

J. TURPIE.

Looms for Weaving Hair-Cloth.

No.154,996.

Patented Sept. 15, 1874.

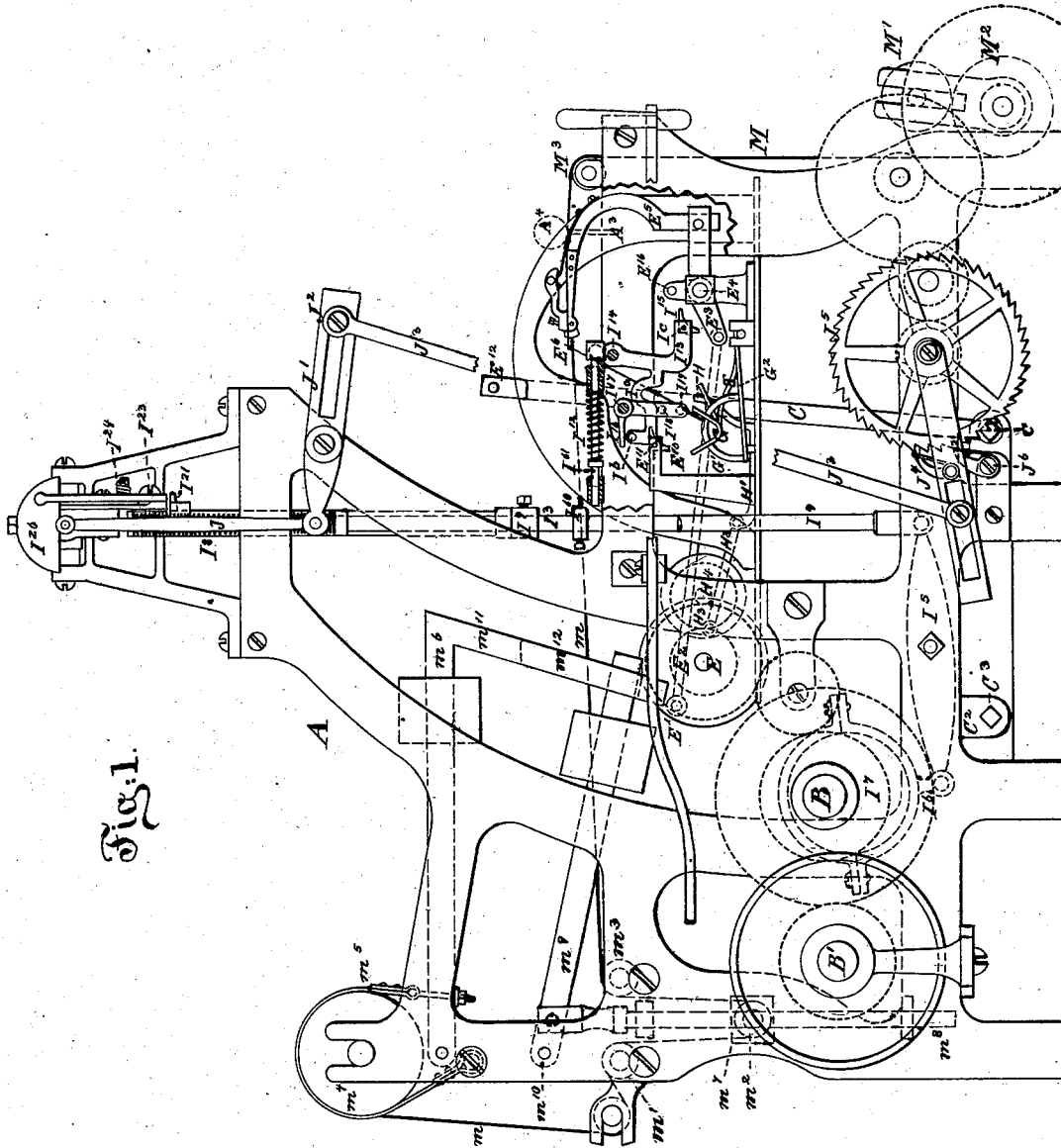


Fig. 1.

Witnesses:

W. C. Day.

E. V. Hermann.

Inventor:

John Turpie

by his attorney

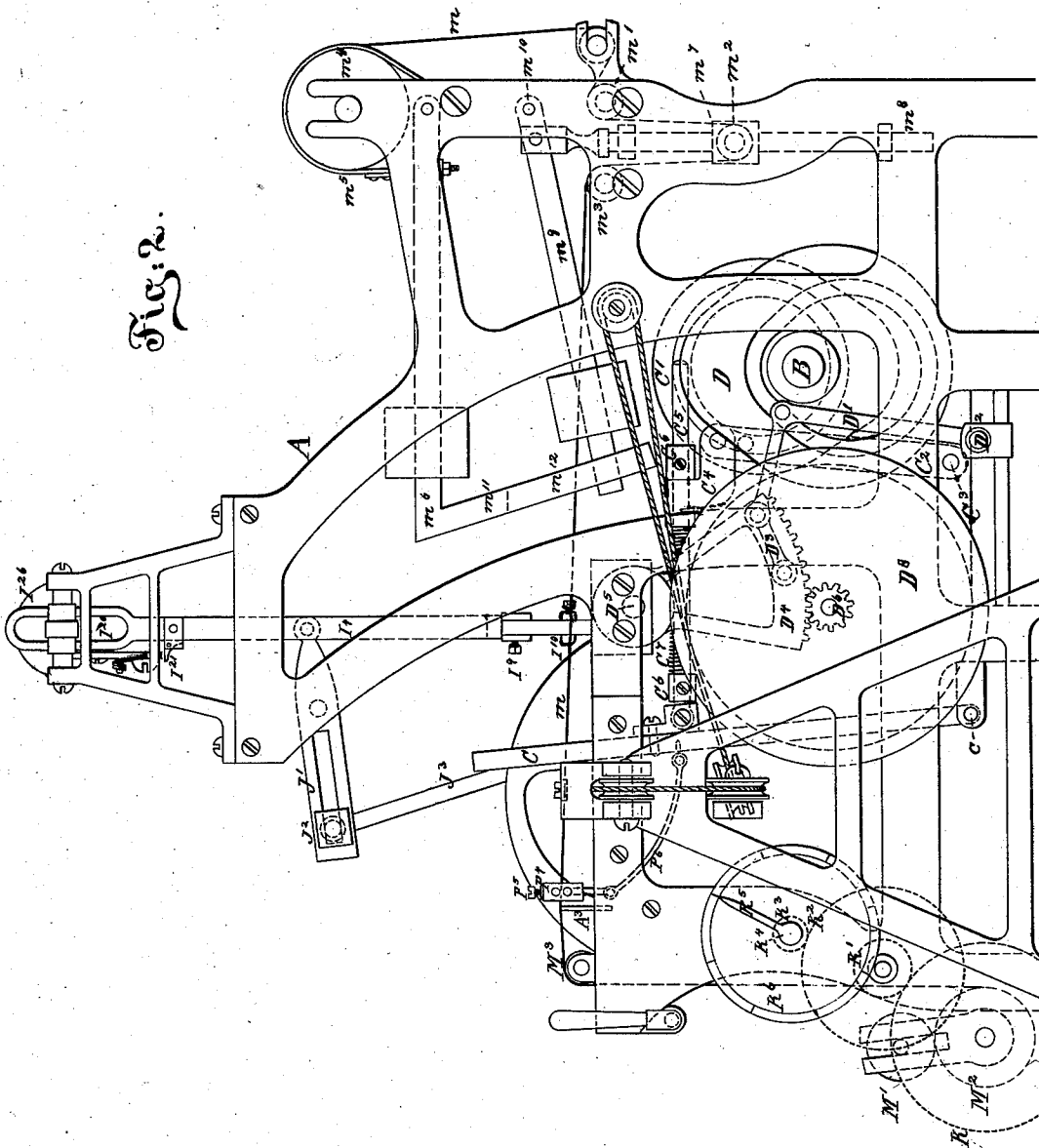
T. L. Stearns

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M. C. Key.

E. V. Kermann.

Inventor:

John Turpie

by his attorne,

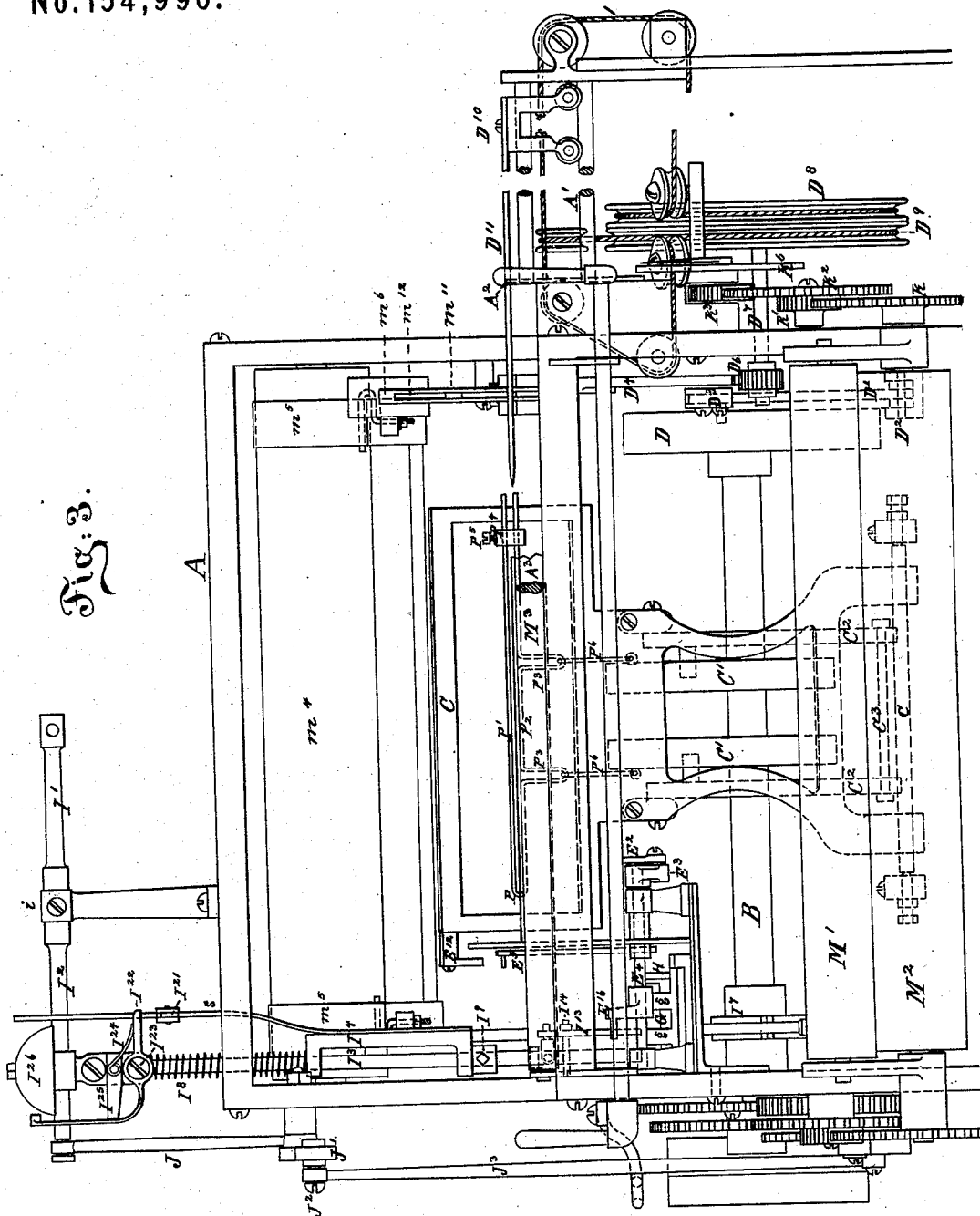
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Witnesses:
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E. V. Hermann.

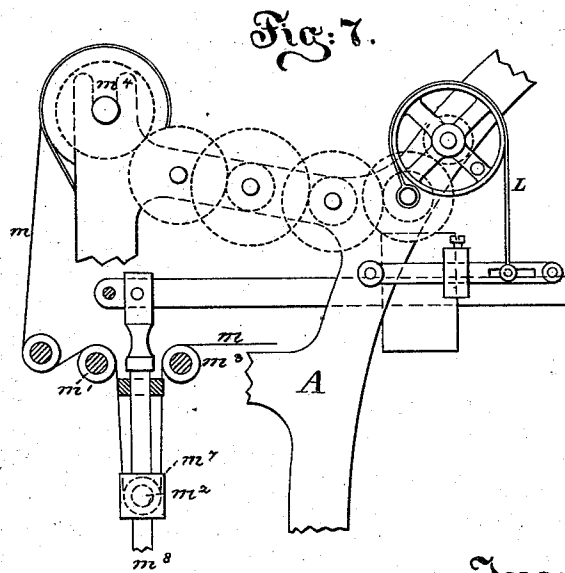
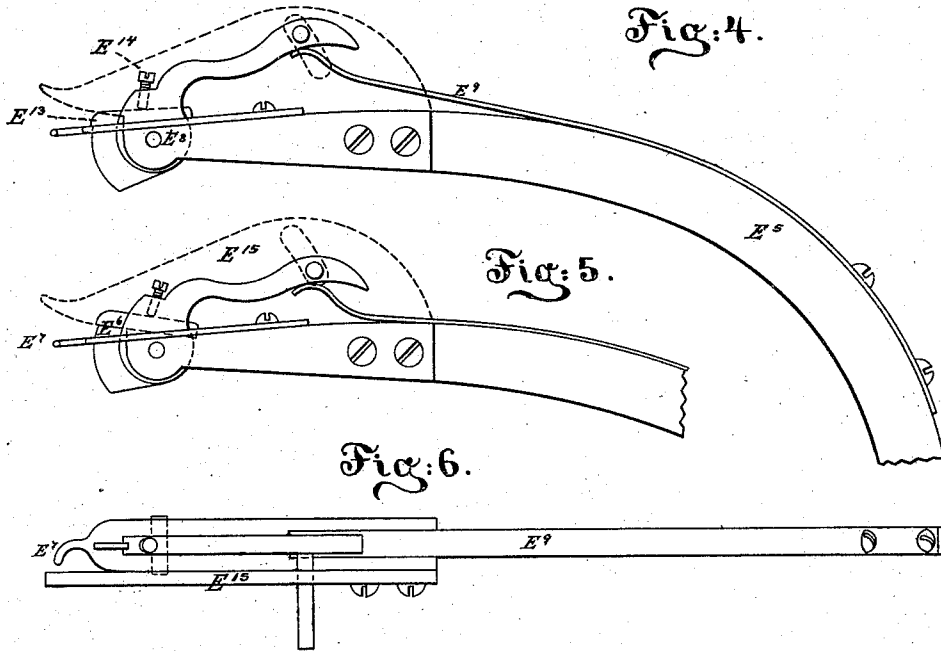
Inventor:
John Turpie
 by his attorney
J. L. Peterson

J. TURPIE.

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Witnesses:

W. C. Dey.
E. Volkmann.

Inventor:

John Turpie
by his attorney
J. S. Sutton

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. **154,996**, dated September 15, 1874; application filed August 6, 1874.

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 relates to the details of the mechanism whereby important difficulties are overcome. The hairs are automatically separated from the bunch, and drawn through the warps with a motion resembling that of the best hand-work. When a hair is missed the shed remains quietly open, and the movement of the jacquard is completely arrested, while the rest of the mechanism remains in full operation, and an alarm-bell or striker calls attention to the fact. The bunch of hair is agitated at each revolution. Provision is made for varying the friction on the yarn-beam in proportion as the tension on the warps is diminished, and a dial is provided to show to the eye the rate at which the cloth is taken up.

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

Figure 1 is a side elevation, a portion of the framing being broken away. This view is from the left-hand side. Fig. 2 is a side elevation from the right-hand side. Fig. 3 is a front view, the work on the right-hand side being shortened in. Figs. 4, 5, and 6 represent the nippers on a larger scale. Fig. 4 represents the nippers closed by the force of the spring represented. Fig. 5 represents the nippers as held open against the pressure of the spring through contact with some part not represented. Fig. 6 is a plan view corresponding to Fig. 4. Fig. 7 represents a modification.

The friction-brake, peculiarly controlled, is here applied to the yarn-beam, not directly, but to a pulley geared to the yarn-beam, and having a more rapid motion.

To avoid unnecessary complication of the drawings I have shown some of the plain gear-wheels simply by strong dotted lines.

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

A is a rigid frame of cast-iron, certain points in which will be designated A^1 A^2 , &c., when necessary. B is the main shaft, turned by gearing from a short shaft, B^1 , which receives motion through a belt from any suitable power. C^1 C^1 are face-cams fixed on the shaft B, which, through grooves in their faces and corresponding rollers received therein, give motion, as represented, to the levers C^2 fixed on the rocking shaft C^3 , and carrying, by means of swiveling-pieces C^4 , sliding rods C^5 , which, through joints C^6 and springs C^7 , give the proper to-and-fro motion to the lay C, which latter turns on the center c below, and carries reeds adapted to perform their usual function. The cloth M is wound on a cloth-beam, M^1 , which is free to rise as it is filled on the friction-beam M^2 , actuated with the proper very slight steps, by a turn of mechanism from the jacquard, the working and arresting of which will be described farther on. M^3 is the ordinary roller at the front of the loom over which the cloth is drawn. Beyond the weaving-line the naked warps are marked m , and are worked up and down to the proper extent by heddles, not represented, connected to the jacquard. A drop-roller, m^2 , hangs in the warps between the bearing-rollers m^1 m^3 , and as the warps, in being drawn off from the yarn-beam M^4 , become slackened or tightened the drop-roller m^2 correspondingly rises and sinks. Brake-straps m^5 , tightened by loaded levers m^6 , impose a frictional resistance to retard the yielding of the yarn-beam M^4 . This friction is varied within wide limits, according to the depth to which the drop-roller m^2 is allowed to sink. This roller m^2 runs in bearings in blocks m^7 , which are fixed on vertical slide-rods m^8 , which traverse easily up and down in bearings in the inner side of the framing A. These rods m^8 support loaded levers m^9 , which turn on fixed centers m^{10} at one end, and traverse up and down at the other end in long slots m^{12} formed in knee-bars m^{11} , which project down from the ends of the levers m^6 . When the warps m slacken so as to lower the roller m^2 below its proper position, the loaded levers m^9 sink and bear in the bottom of the slots m^{12} . In this position they add to the load previously on the brake-straps m^5 . When, on the other

hand, the yarn-beam m^4 does not deliver the warp sufficiently fast the increased tension on the warps raises the roller m^2 , and with it the levers m^3 . A considerable range of motion of the levers m^3 is allowed in the slots m^{12} without producing any effect; but when the tension on the warps m exceeds the proper limit it raises the roller m^2 so high as to cause the levers m^3 to touch the upper ends of the slots m^{12} . Here they exert a lifting force tending to relieve the yarn-beam m^4 from a part of the weight even of the principal load m^6 . Thus the levers m^3 vibrate in the slots m^{12} , keeping the tension of the warps practically uniform.

The hairs are drawn through the shed by a movement resembling that of the hook-rod in hand-weaving.

D is a face-cam, having a groove in one face, which receives a roller from the knee-lever D^1 , turning on a fixed point, D^2 , below. A short link, D^3 , connects this lever D^1 to a pin on a segment, D^4 , which turns on a fixed pin, D^5 , on the framing, and meshes into a pinion, D^6 , keyed on a shaft, D^7 , which carries a pair of large grooved wheels, D^8 . The rotation of the cam D reciprocates the segment D^4 , and whirls the wheels D^8 , alternately, one or more revolutions in opposite directions. Cords D^9 , wound in these grooves, and running around pulleys, as represented, connect to a traveler, D^{10} , running lightly on a straight level way, A^1 , and carry a hook-rod, D^{11} , which—the operations being rightly timed, and the rod being guided in a standard, A^2 , of the framing—is reciprocated through the shed at each movement of the heddles. This gives the desired motion to the hook-rod very perfectly, and with little complication. The hairs are singled out and placed in the hook by a motion which draws each one across the path of the hook, in the same manner as the fingers of an attendant in hand-weaving. A train of gearing from the main shaft B revolves a short shaft, E, at the same rate, and in the same direction. This carries a crank-pin, E^1 , which connects, by a rod or link, E^2 , to an arm, E^3 , on a rocking shaft, E^4 , supported in uprights on the framing, in the position represented. This shaft E^4 carries a curved arm, E^5 , which is equipped at the end with mechanism for seizing a single hair at each vibration, and drawing it across the hook-rod, D^{11} . The curve of the arm E^5 is adapted to allow the hook-rod D^{11} to stand within it, while the end E^6 dives into the bunch of hair. On the return motion of the curved arm E^5 it draws the hair through the hook, and the return of the hook-rod D^{11} draws the hair through the shed. The nippers E^6 , which seize one hair only at each plunge, and the provisions for presenting the bunch of hair to the action thereof, require careful attention. The bunch of hairs lie in V-shaped holders G, which are held on the springs g , so that they may yield a little to each plunge of the nippers. Straps or arches G^1 , carried on the same hinged platform G^2

which supports the spring g , stand in deep notches in the V-shaped holder G, and serve to hold down the hairs.

To introduce a quantity of hair, the holder G must be depressed by the fingers, or otherwise, in opposition to the elastic force of the spring g , so as to leave sufficient space under the straps G^1 . The holder G supports a sufficient length of the hair to allow of seizing it. There should be a table, trough, or analogous support, (not represented,) reaching out in line with the holder G, to support the remainder of the length of the hair. It may be curved, if preferred.

The nippers E^6 , on the end of the arm E^5 , are peculiarly formed, so that when they open they present not an ordinary V-shaped opening, but a rectangular, or nearly rectangular, notch. In other words, the bottom of the opening is square. The jaw opens only a little more than enough to take in one hair. By plunging into a mass of hair with this kind of an open mouth, one hair, and only one, is received into the mouth. A slight movement, while it is thus depressed, shuts the jaw, and seizes firmly on the hair. On the withdrawal of the arm E^5 , with its peculiar nippers E^6 , the hair thus seized is drawn up out of the bunch and separated from its fellows. As the nippers E^6 move upward in their curved path they turn the hair, and thus present it directly in the hook, so that on the withdrawal of the hook-rod D^{11} the hair is received fairly on a pulley or sheave therein, and pulled into and through the shed. The drawing of the hair into the shed winds the portion in immediate contact, with the nippers partially around a horn or pin, E^7 , which is properly adapted to plunge down through the mass of hair, and to form a firm support for the hair when the latter is thus drawn partially around it. The arrangement insures that the pull of the hair on the nippers during the period while the hook D^{11} is being rapidly withdrawn through the shed, shall be not in the line of such draft, but in nearly the same line in which it originally lay—that is to say, the partial winding of the hair around the horn E^7 causes the hair to resist the pull by the strain which is received primarily on the horn E^7 , and the small portion which is left on the nippers E^6 lies in the same direction as the hair lay therein when it was first nipped. Except for the horn E^7 the pull of the hook-rod D^{11} would tend to slue the hair around in the nippers. H is an agitating-finger, which at each rise of the nippers E^6 moves into the slot provided for it in the V-shaped holder, and compresses the bunch of hairs together. This finger H is carried on a slide, H^1 , which is guided in a slot in the framing A, and is worked by a link, H^2 , which connects it to a crank-pin, H^3 , on a short shaft, H^4 , which is geared to the shaft E. The movable jaw of the nippers E^6 turns on a center, E^8 . A spring, E^9 , carried on the arm E^5 , tends to keep the nippers constantly closed with a

just sufficient force to properly hold the hair. At each plunge of the nippers into the bunch of hair in the holder G, the end of the jaw E⁶ strikes a hinged piece, E¹⁰, which turns on the fixed center E¹¹, and which is so supported that it cannot be depressed below the position represented, although it is free to rise. As the nippers E⁶ descend the hinged piece E¹⁰ compels them to open. After the jaw, thus opened, has descended into the hair the upper end of the nippers E⁶ passes the hinged piece E¹⁰, and is moved outward by the spring g. On the rise of the arm E⁵ with the nippers E⁶ the hinged piece E¹⁰ is deflected upward and produces no effect, so that the nippers E⁶, after seizing a hair, rise without opening. The nippers E⁶ should hold onto the hair tightly by the aid of the half-turn around the horn E⁷ until the return-motion of the hook-rod D¹¹ has rolled the hair through the shed. Just at this latter moment the nippers E⁶ should open and liberate the hair. The opening at this juncture is effected by a cam-piece, E¹², which is carried on the side of the lay C. When the curved arm E⁵ has drawn the hair upward and forward to its extreme position, and has commenced to return, it meets the lay C coming forward to strike home the hair, the hook-rod D¹¹ being just at that moment emerging from the opposite edge of the shed, and, consequently, just finishing its work of drawing the hair through. In this condition of affairs the cam E¹² performs its functions, as it passes the nippers, of opening them for an instant, and then allowing them to close again. During that brief interim the hair is liberated.

I have so far described the movable jaw of the nippers E⁶ as formed in a single piece, and of suitable outline to allow the feeler I¹⁹ to ride smoothly over it. I can work the invention with some success in that form; but I esteem it preferable to insert an adjustable piece in the movable jaw, which can be set out and in at will to increase or diminish the capacity of the jaw, and which can be removed, and ground and reset, whenever it becomes dull by long use. Figs. 4, 5, 6 represent these parts on an enlarged scale, and with what I esteem the most complete construction. In these figures E¹³ is the removable and adjustable piece, and E¹⁴ a pinching-screw, which holds it firmly in the desired position. In these figures the dotted lines indicate a face-piece bolted upon the side and covering the nippers. I will designate the entire face-piece by E¹⁵. It stands in such position that the edge of this piece E¹⁵, instead of the nipper jaw E⁶, takes the gentle pressure of the feeler I¹⁹. This allows the jaw to be made of any form, and allows the head of the pinching-screw E¹⁴ to project as much as may be necessary, so long as it does not project beyond the outline of the face-piece E¹⁵. I also deem it desirable to provide a sharp point on the face-piece E¹⁵, which plunges into the mass of hair at a different base from the horn E⁷, and thus further agitates the hair and keeps it properly loosened. In case

the nippers E⁶ fail to seize a hair, and, in consequence, the hook-rod D¹¹ returns idly through the shed, the lay will beat exactly as before, but the shed will not close. It will remain open, and the let-off and take-up motions will be arrested.

I¹ I² is the jacquard-lever, turning on a center, i, on the fixed frame-work, and carrying jacquard mechanism, which may be of the ordinary character, adapted to change the warps, and at each rising movement of the arm I¹ opens the shed required to produce the proper pattern in the goods. To the arm I² is hinged a rod, I³, which plays easily through guides formed on the side of the adjacent rod I⁴, which latter is hinged to a vibrating lever, I⁵, which turns on the center represented on the fixed framing below, and is operated by a short connection, I⁶, to an eccentric, I⁷, keyed to the main shaft B. A long helical spring, I⁸, encircles the upper part of the rod I³, and abuts at its upper end under a collar on the latter, while it abuts at its lower end on one of the bearings, which forms a part of the rod I⁴. A collar, I⁹, fixed adjustably on the rod I³, is held up by the pressure of the spring I⁸ against the under side of another bearing on the rod I⁴. It follows that, as the rod I⁴ is uniformly raised and lowered by the action of the eccentric I⁷, it pulls down on the rod I³ by a direct contact against the collar I⁹, and thus opens the shed by a positive motion; but in pushing upward to close the shed it acts only through a long spring, I⁸, which is capable of yielding to a sufficient extent to allow the full upward motion of the rod I⁴ while the rod I³ remains in its lowest or nearly its lowest position. A beveled projection, I¹⁰, fixed on the rod I³ has a square shoulder on its upper face, which vibrates close to the end of a horizontal bolt, I¹¹, which is capable of moving a little way in bearings in the frame-work, and is pressed constantly toward the rod I³ by a coiled spring, I¹². The force of this spring tends to urge the slide I¹¹ into such position that it will engage with the projection I¹⁰ and arrest the ascent of the rod I³. When this is allowed to take place the shed remains open; but when the slide I¹¹ is held back in opposition to the gentle force of the spring I¹² the shed will close and reopen at every motion of the lever I⁴. I control the position of the slide I¹¹, and consequently the holding open of the shed, through the intervention of a delicate feeling mechanism analogous to that in the stop-motion of a loom. A slender feeler, acting with a gentle force, tends to move, at each operation, across the path of the hair. If the hair is there it will be arrested and the slide I¹¹ restrained; but if the hair is absent it will move, without resistance, across the place of the hair and disengage the slide I¹¹. The latter is drawn back at each revolution by a strong positive motion. I¹³ is a peculiarly-shaped piece of metal turning on a fixed center, I¹⁴, and which performs important functions. The several points or parts thereof

will be indicated, when necessary, by the double letters I^a, I^b, &c. At the point I^a is a deep notch on the under side. At the point I^b is a pin extending horizontally outward. At the point I^c is a pivot and small hinged arm, I¹⁵. This latter is so mounted that it can be turned up easily, but will resist a tendency to bend it downward, and will communicate any force received in that direction to the entire piece I¹³. At each rocking motion of the shaft E an arm, E¹⁶, fixed thereon, presses down on the arm I¹⁵, and rocks the entire piece I¹³. The pin I^b, on rising, strikes a lever, I¹⁶, which turns on a fixed center, I¹⁷, and carries on another arm two horizontal pins or arms, I¹⁸ and I¹⁹. The arm I¹⁸ is adapted to match into the notch I^a when the parts come in the proper position therefor. The arm I¹⁹ is longer, and serves as a feeler to move across the place of the hair. The arm E¹⁶ is adjustable by a pinching-screw on the shaft E, and is so placed that the motions are properly timed. On each plunge of the nippers E⁶ the piece I¹³ is moved by the arm E¹⁶, causing the notch I^a to liberate the pin I¹⁸, and the pin I^b to rise and turn the lever I¹⁶. This movement carries the feeler I¹⁹ backward (or from the attendant) across the path of the descending nippers E⁶. Now, before the nippers E⁶ rise the arm E¹⁶ slips off from the hinged piece I¹⁵ and liberates the important piece I¹³, and with it, of course, the light lever I¹⁶. The latter now turns until the feeler I¹⁹ rests against the outer face of the nippers E⁶, or a guard-piece, E¹⁵, attached for the purpose, and the piece I¹³ rests upon the pin I¹⁸. In this delicate position, the parts rest during the period while the nippers E⁶ commence to rise, after having made a plunge into the bunch of hair. As the nippers rise, the feeler I¹⁹ slides with a delicate pressure down the outer face, and as the arm E⁵ continues to rise slips off the lower end. Now is the critical moment. If the hair is there, it will be held for a brief period longer by the presence of the hair, during which period the projection I¹⁰ will rise past the sliding bolt I¹¹, after which the liberation of the sliding bolt is too late to arrest the ascent of the rod I³. In such case the rod I³ will rise with the rod I⁴ as if the parts were a single piece, and the lever I¹ I² will rock to impart the proper motion to the jacquard, to close the shed. But if the hair is not there, the feeler I¹⁹ will, on losing the support of the lever E⁵, be entirely unsupported, and will move forward across the place where the hair ought to be. In thus moving forward it brings the pin I¹⁸ within the influence of the notch I^a, which is in the shape of an inverted V. It now quickens its motion by the force of the spring I¹², and the gravity of the part I¹³, and allows the latter to rapidly receive the pin I¹⁸ into the notch I^a. This movement of the piece I¹³ carries the connected slide or horizontal bolt I¹¹ into a position to engage with the projection I¹⁰ on the rod I³. Now, the upward movement of the rod I³ is instantly and positively arrested by the bolt or

strong slide I¹¹, and although the rod I⁴ continues and completes its full upward movement the spring I⁸ yields thereto without any further motion of the lever I¹ I².

In order to notify the attendant or overlooker how frequently this failure to seize the hair occurs, an extension, S, of the rod I⁴ is provided, and is guided by taking hold of the lever I² in a long slot indicated by I²⁰. Below this is a hinged arm, I²¹, which, when the rise of the rod I³ is arrested, touches the lever I²², turning on a pivot, I²³, carried on the rod I³. On another arm of the lever I²² is a spring-hammer, which, at each release, strikes, by the force of a spring, I²⁴, against a stop, I²⁵, and by its elasticity moves farther and strikes against a bell, I²⁶, which is carried on the arm I² of the jacquard-lever.

I find that the hold of the nippers E⁶ on the hair is very efficient to retain it, even if the hair should not be supported much, if at all, by the horn E⁷. I believe that, as an important modification, my selecting device made with the nippers E⁶ alone can be carried successfully on a rod analogous to the hook-rod D¹¹, and be made to draw the hair completely through the shed without any other aid.

As another modification, I can attach the selector to the lay, and make available the reciprocating motion of the lay, to effect the drawing of the hairs across the path of the hook.

Many modifications may be made in the other parts. Fig. 7 represents a multiplying-gearing connected with the let-off beam. The brake-strap L' in this modification is lightened up by the lifting of the same drop-roller m², before, and has the same general effect, but, instead of being applied directly upon the yarn-beam, it is applied on a quick-turning pulley, and the action is more sensitive. The employment of this train of gearing shown in Fig. 7 has the effect to control the let-off more regularly.

I provide a fixed bar, A³, which touches firmly across the whole under side of the cloth a little front of the weaving-line. This tends to hold the goods against jumping up and down with any irregular strain due to the friction of the reeds or variable tension of the warp-yarns, and aids in insuring that the hook-rod D¹¹ shall always strike with certainty within the shed. I can still further increase the steadiness of the cloth by mounting a slender roller directly over the bar A³, to press lightly on the upper face.

Such an arrangement is shown in Fig. 1. I propose to use the bar A³ either with or without the accompanying roller A⁴. In case the roller is added, the cloth may be held between the parts either above or below its natural position, or, as will usually be preferred, exactly in its natural position, or in the position which the cloth naturally assumes, being the resultant of the several oblique strains, or the line of the mean strain of the warp-yarns. In case only the bar A is employed, the front

bearing-roller m^3 should be lowered enough to insure a gentle bearing of the goods on the bar.

Hair-cloth involves peculiar difficulties in maintaining the width of the goods with a proper condition of the fabric near the edge. Ordinary temples cannot be employed with success, as they are liable to produce holes in the goods. I provide a light movable frame which moves forward and backward past the weaving-line after each beat of the lay, and touches lightly each edge of the goods, so as to hold the edge warps against spreading. The warp-yarns come through the heddles and also through the lay more widely spread than they are to finally lie in the goods. For hair-cloth thirty inches wide, the width of reeds used should be about thirty-one and a quarter inches besides the selvage. The light movable frame which holds the goods to the proper width under these conditions is formed of a straight upper bar, P^1 , and short smooth bend P , and a lower bar, P^2 , which extends mainly parallel to the upper bar P^1 , but with two bends therein, as indicated by $P^3 P^3$. An adjustable block, P^4 , secured by a pinching-screw, P^5 , completes the frame, and two flexible cords, P^6 , extending from the bends P^3 to the lay C , complete the mechanism. At each forward movement of the lay the reeds strike the light frame and send it forward across the weaving-line. The extreme back movement of the lay acts, through the strings P^6 , to haul it backward across the weaving-line. In both positions it presses lightly with one side, P , against one edge of the goods or warps, and with the adjustable piece P^4 against the other edge.

To the extremity of the lever I^2 is connected a link, J , which gives motion to a lever, J^1 , turning on a fixed center. The other arm of the lever J^1 carries a link, J^2 , which is adjustably connected to a lever, J^3 , carrying a spring-pawl, J^4 , working on a ratchet-wheel, J^5 , held by a spring-pawl, J^6 , connected by suitable gearing, to the friction-roller M^2 , which carries the cloth around it by friction, and winds it on a cloth-roller M^1 . On the opposite end of the roller M^2 is a gear-wheel, K , which connects, through a train of multiplying-gears, $K^1 K^2 K^3$, to a shaft, K^4 , carrying an arm, K^5 , which works around on a dial, K^6 . This dial K^6 should be properly graduated to indicate, in inches and parts of an inch, the motion on the surface of the friction-roller M^2 .

It is easy for an overlooker to time a loom and observe how many picks or movements of the lay are performed in a unit of time. Prior to my invention I am aware of no simple means of conveniently determining the number of picks being at any given moment performed for any unit of length of the cloth. The index K^5 , by its movement on the dial K^6 , gives the unit of length which is taken up during the time the attendant or overlooker is counting the picks.

Although I have spoken of the material throughout this specification as hair-cloth, I believe that my improvements may be applied in the weaving of analogous fabrics with various grasses, and wish to include any which requires the filling to be introduced in separate wefts.

I claim as my invention—

1. The intermittent side presser or agitator H , in combination with the holder G , adapted to aid in closing together the bunch of hair after each plunge of the selecting mechanism, as herein specified.

2. The removable hair-holder G , having a spring-bed, g , and rigid straps G^1 , adapted to receive and deliver the hairs, as herein specified.

3. The spur E^7 , in combination with the selecting mechanism, and adapted to agitate the hairs at each descent, as also to deflect and serve as a partial abutment or resisting-point for the hair in being carried into the shed, as herein specified.

4. The vibrating cam E^{12} , in combination with the nippers E^6 , arranged and operating together to liberate the hair, as herein set forth.

5. In combination with the nippers having a square-bottomed opening, and with mechanism for plunging it into a mass of hair and withdrawing it, the adjustable piece E^{13} , and confining-screw E^{14} , for the purposes specified.

6. The jacquard-lever $I^1 I^2$, yielding connection I^3 , and locking-catch $I^{10} I^{11}$ on the operating parts $I^3 I^4$, controlled by the feeler I^{19} , all operating together as and for the purposes herein set forth.

7. The bell I^{26} , in combination with the jacquard-lever and operating-rod having a yielding connection thereto, the hinged arm I^{21} and spring-hammer lever I^{22} , all arranged to operate together, as specified.

8. The loaded levers m^9 , supported by the drop-roller m^2 , and the warp brake-levers M^6 connected loosely thereto, combined and arranged to serve as and for the purposes specified.

9. The front bearing-bar A^3 and corresponding top roller A^4 , arranged between the lay and the breast-beam to prevent the cloth from vibrating up and down, as herein specified.

10. In the manufacture of fabrics having a filling of hair or analogous material without selvage, the movable frame $P P^1 P^2 P^4$, adapted to touch lightly against the edges, and driven forward and backward near the weaving-line by cords P^6 connected to the working part C , substantially as and for the purposes herein specified.

In testimony whereof I have hereunto set my hand this 30th day of July, 1874, in the presence of two subscribing witnesses.

JOHN TURPIE.

Witnesses:

WM. C. DEY,

M. A. VAN NAMEE.