No. 791,678. PATENTED JUNE 6, 1905.

J. F. DUSTIN.

PILE FABRIC LOOM.

APPLICATION FILED MAY 11, 1904.

3 SHEETS—SHEET 1.

Fig. 1.

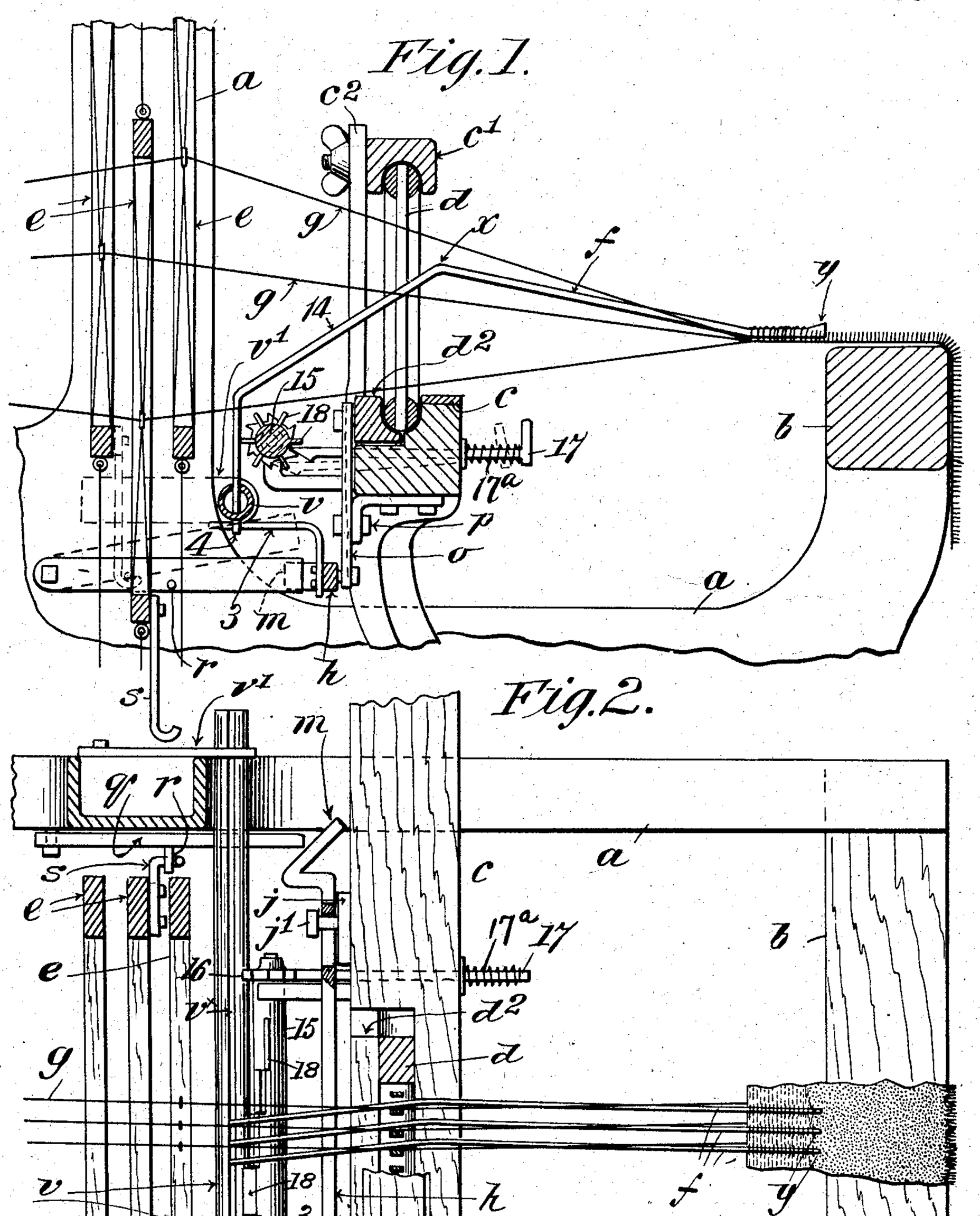

Fig. 2.

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3 SHEETS—SHEET 2.

Fig. 3.

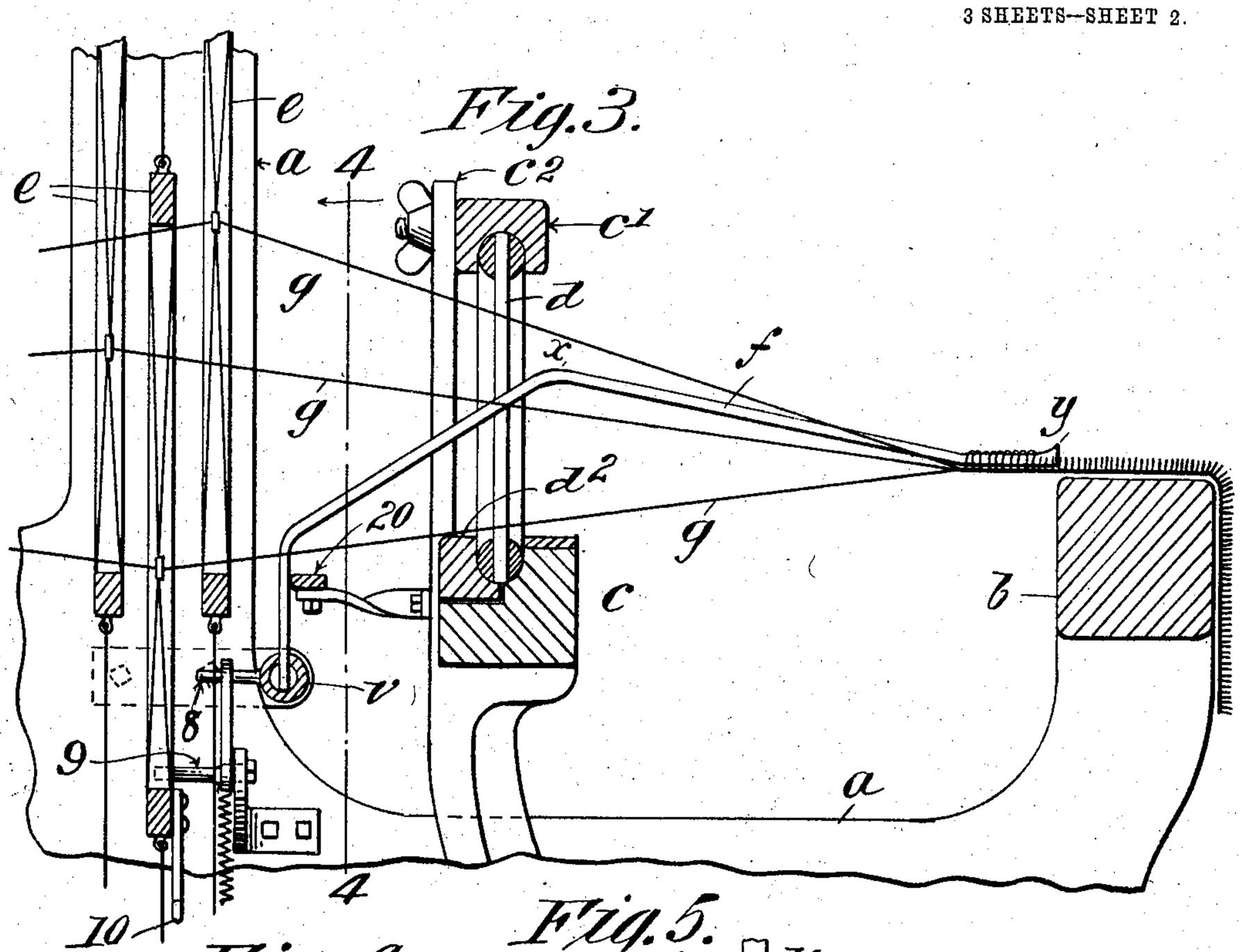


Fig. 4.

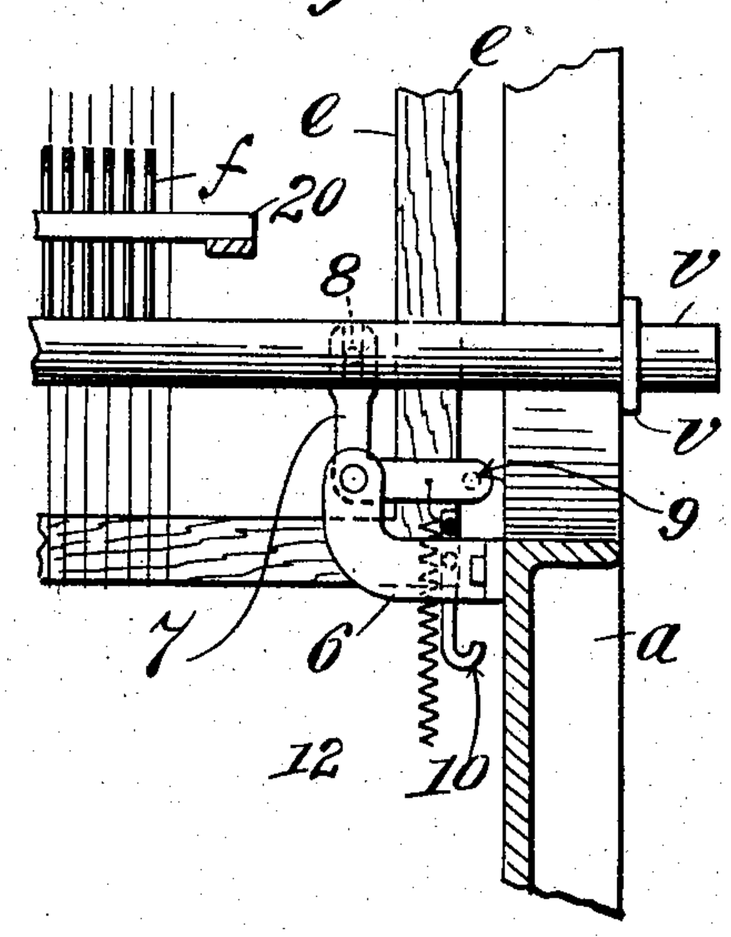


Fig. 5.

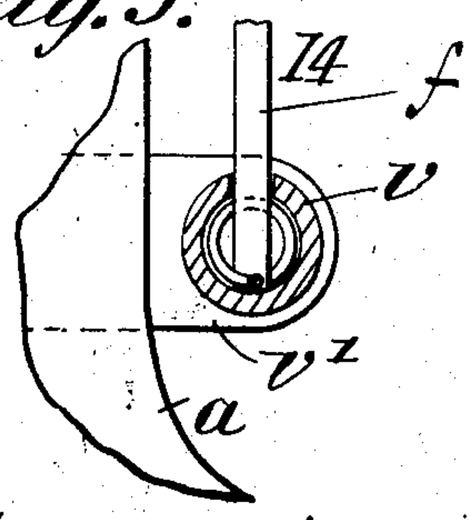
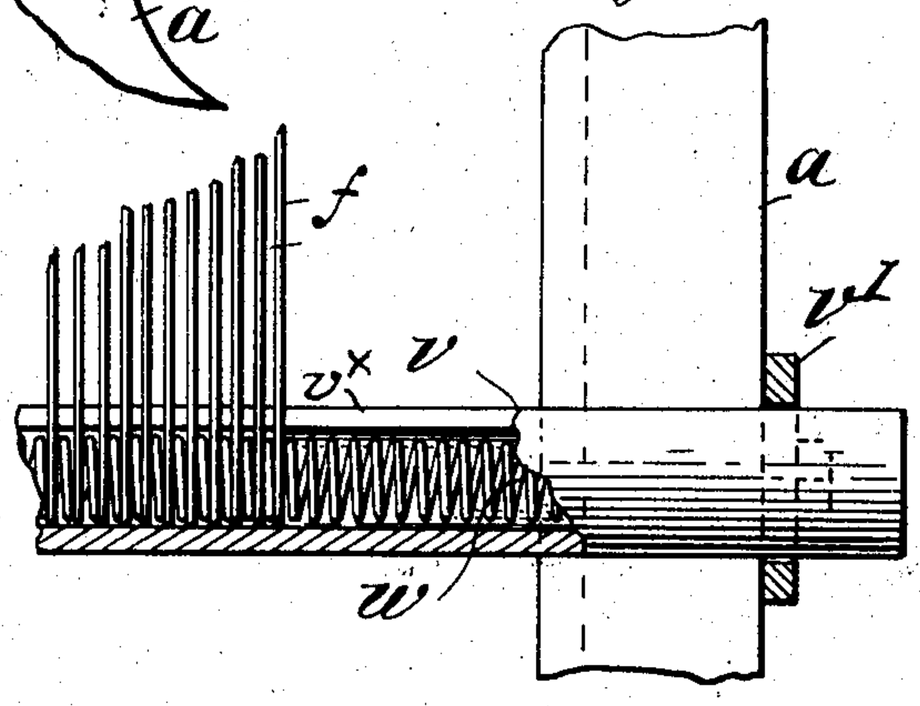


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 7.

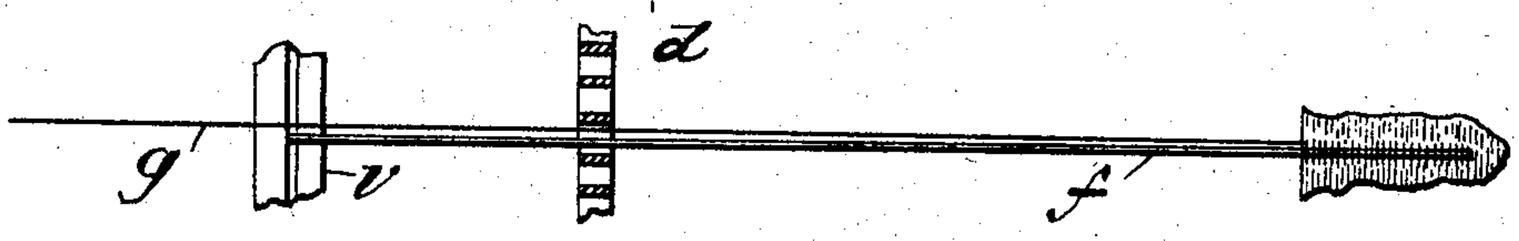


Fig. 8.

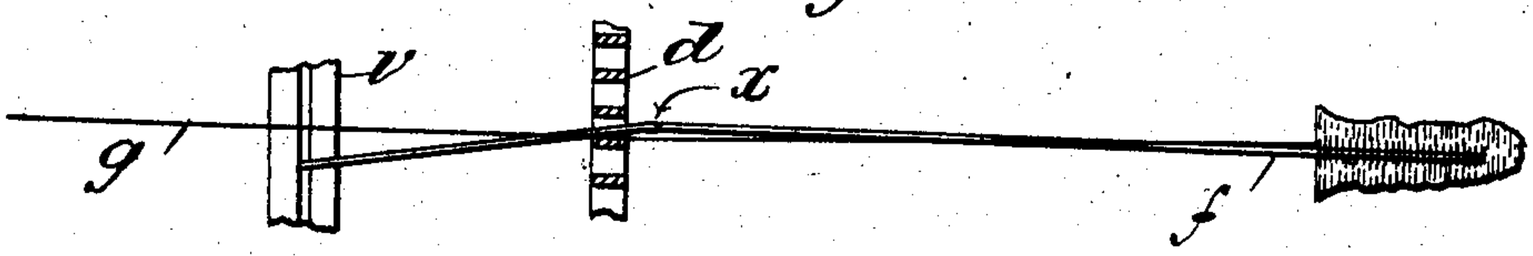


Fig. 9.

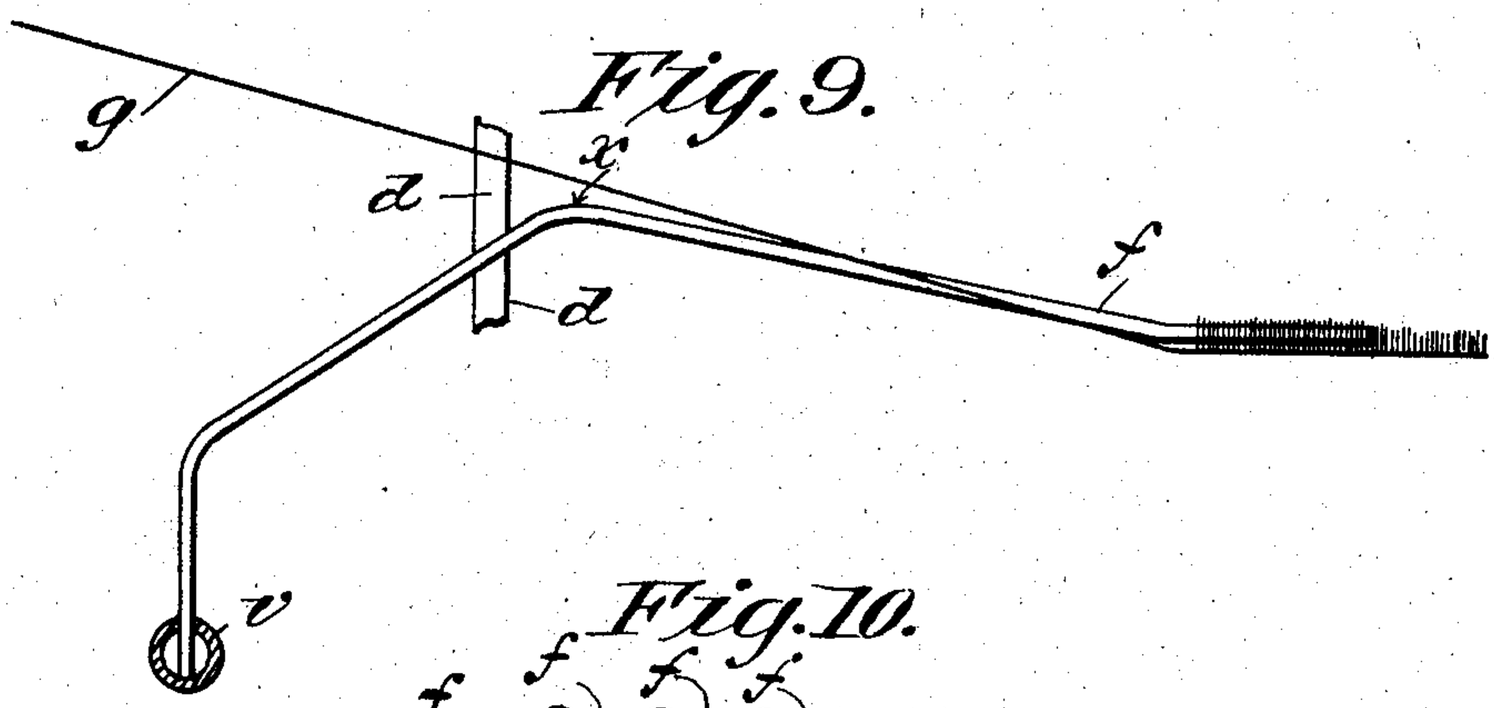


Fig. 10.

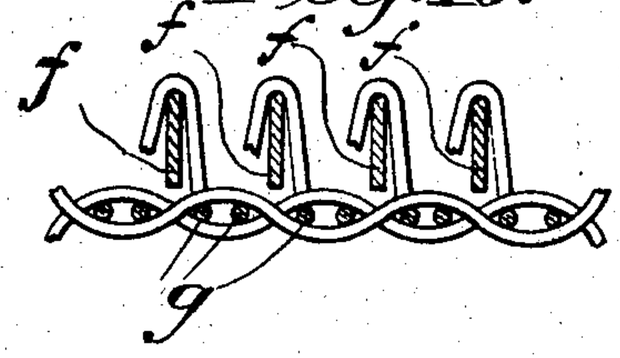
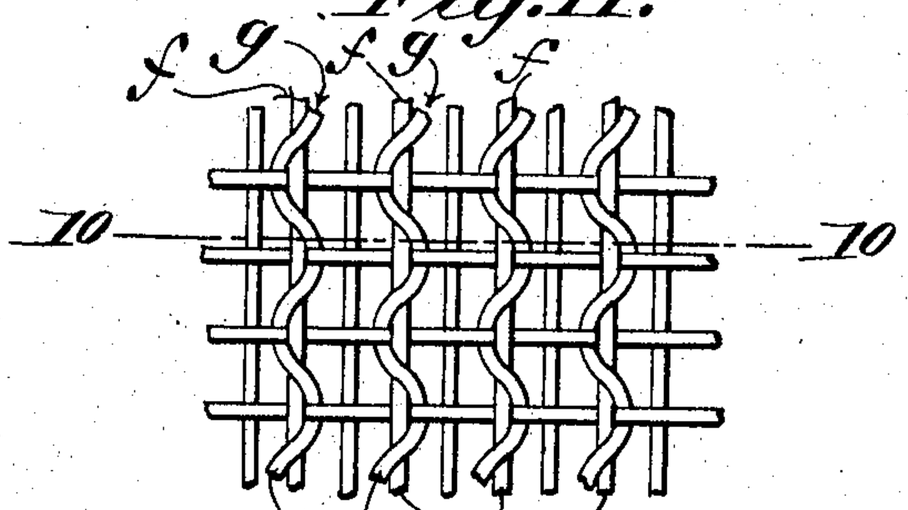


Fig. 11.



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No. 791,678. Patented June 6, 1905.

UNITED STATES PATENT OFFICE.

JOHN F. DUSTIN, OF SPRINGFIELD, MASSACHUSETTS.

PILE-FABRIC LOOM.

SPECIFICATION forming part of Letters Patent No. 791,678, dated June 6, 1905.

Application filed May 11, 1904. Serial No. 207,446.

To all whom it may concern:

Be it known that I, JOHN F. DUSTIN, a citizen of the United States of America, residing at Springfield, (Indian Orchard,) in the county of Hampden and State of Massachusetts, have invented new and useful Improvements in Pile-Fabric Looms, of which the following is a specification.

This invention relates to weaving, and has especial reference to looms for weaving pile fabric in which the pile-loop is formed from the warp, the object of the invention being to provide improved means to loop the warp over the pile-wire or, vice versa, to move the pile-wire under the warp prior to the closing of the shed.

Another object is to provide a pile-wire of novel construction whereby the loom is rendered less liable to skip a loop during the pile-forming operation of the loom; and a further object of the invention is to provide novel means for bending or flexing the pile-wires between their ends, whereby the mid-section of the wire may be located one side or the other of the warp-thread; and having these ends in view the invention consists in a construction which comprises a pile-wire, its rear end supported back of and below the reed and extending upwardly through the latter, reaching its maximum height in front of the reed, from that point extending down toward the breast-beam, and in means to move the support of the rear end of the pile-wires and the reed one relative to the other, together with means to impart endwise movement to the pile-wires, whereby the cutting of the pile-loops is facilitated.

The invention is clearly illustrated in the drawings, in which—

Figure 1 is a sectional elevation of that portion of the loom to which the construction embodying this invention has been applied. Fig. 2 is a plan view of the same. Fig. 3 is a view similar to Fig. 1, showing a modification of the mechanism by which sidewise and endwise movement is imparted to the pile-wires. Fig. 4 is a sectional view of Fig. 3 on line 4 4 in that figure. Fig. 5 is a fragmentary view of the support for the rear end of the pile-wires shown in sectional elevation; and Fig. 6 is a front elevation of the same, certain portions of the pile-wire support being broken away to show the disposition of the wires and ends. Figs. 7, 8, and 9 are respectively two plan views and one side elevation of a pile-wire, showing the relation of the warp-thread thereto before and after the pile-wire has been swung to one side of the warp. Fig. 10 is a sectional view of a portion of a piece of uncompleted fabric, showing the relation of the pile-wires thereto, the plane of this section being on line 10 10, Fig. 11. Fig. 11 is a plan view of the same.

Referring to the drawings, *a* indicates the frame of the machine; *b*, the breast-beam; *c*, the lay-beam; *d*, the reed; *e e*, the heddle-frames, and *f* the pile-wires. The heddles (through which are strung the warps *g*) are operated in the usual manner, as is also the lay-beam, and the weaving takes place as usual, the novelty of the invention residing in the reed and its operative mechanism, the pile-wires and their operative mechanism, and in certain incidental details of construction, which will be duly hereinafter referred to and explained.

Referring to the reed construction, it is to be noted that the reed proper is of the usual construction, but that it is slidably supported in the lay-beam *c*, the top of the latter being grooved to receive the lower edge of the reed-frame, whose upper edge is supported in a grooved bar c', supported on uprights c^2. Along the rear lower edge of the reed-frame is secured a bar d^2, which is let into the upper edge of the lay-beam *c* and has an endwise-sliding movement thereon. The bar d^2 may be secured to the reed-frame in any suitable manner whereby endwise movement imparted to the bar will actuate also the reed. Any suitable means may also be adopted to mount this bar d^2 slidably on the lay-beam lengthwise of the latter. To impart endwise movement to the reed, (whereby at the proper time the pile-wires which extend therethrough may be thrown one side or the other of the line of the warp,) the bar *h* is slidably supported substantially in the plane of the back side of the lay-beam on two depending arms *j*, one of which is shown in plan in Fig. 2.

The bar *h* may be slotted and bolts *j'* extended therethrough in said arms *j*. Each end of the bar is bent to form an inclined cam-surface *m*, only one of which, however, is shown in Figs. 1 and 2. Between the ends of this bar is a link *o*, supported between its ends at *p* and pivotally secured to a suitable arm secured to the lay-beam. The lower end of this link pivotally engages the bar *h*, and the upper end pivotally engages the bar d^2. The bar *h* and its described accessories are thus carried by the lay-beam.

On the two side members of the frame *a* there are pivotally supported by one end the bars *q*, (only one of which is shown,) which are provided with inwardly-projecting pins *r*, and are so located that these pins will lie near the path of movement of the heddle-frames, and on one of the latter is located a hook *s*, so disposed that when the heddle-frame is raised the hook will engage the pin *r*, and thus lift the forward end of the bar *q* from the position shown in full lines in Fig. 1 to that shown in dotted lines therein—that is to say, out of the path of movement of the cam-shaped end *m* of the bar *h*. The mechanism is so constructed that when the bar *q* on one side of the loom is raised the similarly-disposed bar on the opposite side, actuated by another heddle, will remain down in a horizontal position. Therefore as the lay-beam swings back and forth the cam-shaped extremities of the bar *h* will alternately come in contact with the ends of the bars *q*, and thus effect the shifting of the reed-frame in the lay-beam. This movement of course is not very extensive, as it is only for the purpose of throwing the pile-wires one side or the other of the line of the warps *g*, and while this movement of the reed may in itself suffice to locate the pile-wires one side of the line of the warps in a completely operative way I prefer to simultaneously move the rear ends of the wires in a direction opposite to that in which the mid-section thereof is moved by the reed, whereby, owing to the peculiar shape of the wires, I obtain a better sidewise curve to the pile-wire with less movement of the reed than where the reed is depended upon to effect the entire movement of the pile-wires, and to impart sidewise movement to the rear ends of the pile-wires I prefer to move the bar in which the ends of these wires are supported in a manner which will be shortly described.

The support for the rear ends of the pile-wires is indicated by *v*, and it consists of a tube having a longitudinal slot $v^{\times}$ therein, as shown in Figs. 2 and 6. In this tube is located a closely-coiled spiral spring *w*, and the ends of the pile-wires are inserted between the coils of the spring. The latter may then be compressed to whatever degree may seem desirable to hold the wires. The pile-wires *f* extend vertically from this support up to a point about level with the top of the lay-beam and from thence extend in an upwardly-inclined direction through the dents of the reed to a point somewhat beyond the face of the latter when the lay-beam is thrown back, as in Fig. 1, to the position which it occupies when the warps are looped over the pile-wires. From this highest point of the wire, which is indicated by *x*, the wire inclines downwardly to the level of the lay-beam, it being made long enough to extend more or less into the fabric beyond the batten-point and is provided with the knife-edge *y*, as usual in looms making cut-pile fabrics.

While the form of pile-wires just described is that which from practice has been found of most desirable shape, the latter obviously may be changed more or less without sacrificing the essential feature, which consists in a wire whose rear end is supported back of the reed and below it more or less and whose highest point is located in front of the reed when the latter is thrown back, as described, whereby a shoulder or high point, as *x*, in the wire may be located in front of the reed, over which shoulder the loop-forming warp is carried, whereby upon the change of the shed to form this loop this elevation *x* in the wire constitutes means to prevent the warp from slipping back over the pile-wires during the change of shed. The formation of this shoulder in the pile-wires in front of the reed causes the warp to be caught behind it almost at the beginning of the change of shed, whereas in the L-shaped pile-wires, such as have been used heretofore in this class of looms and which extend through the reeds in substantial parallelism with the warps, the shoulder over which the warp is drawn is the bend in the wire at the angle of the long and short arms thereof and is located well behind the reed, and therefore after the warp has been carried over it and the change of shed takes place the warp is not caught back of the shoulder on the wire until the change in the shed is nearly completed, and during this movement the angle at which the warp crosses the wire is so slight that the wire and warp are almost parallel, and it requires but little to cause the warp to snap back over the wire again, whereby it becomes located on the wrong side thereof, and thus causes a loop to be missed. This has been found to be a serious defect. It is desirable, therefore, that a clear separation laterally of the mid-section of the wire and the warp should be effected, and to make sure of the regular operation of the machine the angle of the wire relative to the warp should be as great as possible at the moment of forming the loop and changing the shed. Therefore, as stated above, I prefer to throw the support *v* of the wires to the left when the reed is thrown to the right, and vice versa, and I effect this movement of one of these parts relative to the other by securing to the bar *h* a rectangu-

larly-disposed arm 3, which extends rearwardly between two pins 4 on the under side of the support *v*, whereby the latter will move with the bar *h*, the bar *h* moving in a contrary direction to the reed. This will locate the wires as shown in Fig. 2.

There is still another method whereby the wires may be operated, and that is by the endwise shifting of their support *v* while holding the reed stationary. The mechanism for this purpose is illustrated in Figs. 3 and 4 and will now be described. In this construction the pile-wire support *v* is slidable endwise in its bearings—as *v'*, for example—but the sliding movement instead of being imparted thereto by the lay-beam originates in the movement of one of the heddles, as follows: On the frame of the machine on a bracket 6 an elbow-lever 7 is supported, one arm of which engages the pile-wire support *v* at 8 and the other arm of which has a pin 9 therein, which is located near the border of one of the heddle-frames *e*. On the latter is a hook 10, so disposed that when the heddle is moved upward this hook will engage the pin 9, thus swinging the elbow-lever on its axis and shifting the support *v* endwise in one direction, a spring 12 being provided, which is placed under tension by this movement of the support *v* and upon the fall of the heddles serves to return the support *v* to its normal position. As heretofore stated, however, while this manner of shifting the pile-wires is entirely operative the construction shown in Figs. 1 and 2 is the preferred construction, for the reason that the degree of flexure of the pile-wire at the point *x* thereon is greater when the end of the pile-wire is moved in one direction and the mid-section of the wire is moved in the other direction by the reed. This movement results in the disposition of the wire relative to the warp as shown in the plan view in Figs. 2 and 8, from which it is apparent that a far greater degree of flexure of the pile-wires is possible when they are actuated as shown and described herein than when they run straight through the reed in substantial parallelism with the warp. In the latter case the transverse movement of the wire relative to the warp must be governed entirely by the space between the dents of the reeds, whereas when the wires are formed, as shown in Fig. 1 of the drawings, with a high point, as *x*, formed therein, located in front of the reed, the movement of the rear ends of the wires in one direction and the movement of the mid-section of the wires in the opposite direction, as described, permits the wire to be located at a greater angle of inclination relative to the warp than is possible with a straight wire, for the reason that the inclined portion of the wire (indicated by 14 and extending from the point *x* thereon downwardly and rearwardly through the reeds) acts as a lever to shift the high point *x* in the wire, the fulcrum being the dents of the reed. The advantage of securing this greater degree of obliqueness relative to the warp-thread by this method is that it permits the application of the device to a much finer reed than when straight wires are used, and at the same time this increased obliqueness of the wire, together with the provision of a high point therein in front of the reed, will prevent the skipping of the loops in the weaving.

It has been found desirable to provide means to impart slight endwise movements to the pile-wires rearwardly to aid in the cutting of the loops instead of depending upon the forcing of the loops over the knives *y* by the beating-up movement of the reed, and to this end means are provided whereby upon the return movement of the lay-beam *c* a slight endwise movement to the rear may be imparted to the pile-wires *f* or certain of them, thus effecting the cutting of the loops upon the movement of the lay-beam in both directions. Preferably the construction shown in Figs. 1 and 2 is used, whereby, commencing from one side of the fabric, rearward movement will be imparted to the wires in groups successively upon each rearward movement of the lay-beam. This is effected by mounting a roll 15 in suitable bearings on the lay-beam, which roll has the ratchet-wheel 16 secured to one end thereof, and extending through and in front of the lay-beam is a pawl-arm 17, as shown in Fig. 1, in such position that when the lay-beam swings forward the end of this arm 17 will strike the breast-beam *b'* or some other suitable abutment and be moved endwise far enough to partially rotate the roll 15, the return movement of the pawl being effected by a spring 17ª thereon. Arranged around the roll 15 in spiral form are wings 18, wide enough to extend across the number of wires it is desired to actuate, each turn of the roll 15 by the pawl-arm bringing one of the wings opposite certain of the wires, whereby the latter may be operated in groups, as described, to pull the knife *y* on the wires rearwardly through the pile-loops, the reed during the batten movement beating the newly-formed loops up toward the knife.

It has not been deemed necessary to refer herein to anything but the loop-forming warps *g*, it being assumed that the presence of suitable body-warps and weft-threads or stuffer-warps may be taken for granted.

In Figs. 3 and 4 still another method of imparting endwise movement to the pile-wires is shown, whereby the cutting of the loops may be effected by the knives by all of the wires at the same time, and this consists in mounting a bar 20 on the rear side of the lay-beam, as shown in Figs. 3 and 4, the bar being supported in any convenient manner in such position that it will be struck by the lay-beam when the latter is thrown rearwardly, and thus all the pile-wires *f* will have im-

parted thereto a simultaneous rearward movement.

Having thus described my invention, what I claim, and desire to secure by Letters Patent of the United States, is—

1. In a loom of the character described, a lay-beam, an endwise-movable reed mounted thereon, and pile-wires supported back of the reed and extending therethrough toward the breast-beam, and mechanism to impart endwise movement to the reed thereon at the proper time in either direction.

2. In a loom of the character described, a lay-beam, an endwise-movable reed mounted thereon, pile-wires supported back of the reed and extending therethrough toward the breast-beam, a movable support for the rear ends of the pile-wires, and mechanism to impart endwise movement to the reed and to the said support for the pile-wires, simultaneously in opposite directions.

3. In a loom of the character described, a lay-beam, a reed mounted thereon, pile-wires supported back of the reed and extending therethrough toward the breast-beam, an endwise-movable support for said pile-wires, and mechanism to impart endwise movement to the pile-wire support at the proper time, in either direction.

4. In a loom of the character described, a lay-beam, a reed mounted thereon, pile-wires supported back of the reed and extending therethrough toward the breast-beam, an endwise-movable support for said pile-wires, heddles, and means actuated by the movement of the heddles to impart endwise movement to the pile-wire support at the proper time in either direction.

5. In a loom of the character described, a lay-beam, an endwise-movable reed mounted thereon, and pile-wires supported back of the reed and extending therethrough toward the breast-beam, and means to impart endwise movement to the reed thereon consisting of an endwise-movable bar on the lay-beam provided with cam-surfaces at each end thereof, movable abutments actuated by the movements of the loom arranged to be moved into and out of the path of movement of said cam-surfaces to impart endwise movement to the bar in opposite directions, and a suitable connection between said bar and the reed, whereby the latter may be actuated by the bar.

6. In a loom of the character described, a lay-beam and an endwise-movable reed mounted thereon, an endwise-movable pile-wire support located back of the lay-beam, suitably-operated heddles, mechanism on the lay-beam to impart simultaneous endwise movements in opposite directions to said pile-wire support and to said reed, and devices actuated by the movement of the heddles to effect the actuation of the pile-wire support and reed.

7. In a loom of the character described, a lay-beam, a reed mounted thereon, a pile-wire support located back of the lay-beam, pile-wires extending from said support through the reed, and means actuated by the successive movements of the lay-beam in one direction to impart endwise movement rearwardly to successive groups of said pile-wires in regular order from one edge of the fabric to the other.

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