a horizontally swinging or oscillating gripper-arm L, which is pivoted at *h* to the plate I. The outer end of this gripper-arm fits and rests in a notch or recess *i* in the upper end of a vertically swinging or oscillating lever M, which is pivoted at *m* to the bracket H. This lever M is moved in opposite directions (thereby oscillating the gripper-arm L) by a spring N and by a sliding cam-bar O. The spring N is carried by the lever and bears against a face of a guide-plate P, carried by the bracket H. When the lever M is free to be moved by the spring, it is moved thereby in the direction of the arrow 1, (see Fig. 4,) whereby the movable jaw K is moved in the direction of the arrow 1, (see Fig. 6,) thereby separating the gripping-jaws and releasing the splicing-thread. The lever M is moved in the opposite direction—that is, in the direction of the arrow 2 (thereby closing the gripping-jaws and clasping the splicing-thread)—by the action of the sliding cam-bar O. This cam-bar slides radially to the axis of the machine in any suitable rectilinear guides, such as in a guide-groove *n* in the guide-plate P. The cam-bar carries a cam-incline *s*, which connects two faces *t* and *u* parallel with each other and with the line of motion of the cam-bar, and which co-operates with a stud *w* on the lever M. When the cam-bar is moved inwardly in the direction of the arrow 2, (see Fig. 7,) the cam-surface *s* encounters the stud *w*, which had been previously resting on the lower face *t*, thereby forcing the stud (and with it the lower end of the lever M) outwardly until the stud rests on the higher face *u*. When, however, the cam-bar is moved outwardly in the direction of the arrow 1, (see Fig. 7,) the stud *w* follows down the cam-incline *s* by the action of the spring N until it again rests on the lower face *t* of the cam-bar. The normal position of the cam-bar O is the inner position, with the stud *w* of the lever M bearing against the outer parallel face *u*. When in this position the movable gripping-jaw is held against the stationary jaw, and it is manifest that the movable jaw cannot be moved until the cam-bar is moved outwardly. Consequently the splicing-thread is held firmly and prevented from being accidentally fed to the needles. The back-and-forth movement of the cam-bar therefore results in the alternate gripping and releasing of the splicing-thread, and its movements are controlled by a fixed cam-plate Q and a movable cam-plate R, the movements of said movable cam-plate being in turn controlled by an intermittently-moving pattern-chain S, whose movements are timed with those of the knitting mechanism. The fixed cam-plate Q is secured to the head-plate A, and it has a throwing-in cam or cam-incline 3, which is in the path of the free lower end of a lever T. The lever T is pivoted at 4 to the guide-plate P and has a slot 5, into which a pin 6 on the sliding cam-bar enters. The extent of movement of this throwing-in cam 3 is sufficient to move the cam-bar O from a position where the gripping-jaws J K are open to a position where they are closed. The movable cam-plate R slides on the head-plate A radially to the axis of the machine and has two positions, an outer operative position and an inner inoperative position, the latter being the normal position. The movable cam-plate R has a drawing-out cam or cam-incline 7, which is in the path of the lower free end of the lever T when the cam-plate is in its outer operative position, but which is out of co-operative relation with said lever when the cam-plate R occupies its inner inoperative but normal position. When the movable cam-plate R is in its outer operative position, its drawing-out cam 7 acts through the lever T to move the cam-bar O from its inner position (where the gripping-jaws are closed) to its outer position, (where the gripping-jaws are open,) the drawing-out cam 7 thus acting to move the cam-bar O in one direction, while the throwing-in cam 3

acts to move the cam-bar in the opposite direction. As the lever T rotates with the rotary parts of the machine it encounters during each rotation first the drawing-out cam 7, whereby the splicing-thread is released and fed into the needles, and then the throwing-in cam 3, whereby the splicing-thread is gripped and broken off. Consequently as long as the movable cam-plate R occupies its outer operative position the splicing-thread is fed in and broken off at each round of stitches. The relative locations of the cam-plates Q and R determine the peripheral extent of the splice or patch. When a patch is finished, the movable cam-plate R is moved inwardly to its normal inoperative position, so that the cam-bar O is never moved outwardly, but remains in its inner position, (thereby insuring the clasping of the splicing-thread,) and then only an ordinary web is knit with the main thread. When a second patch is to be formed, the cam-plate R is again moved outward to its operative position.

The movements of the movable cam-plate R are controlled through suitable instrumentalities by the pattern-chain S. The pattern-chain is operated by any of the well-known means such as are common in knitting-machines, and it carries a series of cam projections U, suitably disposed so as to give proper widths to the patches and to insure their proper positions in the web. These cam projections U act alternately upon two vertically-sliding bars V W, which are mounted on a fixed bracket X. These two bars are connected to the opposite ends of a link Y, which is centrally pivoted at 8 to the bracket X, so that when one bar, as V, is moved upwardly by one of the cam projections U the other bar, as W, will be moved downwardly into the path of the next cam projection. Each bar V or W is connected to the link Y by a pin 9 and slot 10, and each is mounted and guided on the bracket so as to move rectilinearly by means of slots 12 and pins 11. There is enough friction between the bars V and W and their guides so that they remain in any position to which they may be moved by a cam projection U until they are moved by the next cam projection.

The inner bar V is formed on its inner edge with a cam 13, which co-operates with one end of a horizontally-swinging lever Z, which is pivoted at 14 to the base-plate A and which carries at its other end the movable cam-plate R. The cam 13 connects two vertical edges 15 and 16 of the bar V at different distances from the axis of the machine, and the tail end of the lever Z is maintained in contact with the edges 15 16 or the cam 13, as the case may be, by a spring 17. In the normal position of the parts the tail end of lever Z is held against the upper outer vertical edge or face 15, thereby maintaining the cam-plate R in its normal inoperative position. When, however, a patch is to be knit, a cam projection U on the pattern-chain lifts the bar V, thereby bringing the cam 13 against the tail end of the lever Z, and consequently moving the cam-plate outwardly to its operative position. When the cam-plate R is thus moved outwardly, the tail end of the lever Z rests against the lower inner edge or face 16, so that the cam-plate R cannot be moved inwardly by the action of the lever T and the cam-bar O. Consequently the patch is formed until the next cam projection U encounters the outer bar W. The elevation of this bar effects the depression of the bar V, so that the cam 13 is lowered beneath the plane of the lever Z, and the cam-plate R is restored to its inner normal inoperative position by the action of the spring 17 on the tail end of the lever Z.

No special means are shown for insuring the feeding in of the splicing-thread to the needles (when released by the gripper) by the frictional contact therewith of the main thread. No such special means are necessary if rough-surfaced yarns are employed. If smooth threads are employed, the splicing-thread may be slackened just prior to being released by the gripper by slackening devices such as are shown, for example, in Patent No. 443,462, above referred to, or in United States Patent No. 440,606, dated November 11, 1890.

We claim as our invention—

1. A splicing-thread gripper having two gripping-jaws, one of which is movable, the lever M, connected with said movable jaw for moving the same, and the spring N, which moves said lever in one direction, in combination with a sliding cam-bar which reciprocates in a straight line and which moves said lever in the opposite direction, said cam-bar having parallel faces *t u* in different planes and parallel with the line of movement of the cam-bar, said faces being connected by the cam-incline *s*, said lever M being held in contact with said parallel faces and said cam-incline by said spring, substantially as set forth.

2. The splicing-thread-gripping mechanism of a knitting-machine and a fixed cam which acts upon said gripping mechanism to cause it to grip the splicing-thread, in combination with a movable cam which is movable horizontally from an inner inoperative position to an outer operative position, said movable cam in its outer operative position acting on the gripping mechanism to cause it to release the splicing-thread, substantially as set forth.

3. The splicing-thread-gripping mechanism of a knitting-machine, having as its controlling element a movable cam-bar, in combination with a fixed throwing-in cam which acts to move said cam-bar inwardly, and a movable draw-out cam movable from an inner inoperative position to an outer operative position, said draw-out cam when in its inoperative position having no effect upon said cam-bar, but when in its outer opera-

tive position acting to move said cam-bar outwardly, substantially as set forth.

4. The sliding cam-bar and its operating-lever T, in combination with a fixed cam-plate Q, having a throwing-in cam-incline 3 in the path of said lever T, whereby said cam-bar is moved inwardly, and the horizontally-movable cam-plate R, having an inner inoperative position and an outer operative position, said cam-plate R having a draw-out cam-incline 7, which in the operative position of the movable cam-plate is in the path of the said lever T, whereby said cam-bar is moved outwardly, but which is out of the path of said lever when said cam-plate is in its inner inoperative position, substantially as set forth.

5. The movable cam-plate R, which is movable from an inner inoperative position to an outer operative position, and a horizontal swinging lever carrying said cam-plate, in combination with a spring which moves said lever in one direction, a movable cam 13, which moves said lever in the opposite direction, a traveling pattern-chain, and mechanism intermediate between said pattern-chain and said movable cam 13, whereby said cam is moved, substantially as set forth.

6. Splicing-thread-gripping mechanism for a knitting-machine, including a reciprocating actuating cam-bar O and a horizontally-swinging lever Z, carrying a cam R, which actuates said cam-bar in one direction, in combination with a vertically-reciprocating bar V, which moves in a straight line, said bar having parallel vertical faces or edges 15 16 in different planes and parallel with the line of movement of said bar V and said bar V having a cam-incline 13, connecting said parallel faces 15 16, and a spring which holds said lever Z against said faces 15 16 and said incline 13, substantially as set forth.

7. A traveling pattern-chain having cam projections thereon, a portion of said cam projections traveling in one plane and the remainder of said cam projections traveling in a different but parallel plane, and a swinging lever Z, which co-operates with the splicing-thread-gripping mechanism of a knitting-machine, in combination with two rectilinearally-movable bars co-operating with said pattern-chain and movable by the cam projections thereon, one of said bars being movable by the cam projections in one plane and the other of said bars being movable by the cam projections in the other plane, one of said movable bars having a cam which co-operates with and swings said lever Z, and a centrally-pivoted link connected at opposite ends to said movable bars, whereby when one of said bars is moved in a given direction by one of the co-operating cam projections the other of said movable bars is moved in the opposite direction and into the path of its co-operating cam projections, substantially as set forth.

In testimony that we claim the invention above set forth we affix our signatures in presence of two witnesses.

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ALBERT T. L. DAVIS.

Witnesses:
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