(No Model.) 2 Sheets—Sheet 1.

C. J. APPLETON.

STRAIGHT KNITTING MACHINE.

No. 381,898. Patented May 1, 1888.

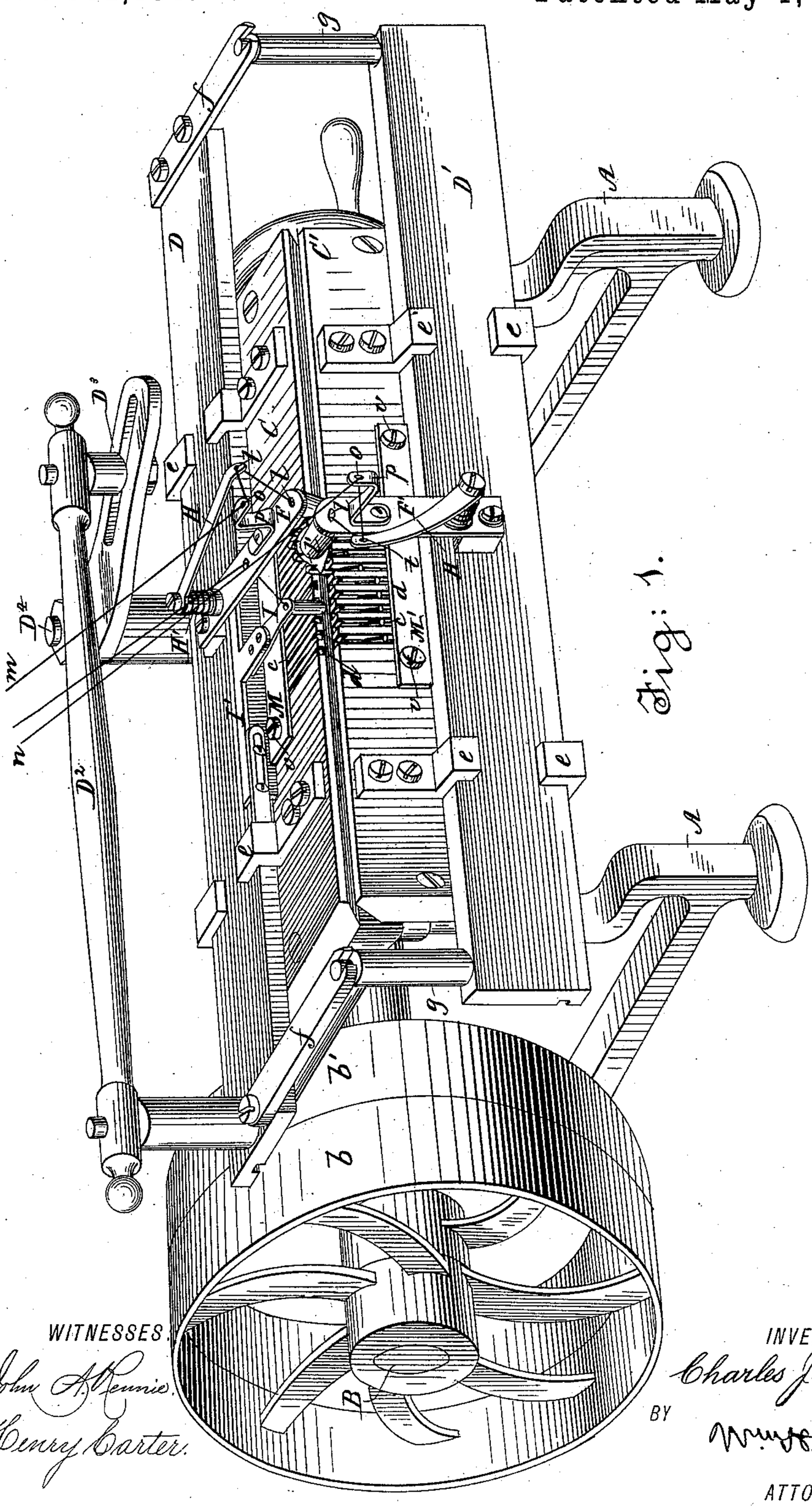

Fig. 1.

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Fig: 2.

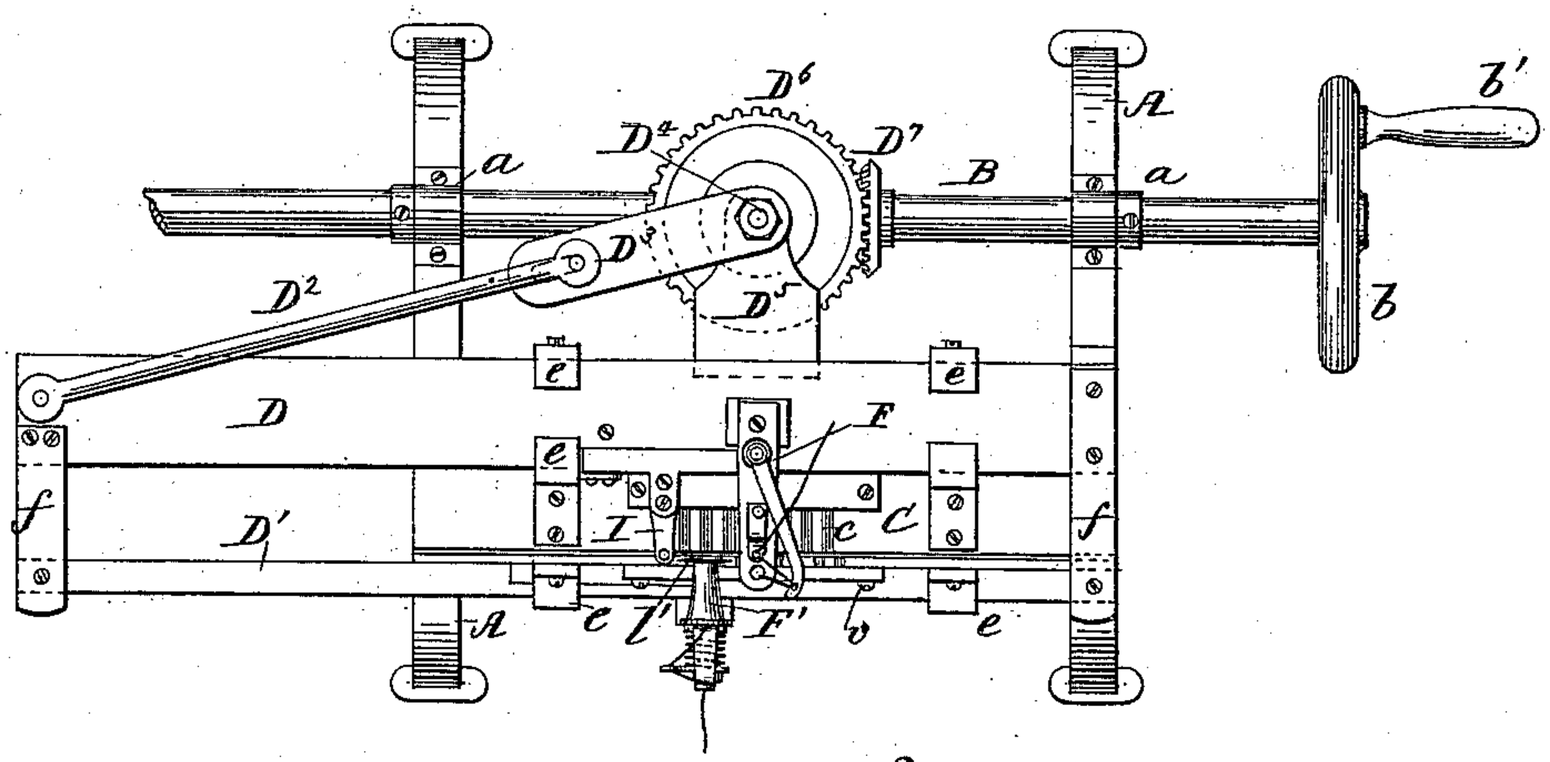


Fig: 3.

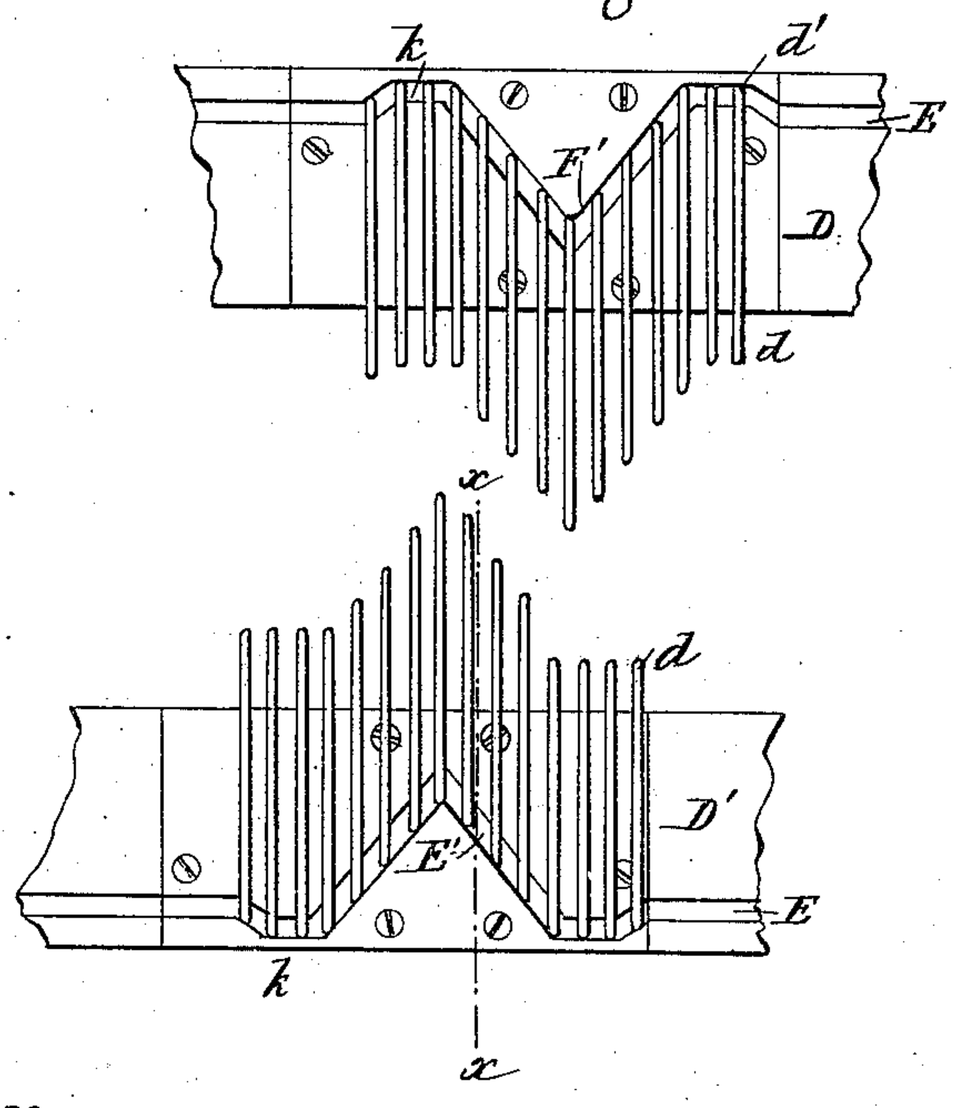
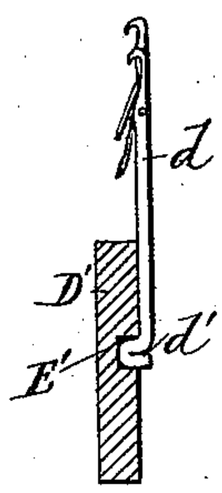


Fig: 4.



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UNITED STATES PATENT OFFICE.

CHARLES J. APPLETON, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO LUDWIG SUTRO, OF NEW YORK, N. Y.

STRAIGHT-KNITTING MACHINE.

SPECIFICATION forming part of Letters Patent No. 381,898, dated May 1, 1888.

Application filed July 16, 1887. Serial No. 244,444. (No model.)

To all whom it may concern:

Be it known that I, CHARLES J. APPLETON, a citizen of the United States, and a resident of the city of Elizabeth, county of Union, and State of New Jersey, have invented certain new and useful Improvements in Straight-Knitting Machines, of which the following is a specification.

My invention relates to what are known in the art as "straight-knitting machines," or those in which the needles thereof are arranged in straight rows, and especially to that class which are designed for knitting flat webs, its object being to produce a machine of this class which shall be adapted to the production of a fabric suitable for use as a braid for ornamental or other purposes. To effect this result I make use of a set of horizontal and a set of vertical needles, with an appropriate yarn-guide for each, and combine with such needles cams for operating the same, which are so constructed and arranged as to cause the needles of each set to form the yarn supplied to them into rows of plain loops, and to interlock such loops with the corresponding loops formed by the other set of needles in such a manner as to produce a firm and homogeneous fabric, with the loops of one yarn lying wholly upon one face and the loops of the other yarn wholly upon the other face thereof. The fabric as thus formed, while possessing novel features in itself, is not claimed herein, but forms the subject of a separate application for Letters Patent filed of even date herewith, the present application being directed to the machine whereby such fabric is produced; and in order that the construction and mode of operation of the same may be more readily understood, reference will be had to the accompanying drawings, in which—

Figure 1 is an isometric projection of such machine with my invention applied thereto; Fig. 2, a plan view thereof; Fig. 3, a view of the under or working faces of the cam-bars, showing the form of the cam-grooves and the relative arrangement of the parts of each with respect to the parts of the other, as well as the several positions assumed by the needles during the operation of the machine, said bars being arranged in the same plane for the purpose of illustration; and Fig. 4, a section taken on the line X X of Fig. 3.

In all the figures like letters are employed to designate corresponding parts.

A A are brackets or standards in suitable bearings, *a a*, formed in which is mounted the main driving-shaft B, the same being provided with a fast and loose pulley, *b* and *b'*, or other convenient means whereby its rotation may be effected.

C C' are the needle-bars, having formed in each the usual grooves, *c c*, for the reception of the needles *d d*, which are fitted to slide therein. These bars are secured at their ends to the brackets or standards, and form therewith the main framing of the machine, the former of said bars being arranged to support its needles in a horizontal plane and the latter its needles in a vertical plane, with the needle-grooves in each so disposed with respect to the needle-grooves in the other that the needles of either bar, when such needles are reciprocated, shall pass between the needles of the other bar without interfering therewith.

The needles *d d* are of the ordinary latch form, and are each provided at the appropriate point on their upper side with the butts *d'*, as shown more clearly in Fig. 4.

Resting upon the needle-bars C C' are the cam-bars D D', respectively, which are held in the proper position thereon by the keepers *e e*, secured to the needle-bars by means of screws or otherwise. These bars are connected at their ends, so as to be caused to move in union, by means of the arms *f f*, secured to the bar D, engaging with the studs or posts *g g*, projecting upward from the bar D', and are reciprocated back and forth across the needles through the medium of the rod D^2, connecting the upper of said bars with the crank D^3, secured to the upper end of a vertical shaft, D^4, which in turn is mounted in a suitable stand or hanger, D^5, projecting rearwardly from the needle-bar C, said shaft being rotated from the main driving-shaft B through the intermediary of the bevel-gears D^6 D^7. In the under or working faces of each of these bars is formed a cam-groove, E, with which the butts *d'* of the needles engage, and such grooves are provided with both the usual V-shaped portions, E', and

"knock-over" depressions *k*, by means of which the advancement and retraction of the needles, as well as the knocking over of the loops, are effected. These V-shaped portions, instead of being disposed in such relation with respect to each other as to bring their apices in the same vertical line, are located upon opposite sides thereof, as shown in Fig. 3, in order that the needles of each set, when their cam-bars are reciprocated, may form the yarn supplied to them into courses of plain loops and interlock such loops with the loops of the other needles, and so on.

Secured to the cam-bars D D', respectively, are the yarn-carriers F F', through the action of which the yarns *m* and *n* are fed to the needles, the carrier F being employed in connection with the horizontal set and the carrier F' in connection with the vertical set. These carriers are each provided in its outer end with a guide-eye, *l*, through which the yarn on its way to the needles passes and is guided, and also with a latch-opener, *l'*, by means of which the latches of the needles are thrown back as such needles are advanced to engage the yarn, and the taking of the same by them is thereby insured.

The yarns *m* and *n*, instead of passing directly to the guide-eye *l* in their respective yarn-carriers, are each caused to travel through a guide-eye, *o*, formed in the outer end of a bracket, *p*, which is secured to the upper or outer side of such carriers; and, in order that the slack in the same may be taken up and controlled at all times, the yarn-carriers F F' are each provided with a take-up lever, H, which is pivoted to the upper or outer side thereof and is controlled in its action by means of a coiled spring, H'. These levers are each constructed with an orifice, *t*, in its outer or free end, through which the yarn travels on its way from the guide-eye *o* to the guide-eye *l*, and when unacted upon by the yarn such lever is nominally held by its spring in a position nearly at right angles to its appropriate yarn-carrier. When, however, any strain is exerted upon either of such levers by the action of the yarn in passing through the orifice in its end, it yields thereto, and its orifice approaches the guide-eyes *o* and *l*, the amount of such deflection depending upon the measure of strain exerted by the yarn. This deflection continues as long as any strain is transmitted by the yarn, but ceases the moment that it is removed, and the lever returns to its original position, taking up in such movement any slack that may be present in the yarn.

In order to maintain the needles in their grooves, and at the same time to hold them back away from the cam-bars to obviate the friction incident to the rubbing of such parts together as the latter are reciprocated, I find it convenient to employ the bars or plates M M', which are respectively secured to the faces of the needle-bars C C' in front of said needles by means of screws *v v*, as shown more clearly in Fig. 1.

With the parts above described may be employed any of the well-known forms of tension and take-up devices common to knitting-machines; but as the same form no part of my invention they have not been illustrated.

As thus constructed, with the yarns *m* and *n* properly threaded through the appropriate guide-eyes *o* and *l* and take-up orifice *t*, and proper loops having been formed upon the needles, the operation of the machine to form my improved fabric is as follows: Starting with the cam-bars at the extreme limit of their movement to the left in Fig. 1, upon rotating the main driving-shaft such cam-bars will, through the action of the intermediate devices, be moved to the right. This movement will cause the advancement and retraction of the needles of both sets, and the formation of a row of loops upon each set thereof, which loops, owing to the advancing movement of the vertical needles, as the horizontal needles are being retracted, due to the peculiar arrangement of the V-shaped portions of the needle-actuating grooves in the cam bars, will be interlocked together, the yarn taken by the horizontal needles during this operation being drawn around the shanks of the vertical needles, as the former needles are withdrawn, and cast off upon the loops of the latter needles as they are withdrawn, serving to effect this result. The movement of the cam-bars to the left reverses these operations, the vertical needles being first advanced, and, in their backward movement, drawing the yarn taken by them around the shanks of the advancing horizontal needles, which, in their backward movement, cast off such yarn upon the loops carried by them, interlocking the two rows of loops together, as in the preceding operation, and so on, the vertical and horizontal needles in these operations alternately serving as sinkers for each other, and the several movements resulting in a double fabric composed of two yarns, each of which is knitted into plain fabric and interlocked with the other. I sometimes find it desirable to combine a weft-yarn with the fabric as thus formed, and for this purpose I make use of the weft-carrier I. This carrier may be made of any approved form, and may be mounted in various ways. I prefer, however, to make it of the form shown in the drawings, and to so mount it that, while free to travel with the cam-bars through a portion of their reciprocative movements, its motion shall be arrested near the end of the stroke of the latter, in order that it may be in proper position to lay its yarn between the loops on the needles during its backward movement. To accomplish this result the carrier I is secured to the angle-bar I', which is preferably supported upon and in frictional contact with the front edge of the cam-bar D, with its ends so disposed as to be in line with the keepers *e e*, so that as the cam-bars are reciprocated

in the operation of the machine the angle-bar with the carrier shall be caused to travel therewith until arrested by the ends of said bar coming in contact with the keepers *e e*, thereby placing the carrier in position for the return movement of said cams-bars. Provision is thus made not only for carrying the weft-carrier back and forth across the needles, but also for adjusting the same at the limit of movement of the cam-bars, to place it in proper position to lay its yarn between the rows of loops carried by the needles during the next succeeding knitting operation.

While I have shown the best means contemplated by me for carrying out my invention, I wish it distinctly understood that I do not limit myself strictly thereto, as it is obvious that I may modify the same in various ways and still be within the scope thereof—as, for instance, instead of arranging one needle-bar in a horizontal and the other in a vertical position, I may, if I so desire, arrange them both at an angle to the horizon, it only being essential that the two bars be arranged at an angle to each other.

Having thus shown and described one way in which my invention is or may be carried into effect, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination, substantially as hereinbefore set forth, with two sets of needles of a straight-knitting machine, arranged at an angle to each other, and cams for reciprocating said needles, disposed with their apices in different vertical planes, whereby the needles of each set are alternately caused to follow in their movements the needles of the other set and act as sinkers for them, of independent yarn-supplying devices for each set of needles, devices for throwing back the latches of the needles when such needles are advanced, and mechanism for operating said cams.

2. The combination, as hereinbefore set forth, with a set of vertical and a set of horizontal needles of a straight-knitting machine, independent yarn-supplying devices for each set thereof, and a weft-carrier, of a cam for reciprocating each set of needles, arranged with their apices in different vertical planes, and mechanism for operating said cams and weft-carrier.

3. The combination, substantially as hereinbefore set forth, with the needle-bars C C′, arranged at an angle to each other, the needles *d d*, provided with the butts *d′*, and the cam-bars D D′, provided with the needle-actuating grooves E, which have the apices of their V-shaped portions disposed in different vertical planes, whereby the needles carried by each bar are caused alternately to follow in their movements the needles of the other bar and act as sinkers for them, of yarn-carriers F F′, having the eyes *l l* formed in their outer ends, the latch-opener *l′*, the take-ups H H, and mechanism for reciprocating said cam-bars.

In testimony whereof I have hereunto set my hand this 5th day of July, 1887.

CHARLES J. APPLETON.

Witnesses:
THEODORE SUTRO,
ALBERT I. SIRE.