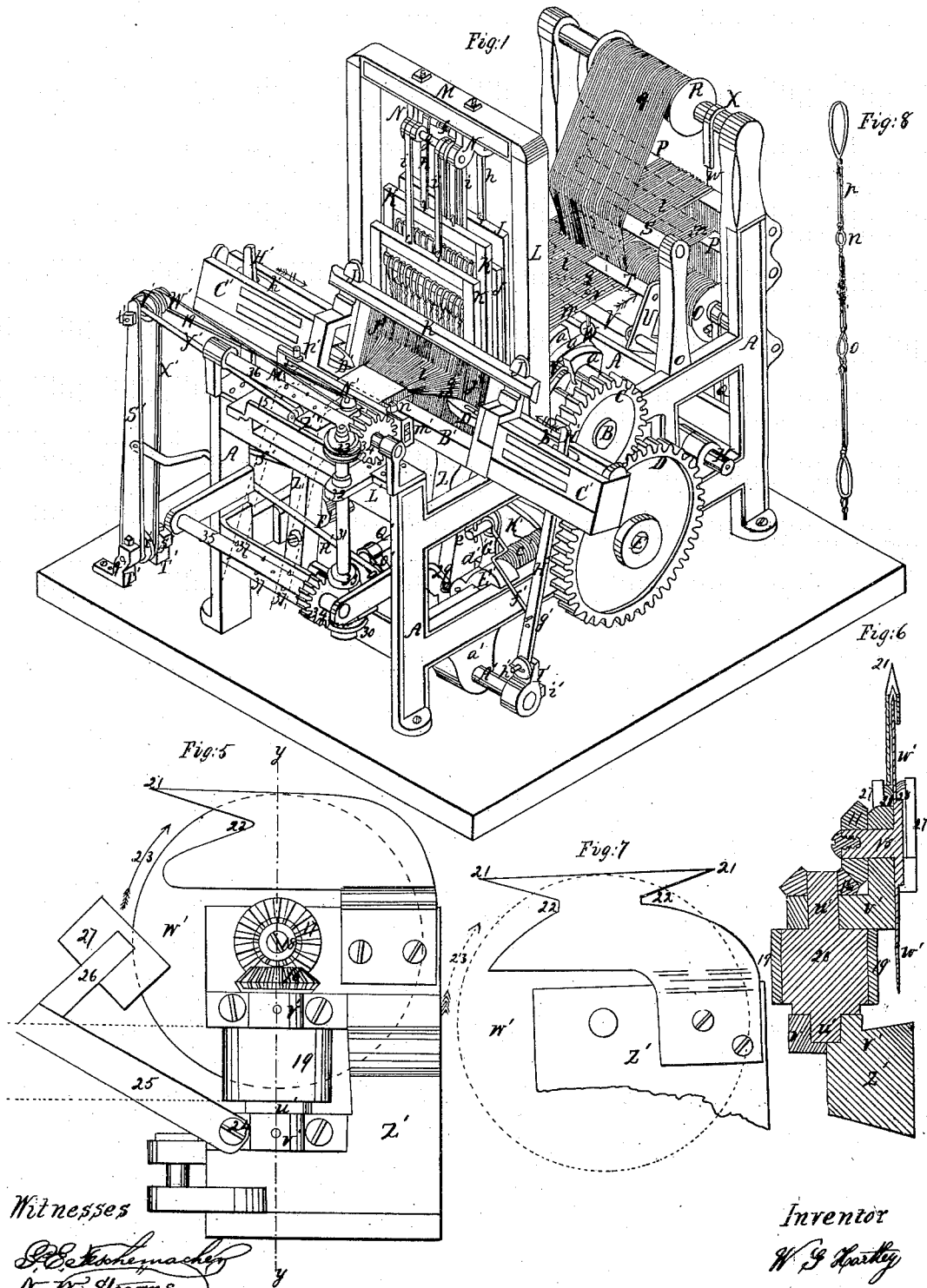


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LOOM FOR WEAVING PILED FABRICS.

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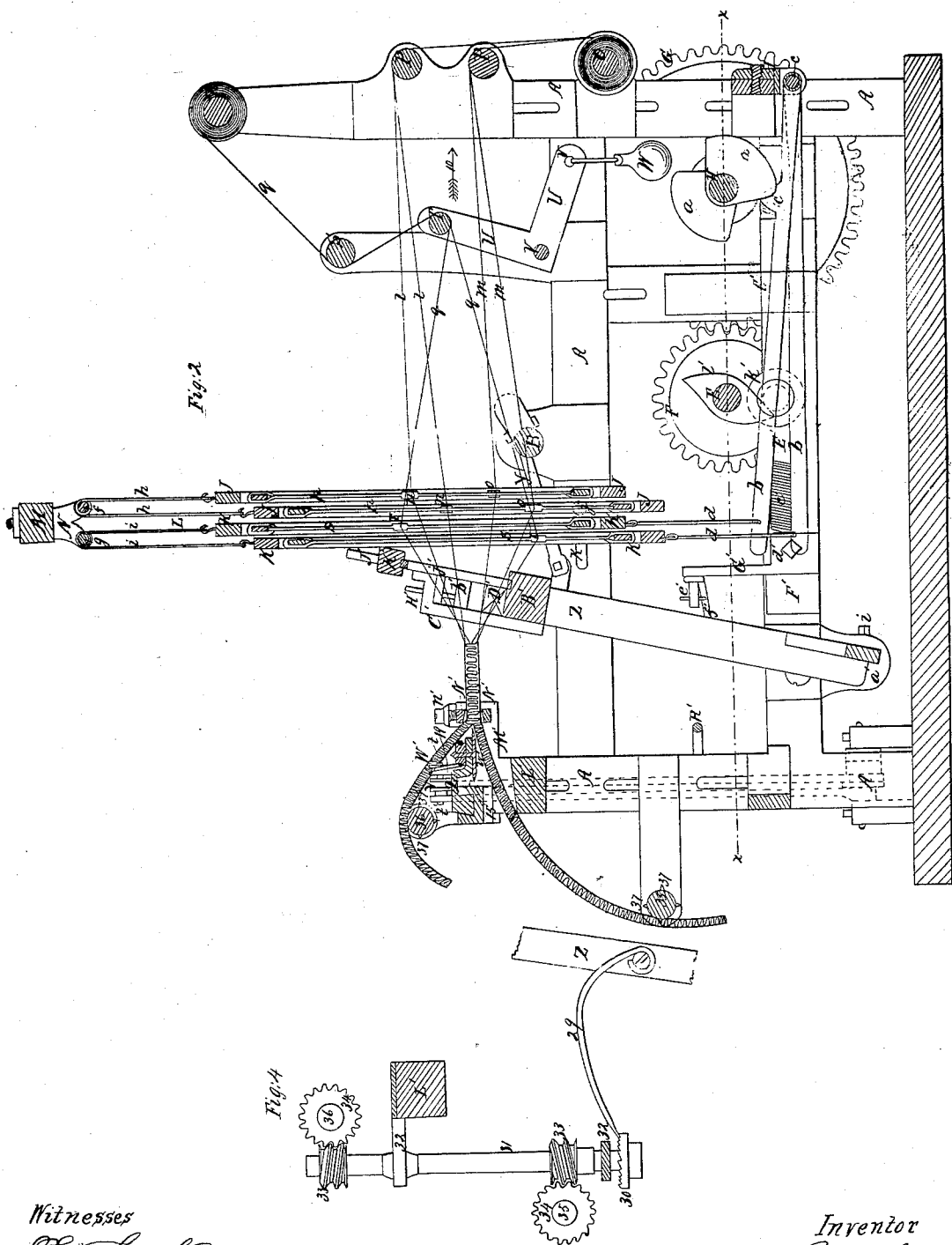
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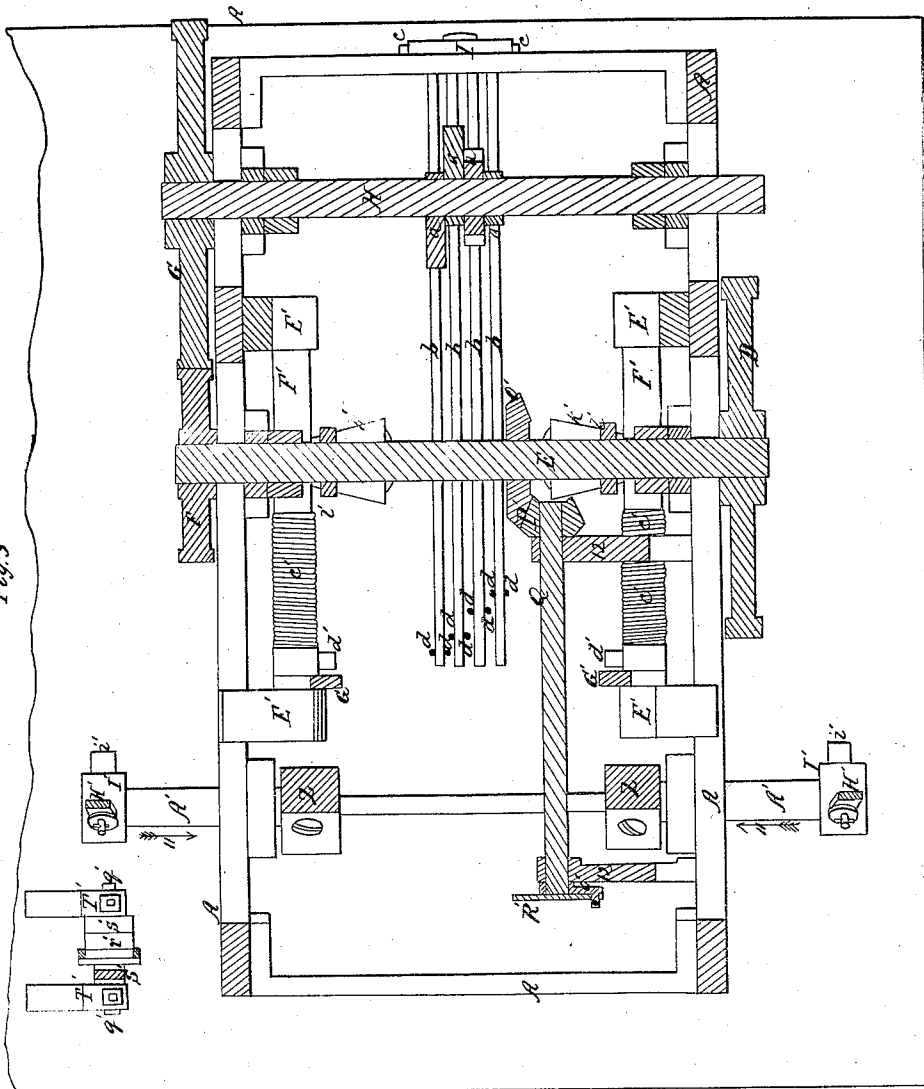


Fig. 3

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WILLIAM G. HARTLEY, OF SAXONVILLE, MASSACHUSETTS.

IMPROVEMENT IN LOOMS FOR WEAVING PILED FABRICS.

Specification forming part of Letters Patent No. 63,631, dated April 9, 1867.

To all whom it may concern:

Be it known that I, WILLIAM G. HARTLEY, of Saxonville, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Looms for Weaving Velvet Carpets, Plushes, and other Fabrics of Cotton, Woolen, or Silk, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a perspective view of a loom with my improvements applied thereto. Fig. 2 is a longitudinal vertical section through the center of the same. Fig. 3 is a horizontal section on the line *x x* of Fig. 2. Fig. 4 is a side elevation of the mechanism by which the cloth beams are operated. Fig. 5 is a plan of my improved knife for cutting the woven fabric into two pieces. Fig. 6 is a section on the line *y y* of Fig. 5. Fig. 7 is a modification of my invention. Fig. 8 represents one of my improved wire heddles detached.

My invention relates particularly to certain improvements in looms for manufacturing velvets and other fabrics which are made double, to be afterward divided in two pieces; and my invention consists in a bill or guard-finger provided with a slit or opening for the reception of a portion of the blade of a circular knife, which has a rotary motion, and also moves transversely across the pile of the fabric as it is fed in one piece, after being woven, between guide-bars against the knife, the edge of which, in connection with the two edges of the bill or guard-finger, serving (as the tuft-yarn is drawn against them) to produce a cleaner shearing cut and dividing the fabric into two smoother and more perfectly finished pieces than where the cut is produced by the knife-edge acting in connection with the single edge of a spring-blade.

My invention, furthermore, consists in an improved arrangement of the mechanism for operating the circular knife and for sharpening the same.

To enable others skilled in the art to understand and use my invention, I will proceed to describe the manner in which I have carried it out.

In the said drawings, A is the frame-work, in suitable bearings attached to which runs

the driving or crank shaft B, one end of which extends outside the frame-work and carries a cog-wheel, C, (see Fig. 1,) which gears with a cog-wheel, D, on one end of a shaft, E, the other end of which bears a wheel, F, which engages with another cog-wheel, G, upon a shaft, H, provided with four cams, *a*.

b are four levers whose outer ends are loosely pivoted at *c* to a plate or hanger, I, screwed to the frame, while their inner ends are connected by cords or wires *d* to the lower ends of the harness-frames J K, which are alternately lowered by the cams *a* striking against projections *e*, formed on the upper sides of the levers *b*. From the sides of the upper portion of the frame-work rise the standards L, which are connected at their tops by a cross-bar, M, to which are screwed the bifurcated plates N, which form bearings for the ends of the shafts *f g* to revolve in.

h i are strips of leather or belts, the upper ends of the former, *h*, being secured to the shaft *f* and their lower ends to the heddle-frames J, while the upper ends of the belts *i* are secured to the shaft *g* and their lower ends to the heddle-frames K, by which construction as one of each pair of frames J K is lowered by the action of the cams *a* upon the levers *b* the shafts *f g* are made to revolve and one pair of the belts *h i* are unwound, simultaneous with which the other two heddle-frames J K are raised by the winding of their belts around the revolving shafts. The standards L, with their cross-bar M, may be adjusted within the frame-work, should it be necessary to alter the position of the heddle-frames J K, by means of screws *j* (seen dotted) and slots *k*, Fig. 2.

In suitable bearings in the frame-work runs the warp-beam O, from which proceed two sets of binder warp-threads, *l m*, which are led over the whip-rollers P to the back harness or heddle frames, J, and through the eyes *n o* of the heddles *p* to the point where the fabric is being woven, each heddle being provided with two eyes instead of one. The tension of the binder-warps *l m* is regulated by a friction-strap, Q, in a well-known manner.

R is the beam upon which is wound the tuft-forming or pile yarn *q*, which is first passed over a guide-roller, S, and then carried down between contiguous threads of each of the two upper binder-warps, *l*, and thence

under a tension-roller, T, hung between two bent arms, U, secured to a shaft, V, having its bearings in the frame-work. After being led under the tension-roller T the tuft-forming yarns *q* commence to separate, a portion of them passing through the eyes *r* of the heddles *s* in one of the frames K, while the remaining portion passes through eyes *t* of the heddles *u* of the other frame K.

To the outer ends of the lower portions *v* of the bent arms U are suspended the weights W, which serve to keep the roller T constantly pressed against the tuft-yarns *q*, so as to insure their equal tension at all times and keep them in a central position between the two sets of binder-warps *l m*. A friction-strap, X, passes over the tuft or pile yarn beam R, one end of the strap being attached to one of the whip-rollers P or a portion of the frame-work, while the other end of the strap is connected by a cord or wire, *w*, to the outer ends of the portions *v* of the bent arms U, to which the weights W are hung, in order that, as the tension-roller T is moved in the direction of the arrow 10, the friction-strap X may be released from the beam R and the tuft-yarn let off, as required.

The mechanism by which the filling is introduced and the tuft-yarn *q* interwoven with it and the binder-warps *l m*, will now be described.

Y are connecting-rods secured to the crank-shaft B and to upright posts Z, the lower ends of which are fastened to a shaft, A', which rests in bearings *a'*, and is allowed to rock freely therein, the upper ends of the posts Z being connected by a beam, B', which extends over beyond the sides of the frame-work to allow of room for the construction of boxes C' thereon. Each box C' is divided into two compartments for the reception of two shuttles, D', the lower one of which travels (over the lower warp, *m*) on a race formed by the top of the beam B', no race being provided for the upper shuttle, the lower threads of the upper set of warps, *l*, being drawn sufficiently tight to support it as it passes over them. The shuttles D', carrying the filling, are thrown simultaneously either in the same or opposite directions by means of pickers *b'*, which are made separate and independent of each other to allow of the shuttles being regulated, as required, to conform to the difference in the position of the "shed."

The picker-sticks are operated as follows: In bearings E', secured to the inside of the frame-work, are placed the shafts F', around each of which is wound a spiral spring, *c'*, one end of which is secured to the frame, while its other end is fastened to a projection, *r'*, on the shaft F' at the foot of an arm, G', also attached to the shaft F'. From the top of this arm G' projects a pin, *e'*, around which is bent one end of a rod or wire, *f'*, the other end of which fits into a hole, *g'*, made in a long upright lever, H', the lower end of which fits loosely over a pin, *h'*, projecting from the up-

per portion of a collar, I', which surrounds the end of the shaft A' projecting outside the frame-work, the collar I' being confined to the shaft A', and being adjusted in place thereon by operating a screw, *i'*. The upper end of each of the levers H' passes through its shuttle-box C' and through the pickers *b'* within it, a longitudinal slot being formed in the partition dividing the shuttle-compartments, and an opening being formed in each of the pickers *b'* to admit of this being done. Each shaft F' is provided with a conical projection, *k'*, which is depressed by a cam, *l'*, on the shaft E as it revolves, by which means the arm G' is thrown forward, carrying with it the lever H' in the direction of the arrows 11, the pickers *b'* forcibly striking the shuttles D', which are carried across in their respective paths between the binder-warps *l m*, the shaft F', after being relieved of the pressure of the cam *l'* upon its projection *k'*, being returned to its normal position by the action of the spiral spring *c'*, while the pickers *b'* are left in the outer ends of the shuttle-boxes, ready to be again thrown forward on the cam *l'* again striking the projection *k'*.

From the cross-beam B' rise two standards, J', which are connected by a cross-piece, K', between which and the cross-beam B' is secured a metal frame containing a series of parallel flat strips or bars, *j'*, which constitute the shed for beating up the filling.

L' is the breast-beam, to each end of which is screwed one end of a bar, M', the other end of this bar being bent up at right angles thereto and being provided with a recess, *m'*, in which fit the ends of two parallel guide-bars, N', between which the woven fabric in one piece passes just previous to its being cut, the ends of the lower bar, N', resting at the bottom of the recess *m'*, while the ends of the upper bar, N', are raised or lowered therein by screws *n'* in order to vary the distance between them for the purpose of regulating the length of the pile of the fabric.

The construction and operation of the knife by which the fabric is cut into two pieces will now be described. The shaft E carries a bevel-wheel, O', which drives a bevel-pinion, P', on one extremity of a shaft, Q', which runs in bearings 12, attached to the inside of the frame-work. The other extremity of the shaft is provided with a crank, *o'*, to which is secured one end of a connecting-rod, R', the other end of which is fastened to a pin, P', projecting from the side of a long upright lever, S'. The lower end of this lever is pivoted to a shaft, *q'*, which rests in bearings in standards T' and carries a fast and loose pulley, *r' s'*. The upper end of the lever S' is provided with a shaft, *t'*, which carries two pulleys, V' W', over the former of which and the pulley *r'* runs a belt, X'.

Y' is a connecting-rod, one end of which fits loosely on the shaft *t'*, the other end of the connecting-rod being secured to the knife stock or holder Z', the bottom of which is of

the form seen in Fig. 2, and fits in dovetailed ways 15, screwed to the breast-beam L'.

w' is a short shaft, Figs. 5 and 6, the ends of which rest in bearings *v*, screwed to the knife-holder Z', one of the ends of the shaft *w'* projecting beyond its bearing *v*, and being provided with a bevel-wheel, 16, which engages with a bevel-wheel, 17, on the upper end of a stud, 18, rising from the center of a circular knife, *w*, to which is imparted a rotary motion by a belt, 19, passing over the pulley W' and over a drum, 20, formed on the shaft *w*.

21 are metal bills or guard-fingers, (see Fig. 7,) which are slotted out to inclose a portion of the blade of the knife, and serve to lay hold of and conduct the tuft-yarn to the points 22, where it is severed, the knife revolving in the direction of the arrow 23, and also, by the connections above described, traveling transversely back and forth, so as to cut the fabric each way. When the knife moves in the direction of the arrow, the tuft-yarn is pressed by it against the edges of the bill 21 in a manner similar to the action of a pair of shears, whereby a clean, even cut is made, whereas when the knife moves in the direction contrary to the arrow 23 the cut is rough and irregular, owing to the elastic and yielding nature of the yarn, which requires to be pressed against the bill or guard-finger 21, instead of being drawn away from it, to make a smooth and finished cut.

In Fig. 5 is shown a knife provided with but one bill or guard-finger 21, the knife cutting in one direction only, and moving back and forth with a much greater velocity than the feed of the fabric thereto.

To the knife-holder Z' is secured at 24 one end of a strip of metal, 25, to the other end of which are attached two flat springs, 26, carrying plates 27, provided with stones 28, between and in contact with which the knife runs when revolving, by which construction the knife may be sharpened without the delay occasioned by its removal, and when properly sharpened the stones may be readily turned to one side by swinging back the metal strip 25. After the fabric has been split by the knife into two pieces, they are wound or taken up by means of the following mechanism:

To each of the posts Z is pivoted one end of a rod, 29, the other end of which is flattened, and serves as a pawl which revolves a horizontal ratchet-wheel, 30, on the lower end of a vertical shaft, 31, Figs. 1 and 4, running in bearings 32, and carrying two worm-gears, 33, which engage with cog-wheels 34 on horizontal shafts or cloth-beams 35 36, provided with pins or projections 37, upon which the pieces of cloth are laid and wound up simultaneously by the vibration of the posts Z. By placing the upper shaft or cloth-beam, 36, at a sufficient height the "right" or "velvet" sides of the two portions of the fabric are exposed to view after being cut, so that they may be readily examined for the purpose of detecting any imper-

fections or ascertaining if the pattern will match.

The power by which the knife is operated is independent of that which drives the loom, in order that it may be turned back to find the "pick" or "filling" when it is exhausted and requires to be renewed.

By the employment of bevel-gear the mechanism for operating the knife is more compactly placed than that as heretofore constructed for this purpose.

I have spoken of the knife *w* when used in the loom for dividing the fabric into two pieces which are afterward wound up on their respective cloth-beams. I do not, however, confine myself to the use of the knife in this particular position, as the fabric may be removed from the loom to be afterward divided by my revolving knife. It will thus be seen that by the above-described arrangement of two sets of binder-warps, *l m*, in connection with the heddles *n*, provided with two eyes, *n o*, and the shuttles D', for throwing the filling, a double fabric is woven, which is connected together by the interweaving of the tuft-yarns *q*, which are alternately crossed and interwoven, first with one set of binder-warps and then with the other, the tuft-yarns running parallel to the binder-warps.

It is evident that fancy-colored carpets or cloths of various patterns may be woven by a loom constructed similar to that above described, it being only necessary to employ the ordinary "drop-boxes" operated by tappets for the purpose of changing the color or size of the filling when required. These drop-boxes may be made adjustable independently of each other by means of set-screws or other devices, so as to insure the shuttles being thrown in a line across the center of the shed at all times.

By the employment of a jacquard, Brussels carpeting may also be woven in a loom of this description, and with a slight modification of the harness it may be employed in the manufacture of seamless bags, hose-pipe, &c., the tuft forming yarns for connecting the two portions of the fabric being of course dispensed with.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A bill or guard-finger, 21, provided with a slit or opening forming two cutting-edges, when employed in connection with a circular revolving knife, *w*, substantially as and for the purpose set forth.

2. The within-described arrangement and combination of the mechanism for operating the knife *w*, consisting of the shaft Q', crank *o*', connecting-rods R' and Y', upright lever S', pulleys V' W', drum 20, and bevel-wheels 16 and 17, substantially as and for the purpose set forth.

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