4 Sheets--Sheet 1.

J. TURPIE.

Loom for Weaving Hair Cloth.

No. 166,732. Patented Aug. 17, 1875.

Fig: 1

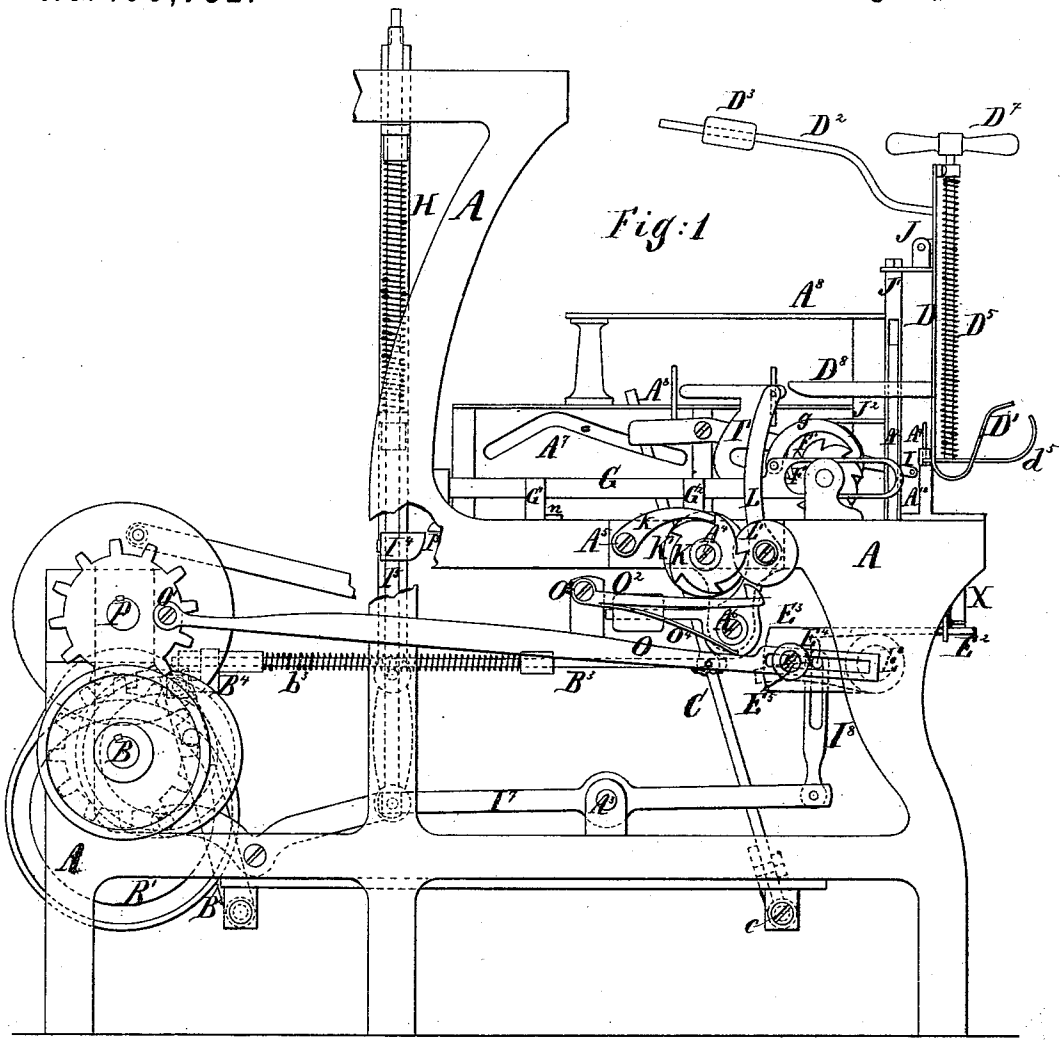
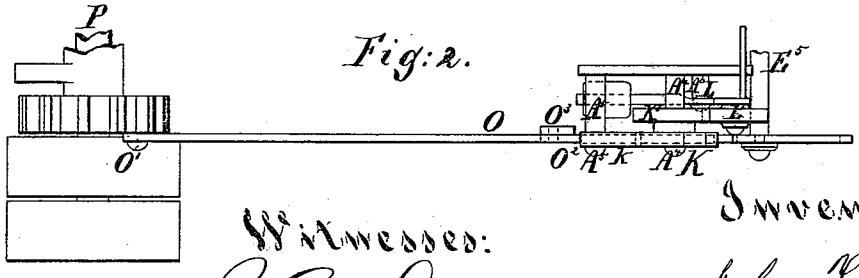


Fig: 2.



Witnesses:

Henry Gentner

Wm. C. Dey

Inventor:

John Turpie

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

4 Sheets--Sheet 2.

J. TURPIE.

Loom for Weaving Hair Cloth.

No. 166,732. Patented Aug. 17, 1875.

Fig: 3.

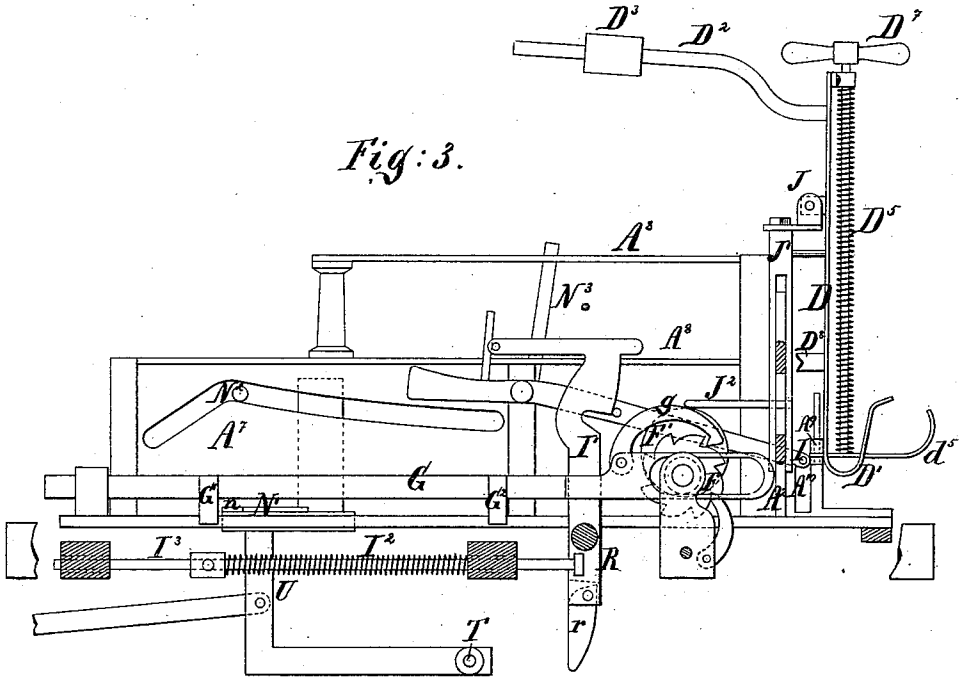
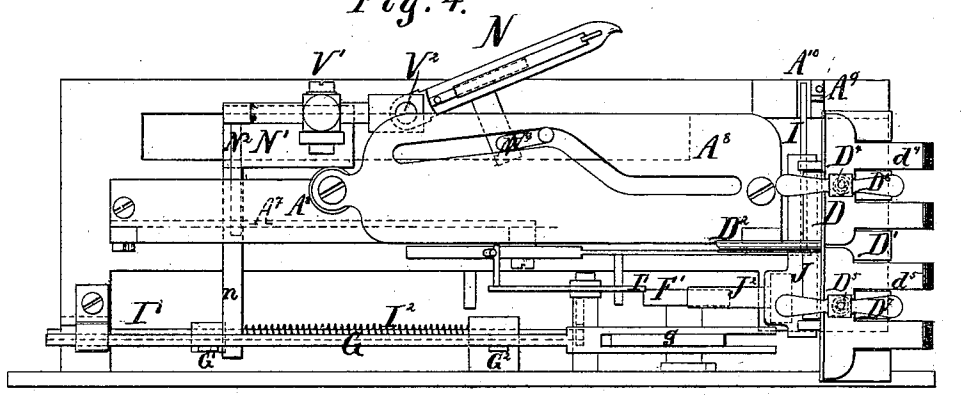


Fig: 4.



Witnessed:

Henry Gentner

Wm. E. Dey

Inventor:

John Turpie

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

4 Sheets--Sheet 3.

J. TURPIE.

Loom for Weaving Hair Cloth.

No. 166,732. Patented Aug. 17, 1875.

Fig: 5.

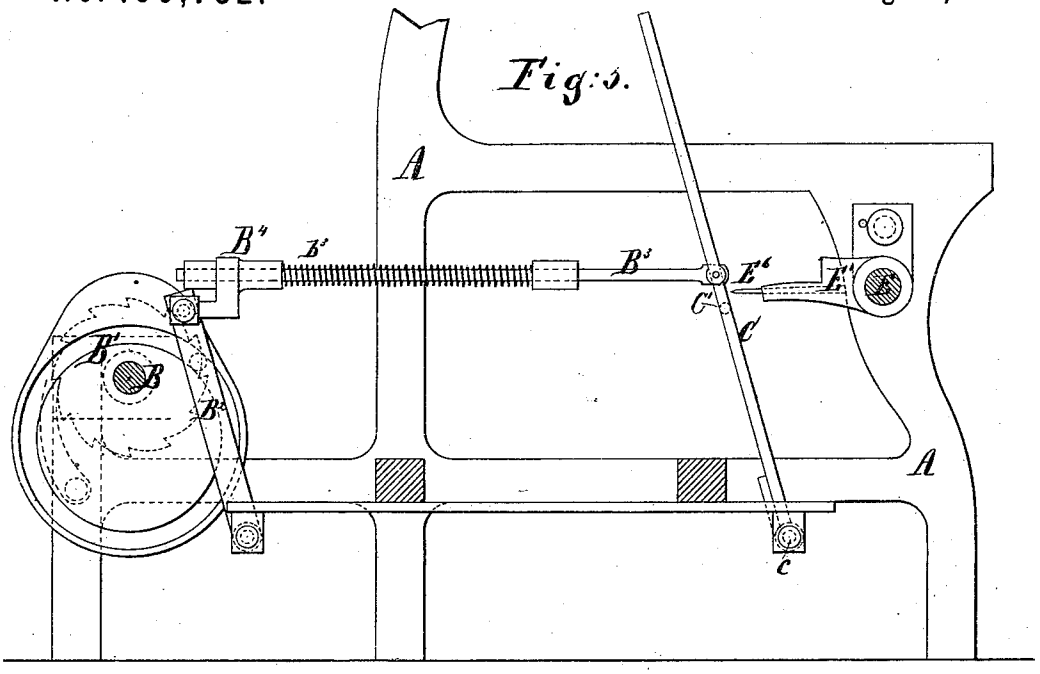
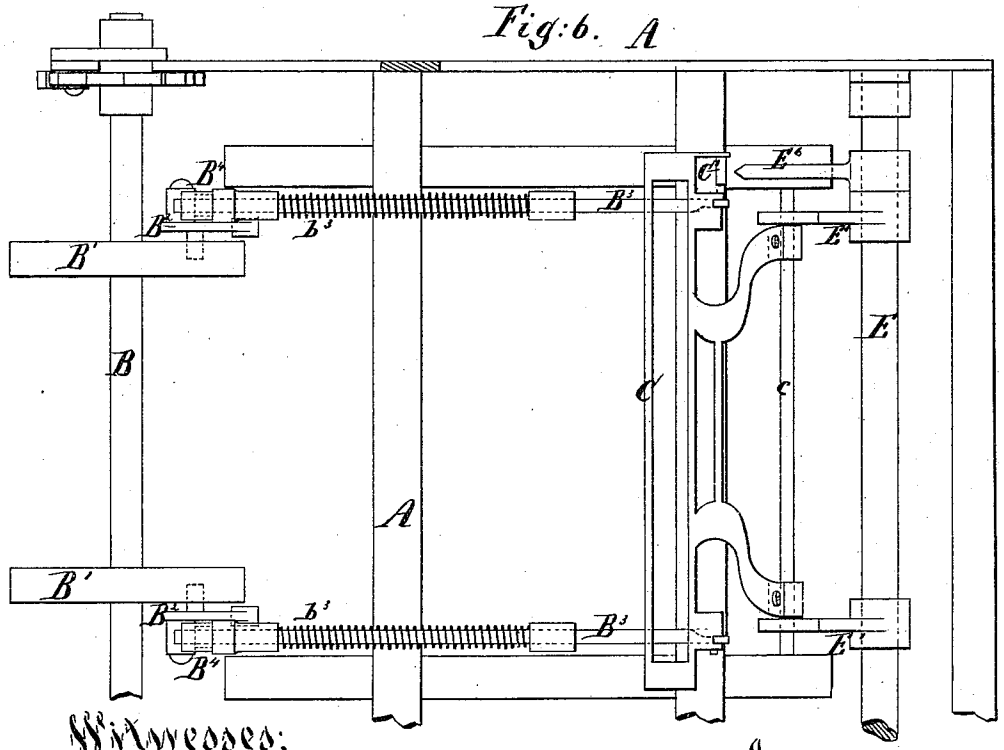


Fig: 6.



Witnesses:

Henry Gentner

Wm. C. Dey

Inventor:

John Turpie

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

J. TURPIE.

Loom for Weaving Hair Cloth.

No. 166,732. Patented Aug. 17, 1875.

Fig: 7.

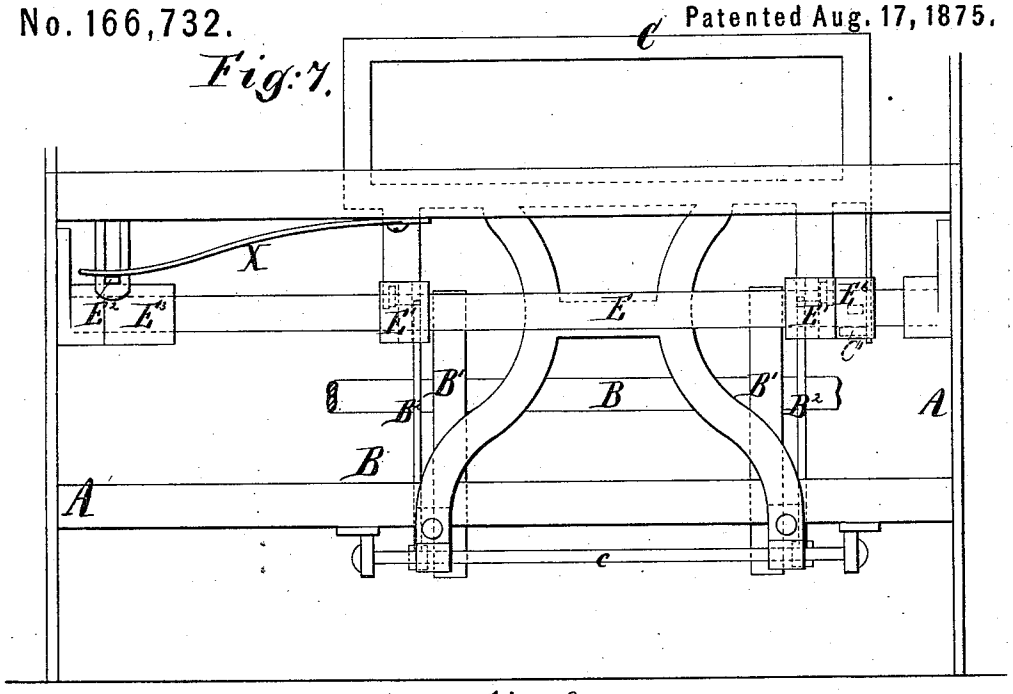
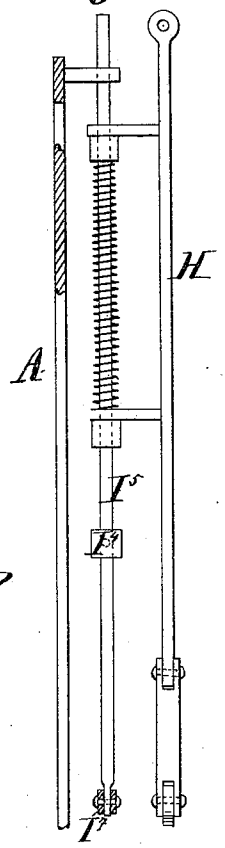


Fig: 8.



Witnesses:
Henry Gentner
Wm. E. Gee

Inventor:
John Turpie

PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN TURPIE, OF NEW YORK, N. Y., ASSIGNOR TO HIMSELF AND EDWARD H. FAULKNER, OF SAME PLACE.

IMPROVEMENT IN LOOMS FOR WEAVING HAIR-CLOTH.

Specification forming part of Letters Patent No. **166,732**, dated August 17, 1875; application filed June 16, 1875.

To all whom it may concern:

Be it known that I, JOHN TURPIE, of New York city, in the State of New York, have invented certain Improvements relating to Looms for Weaving Hair-Cloth, of which the following is a specification:

The invention lies in a number of important modifications of the details for holding the hairs, accommodating the selecting mechanism by presenting the hairs more favorably thereto, better drawing the hairs across, and engaging them successively with, the carrier-hook, traversing the nippers which hold the end of the hair a little into the shed, so as to reduce the waste or projecting end of the hair, preventing the lay from striking when a hair has been missed, and removing the hair from the loom for a little time after a hair has been missed.

The following is a description of what I esteem the best means of carrying out the invention. The accompanying drawings form a part of this specification.

Figure 1 is a side elevation, showing the external parts and some of the internal parts, wherein the novelty lies. Fig. 2 is a plan view of the extreme external parts. Fig. 3 is a side elevation of some of the internal parts. Fig. 4 is a plan view, corresponding to Fig. 3. Fig. 5 is a vertical section, showing the provisions for arresting the blow of the reeds by lessening the stroke of the lay. Fig. 6 is a plan view, showing the same. Fig. 7 is a front elevation, showing the same, and Fig. 8 is a front elevation, showing the means of yielding in receiving motion from the jacquard rod.

Similar letters of reference indicate like parts in all the figures.

The machine somewhat resembles that previously invented by me and described in the patent dated September 15, 1874, No. 154,996. All the parts not otherwise referred to, and the several duties not otherwise specifically described, will be understood as corresponding with the similar parts and duties in the said previous patent.

A is the rigid frame-work, of cast-iron, certain points in which will be designated A^1 A^2, &c., when necessary. D is a delicately-loaded hair-holder adapted to retain the hairs in a cradle or series of hook, D^1, down at the proper level to subject it to the action of the nippers or selector N, being suspended at a point, J, considerably higher. It is free to swing to a considerable extent on the center J, and is provided with a balance-arm, D^2, and an adjustable weight, D^3, thereon, whereby the force with which it retains its vertical position may be adjusted at will. D^4 D^5 are long coiled springs, exercising a gentle force to depress corresponding series of top fingers d^4 d^5, connected by rods extending up through the coiled springs to handles D^6 D^7, conveniently placed. When a fresh lot of hair is to be introduced the top fingers are elevated by applying the hand to the handles D^6 D^7, and after placing the hair in the cradle and liberating the handles the top fingers sink thereon with a gentle force, which they follow up as the bunch of hair is gradually reduced by the successive withdrawals. The division of the top fingers into two sets, operated by separate springs and handles, causes the mass to be pressed upon with gentle but nearly uniform force throughout the breadth of the cradle, however irregularly the hairs may be massed.

It is desirable that the thrusts of the nippers or selector N into the mass of hair should not be always at the same point. To avoid this I provide a gradually rising and sinking motion for the whole hair-supporting apparatus. The pivot J is carried on a slide, J^1, which is capable of vertical movement on the rigid post A^2. Its elevation is determined by an arm, J^2, which rests on an eccentric, F′, which is turned step by step at each pick by the action of the reciprocating rod G, carrying a hook-pawl, *g*, and operated by an arm, *n*, from the selector motion. The stops G^1 G^2, which receive the motion from the pin *n*, extending from the slide N′, may be adjusted, if desired, on the rod G, so that the motion of the latter, and, consequently, of the hook-pawl *g*, may be increased or diminished at will. It is important only that it shall be a sufficient motion to turn the ratchet-wheel F one tooth at each pick. It follows that the eccentric F′ is constantly turning by small increments, and that the center J, and consequently the whole mass of hair, is being constantly and alternately elevated and depressed. As the selector does

not partake of this motion, it is continually plunged into a new place in the mass of hair. The freedom of the hair-holder to swing on the pivot J, and the capacity for adjusting the force with which it seeks the vertical position, provide a very gentle but sufficient resistance to the plunging action of the selector. In practice the hair-holder swings a little at nearly every plunge, and the extent of the swing will depend upon the accidental condition of the hair at the point where the selector strikes. The swinging motion accommodates the action in this respect, and tends to insure a uniformity of resistance to the plunge. There is also another important function performed by the swinging motion of the hair-holder, whereby it is intentionally swung by another agency entirely out of the reach of the selector under certain conditions, and maintained there for a considerable period, as will appear farther on. B is the main shaft, turned by any suitable power. C is the lay, swinging on an axis, *c*, and receiving motion from cams B^1 B^1 on the main shaft B, through the medium of levers B^2 B^2 and elastic and yielding connections B^3 B^3 and springs b^3 b^3. The connecting-rods B^3 are capable of sliding endwise through their bearings in the pivoted upper ends of the levers B^2; but they do not perform such motion except when the motion of the lay is forcibly arrested. The spiral springs b^3 exercise sufficient force to ordinarily transmit the entire motion of the levers B^2 to the lay. In case, however, that anything is interposed to prevent the full motion of the lay, the spiral springs b^3 are ready to contract, allowing the connecting-rods B^3 to slide a little in their hinged connections B^4 with the levers B^2. In case a hair is missed this elasticity is made available.

A stout shaft, E, extends across near the front of the machine, carrying arms E^1, which, when brought up a little above a horizontal position, are struck by the lay, and arrest its motion. When this shaft E is turned a little to depress the arms E^1, they become of no effect, and the lay is allowed to perform its ordinary functions. Some parts of the provisions for effecting this important end are closely analogous to those in my previous machine.

When, as will ordinarily be the case, the nippers N, after being plunged in the mass of hair and closed therein, have seized a hair, and, on their withdrawal, proceed to draw it across the hook, (not represented,) which carries it through the shed, the feeler I will be supported on said hair, and the machinery will continue to operate in the ordinary successful manner; but when, in consequence of failure to thus seize and draw out a hair, the feeler I is not thus supported, but is allowed to drop with gentle force, allowing the heavier lever I^1 to tumble forward under the force of the spring I^2, it causes the bolt I^3 to protrude into the path of the shoulder I^4 on the vertically-sliding rod I^5. The motion of this rod I^5, which would otherwise correspond with the motion of the parallel rod H, and consequently with the jacquard (not represented,) connected thereto above, is thereby arrested, inducing a corresponding arrest of the connected lever I^7, turning on the fixed center A^3 below, thus causing a failure to depress the link I^8, and thereby to rock the shaft E and depress the arms E^1. It follows that one result of the failure of the selector N to secure a hair is that the arms E^1 remain in a position sufficiently elevated to strike and arrest the motion of the lay before it has moved the reed quite up to the weaving line, and thus to protect the goods from any action thereof or blow therefrom. This avoids the production of a mark across the goods when the work is subjected to repeated blows of the lay. Another and very important result follows the sinking of the feeler I, and the consequent tumbling forward of the lever I^1. The shaft E, when the machine is working properly, is subjected to a steadily-oscillating motion. It is turned in the direction to elevate the arms E^1 by a weight or other force, represented in these drawings by the spring X acting on the arms E^2. It is rocked in the opposite direction by a force received from the lever I^7, through the link I^8. This link is connected to the pin E^4 on the arm E^3, which is received in a slot of considerable length, but not of sufficient length to allow for the whole rocking motion of the lever I^7. When the latter rocks to its proper extent the slot in the link I^8 acts on the pin E^4 and draws down the arm E^3.

The transmission of motion to the shaft E and to the arms E^1 is not the only function of the arm E^3. It carries also a stout pin, E^5, projecting therefrom at right angles, and forming a support outside of the frame-work A for the rod O, which receives a reciprocating motion from the crank-pin O^1 carried on the short shaft P. This rod is slotted to play freely on the pin E^5, and its elevation is obviously controlled by the position of the latter. A hook-pawl, O^2, is carried on the rod O, being pivoted thereto at the point O^3, and is supported in an approximately-horizontal position by the spring O^4.

It follows that when the feeler I fails to receive the support due to the presence of a hair in the nippers or selector N, and falls, and thereby allows the catch-bolt I^3 to arrest the ascent of the vertical slide I^5, and arrests the rocking motion of the lever I^7 below, it not only causes the arms E^1 to be left in their high position, and thereby to arrest the lay, but also holds up the rod O and the hooked pawl O^2 in a higher position than they would otherwise move in. The fixed stud A^4, above the path of the hooked pawl O^2, carries a ratchet-wheel, K, having a number of teeth adapted to be turned step by step by the hooked pawl O^2, when it reciprocates in its highest position, but to be left unaffected when the rod O and its connected hooked pawl O^2 are depressed, as usual, at each motion. A pawl, *k*, centered on a fixed pin, A^5, stands ready to engage with the ratchet K, and to hold it in any position in which it may be left.

It will be understood that there is a jacquard or equivalent mechanism, more or less complex, which determines the figure of the goods, and that such jacquard is worked uniformly by the vertical movement of the slide H, the motion of which is never interrupted while the loom is in operation. The number of teeth in the ratchet-wheel K corresponds with the number of picks to complete a round of the jacquard or equivalent shaft, or, in other words, to complete a figure in the goods. A cam, K′, is fixed on the side of the ratchet-wheel K. This cam K′ is mainly circular, but with a deep recess in one side adapted to receive a roller, L′, on a loaded lever L, which turns on a fixed stud, A^6, and tends to press gently against the cam K′. The upper end of the lever L presses against an arm, D^8, on the swinging hair-holder D. In the ordinary working of the loom the cam K′ stands in such a position that the roller L′ is received in the hollow side thereof, and the hair-holder is therefore allowed to remain in its ordinary position, and the nippers enter the bunch hair and extract one hair, or endeavor to, at each motion; but when, in consequence of a failure of the nippers to engage a hair, the train of motions resulting has arrested the rocking of the shaft E, the next movement to the left of the hooked pawl O^2 is performed at a higher level than usual, and it engages with one of the teeth of the ratchet-wheel K and partially revolves it. Such partial revolution turns the cam K′ sufficiently to throw the roller L′ out of its hollow, and to commence to support it on the circular portion of its periphery. This movement carries the connected lever L to the right, and holds it there in such a position as to force away the movable hair-holder D out of the path of the nippers. Thus conditioned, the loom will make just four additional picks, (assuming the ratchet-wheel K to have five teeth,) which are entirely inoperative. After the ratchet-wheel K has been turned step by step once around the wheel L′ is again received in the hollow in the cam K′, allowing the hair-holder, with its contents, to again swing down to its ordinary position, and the next movement of the nippers will ordinarily seize a hair, and the work will go on as before. When another hair is raised the same round of operations is repeated.

E^6 is a straight arm fixed on the shaft E, and which, in connection with an arm or pin C′, on the lay, insures that the arms E^1 are held certainly and firmly in the elevated or depressed position—that is to say, when the rise or the depression of the rod O has, through the lever I^7 and link I^8, communicated to the shaft E the proper motion, either allowing the arms E^1 to remain elevated in the position to arrest the lay, or to be depressed in the position to allow it to pass freely, the arm E^6 is received below or above the pin C′, as the case may be, and thenceforward during the remainder of the forward movement of the lay the position of the arms E^1 is positively determined thereby. If a hair is engaged, and the slide I^5 rises, as usual, the link I^8 turns the shaft E and depresses the arm E^6, so that it is received under the pin C′. Thus conditioned, the latter part of the forward motion of the lay acts forcibly on the upper side of the arm E^6, and depresses the arms E^1 farther than they would otherwise be depressed, and it thus insures that they are fairly and fully out of the way of the lay, so that the lay may complete its stroke, and drive up the hair to the weaving-line. When, on the contrary, the selector has failed to engage a hair, and the feeler I has dropped, thereby inducing the arrest of the vertical slide I^5, and a failure of the link I^8 to turn the shaft E, then the arm E^6 is received above the pin C′, and the last part of the forward motion of the lay acts forcibly on the latter, to hold up the arms E^1 very firmly in their required position, so that they cannot be disturbed by the rather powerful impact of the lay when the loom is working rapidly.

I give a peculiar motion to the selector after the hair is engaged. The selector proper, or the nippers N, are connected to the slide N^1, which gives it the backward and forward motion through the medium of peculiar hinges V^1 V^2. The first hinge, V^1, allows a vertical motion. The selector and its adjuncts rock or tilt vertically on a horizontal pivot at V^1. This motion is induced and controlled by an arm, N^2, which traverses in a crooked slot in a vertical plate, A^7, which forms part of the fixed frame-work of the machine. The slot is so formed as to move the acting end of the selector up after it has passed the hook, and by thus moving upward it draws the hair into the path of the hook, so that the hook engages readily and certainly therewith on its retreat. The other hinge, V^2, allows a horizontal motion on a vertical pin. This motion is induced and controlled by an arm, N^3, which stands in two correspondingly-grooved slots in two horizontal plates, A^8 A^8, mounted at a little height one above the other, and forming portions of the fixed frame-work. These slots are so crooked that, on the retreating of the selector with a hair, it swings around toward and into the open shed.

The nipper-jaw in the selector is opened by contact with a stop (not represented) at the moment when the effective end of the nippers is farthest in the shed.

I find that it is practicable to thus enter the shed to the extent of an inch or more, and thus to utilize the corresponding length of hair which is held in the nippers, and is consumed in winding around the horn thereof. So soon as the nippers are opened and the hair is set free it will straighten.

In carrying out this part of the invention care must, of course, be exercised not to cause the nippers to enter the shed farther than will be compensated for by the shortest portion of hair, which is held in and wound around the selector.

The selector has a better chance to get

hold of a hair, if it is so mounted and guided that it plunges into the mass where it is supported by the cradle, a guide, A^9, being so arranged on the support A^{10} as to direct the selector in its passage into the mass of hair.

To better enable the feeler I to be supported by a hair, I provide side supports A^{10} close to the path of the feeler. The hair being drawn across, may rest on these side supports, and thus is greatly aided in supporting the slight weight of the feeler. It will be understood that as the hook moves away the hair soon slips out past the end of the feeler I, and allows the latter to drop. It will, therefore, fall at each pick, and there will consequently be a thrusting-backward movement of the bolt I^3. But in case it is supported by a hair, such descent will not occur until after the shoulder I^4 has risen past the stop-bolt I^3, so that it will be of no effect. The pin T, carried on the carriage U, which moves the selector at each forward motion, strikes the hinged arm *r*, at the lower extremity of the lever R, and moving that arm forward necessarily moves the upper end of that arm backward, and elevates the feeler I. The hinged arm *r* is so formed and pivoted to the lever that it is stiff in the direction to receive that motion; but when the pin T strikes it on the backward motion it turns on its pivot and allows the pin to pass without any effect.

Although I term this a hair-cloth loom, and have described it as such, it will be evident that it can be used for other material than horse-hair, which may require to be fed into the fabric by single short lengths, as manilla, china grass, or other hairs, fibers, and grasses.

I claim as my improvements in hair-cloth looms—

1. In combination with selecting-nippers and a pendulous hair-holder, the adjustable weight D^3, adapted to graduate the force with which the hair resists the plunge of the selector, as herein specified.

2. The slowly-rotating cam F' and bearer J^2, in combination with a hair-holder capable of being gradually changed in position thereby, as herein specified.

3. The vertical hinge or turning joint V' and the selector $N\ N^2$, in combination with mechanism, substantially as described, for moving the selector vertically as it is carried across the path of the hook, as herein specified.

4. The horizontal hinge or turning joint V^2, and the selector $N\ N^3$, in combination with mechanism, substantially as described, for moving the selector toward and partially into the shed, as described, so as to allow of liberating the hair therein, as and for the purposes herein specified.

5. The stop or stops E^1 and their operating mechanism, substantially as described, and the feeler I, whereby they are controlled, arranged to arrest the motion of the lay C and prevent its touching the goods when the machine is working idly, as herein specified.

6. The lever L and its operating mechanism, substantially as described, in combination with and controlled by the feeler I, the movable hair-holder D, and the selector N, serving to hold the hair out of the reach of the selector after a hair is missed until the figure is completed, substantially as and for the purposes herein specified.

7. The selector-guide A^8, in combination with the selector N and with the cradle D, arranged to direct the selector, as and for the purposes specified.

8. In combination with the feeler I, the hair-supports A^{10}, standing close to the path of the selector N, for the purposes specified.

In testimony whereof I have hereunto set my hand this 14th day of June, 1875, in the presence of two subscribing witnesses.

JOHN TURPIE.

Witnesses:

WM. C. DEY,

HENRY GENTNER.