3 Sheets—Sheet 1.

M. GRODZENSKY.

Machine for Making Artificial Feathers, Chenille, &c

No. 220,918. **Patented Oct. 28, 1879.**

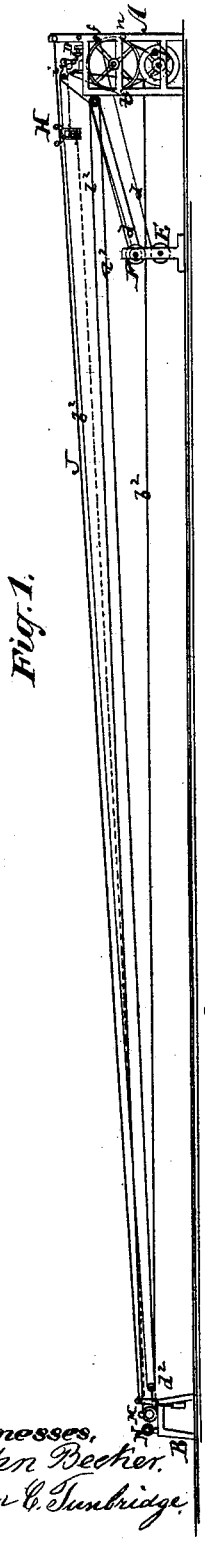

Fig. 1.

Fig. 5.

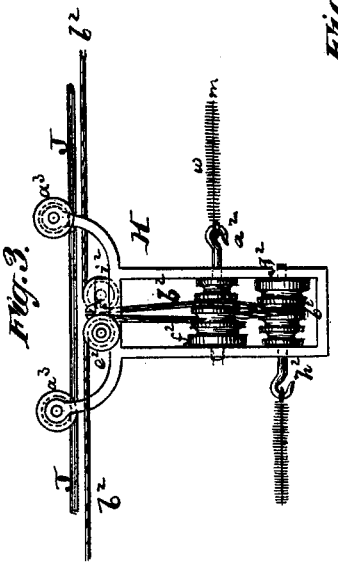

Fig. 3.

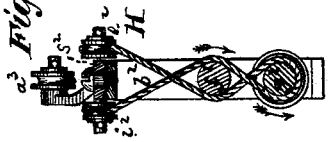

Fig. 4.

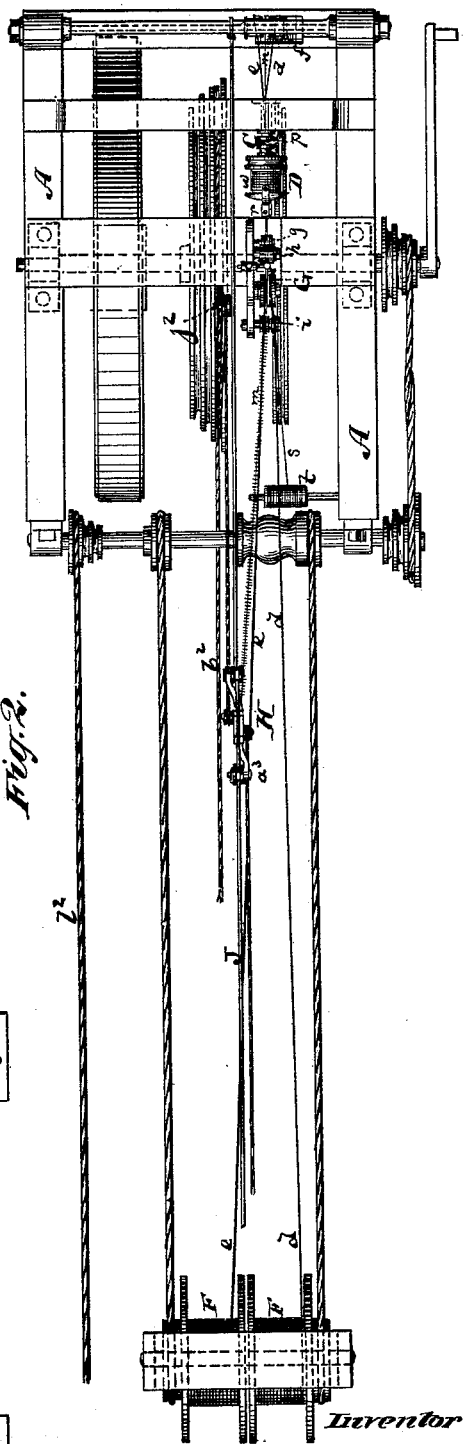

Fig. 2.

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John C. Tunbridge.

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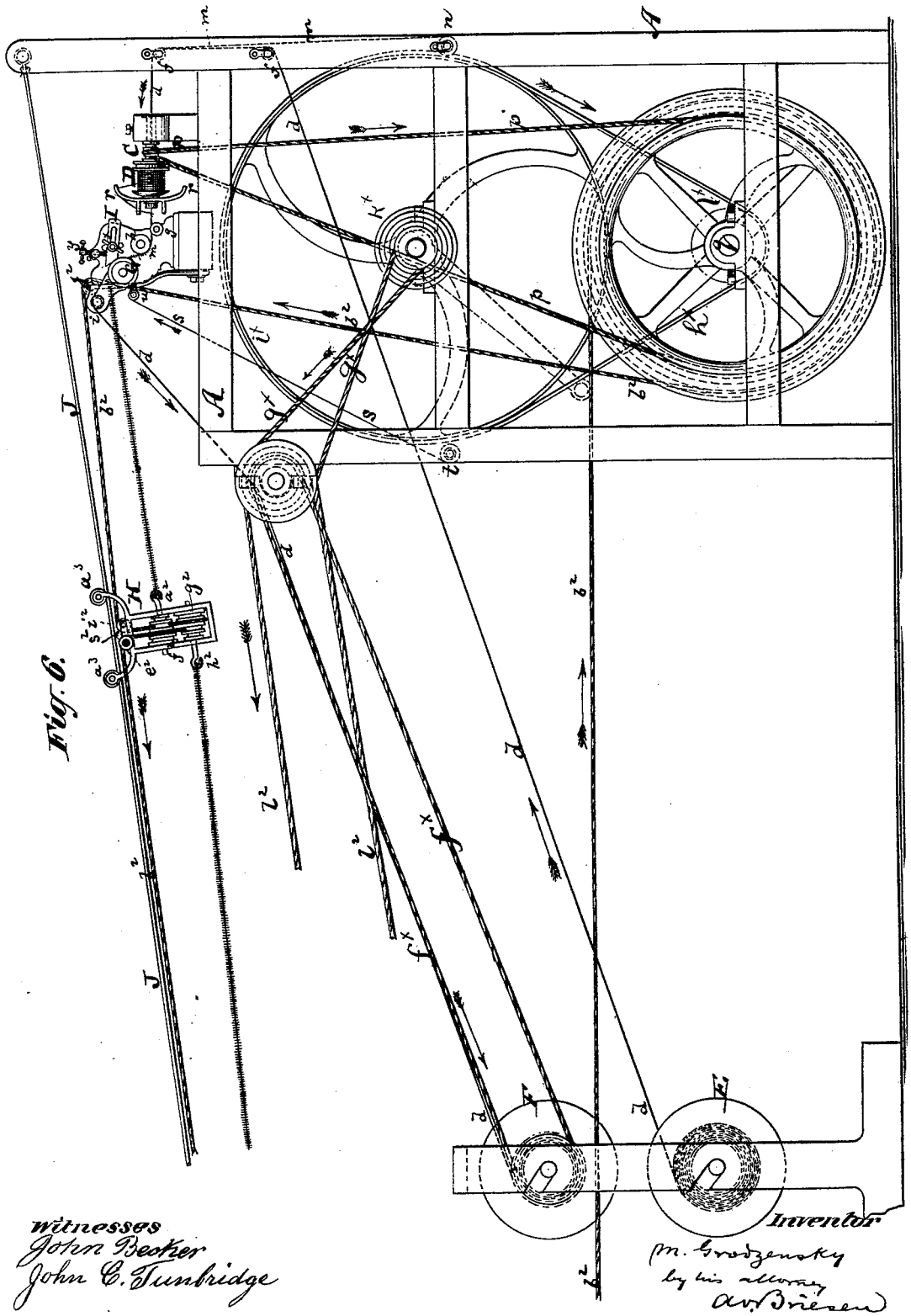

Fig. 6.

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3 Sheets—Sheet 3.

M. GRODZENSKY.

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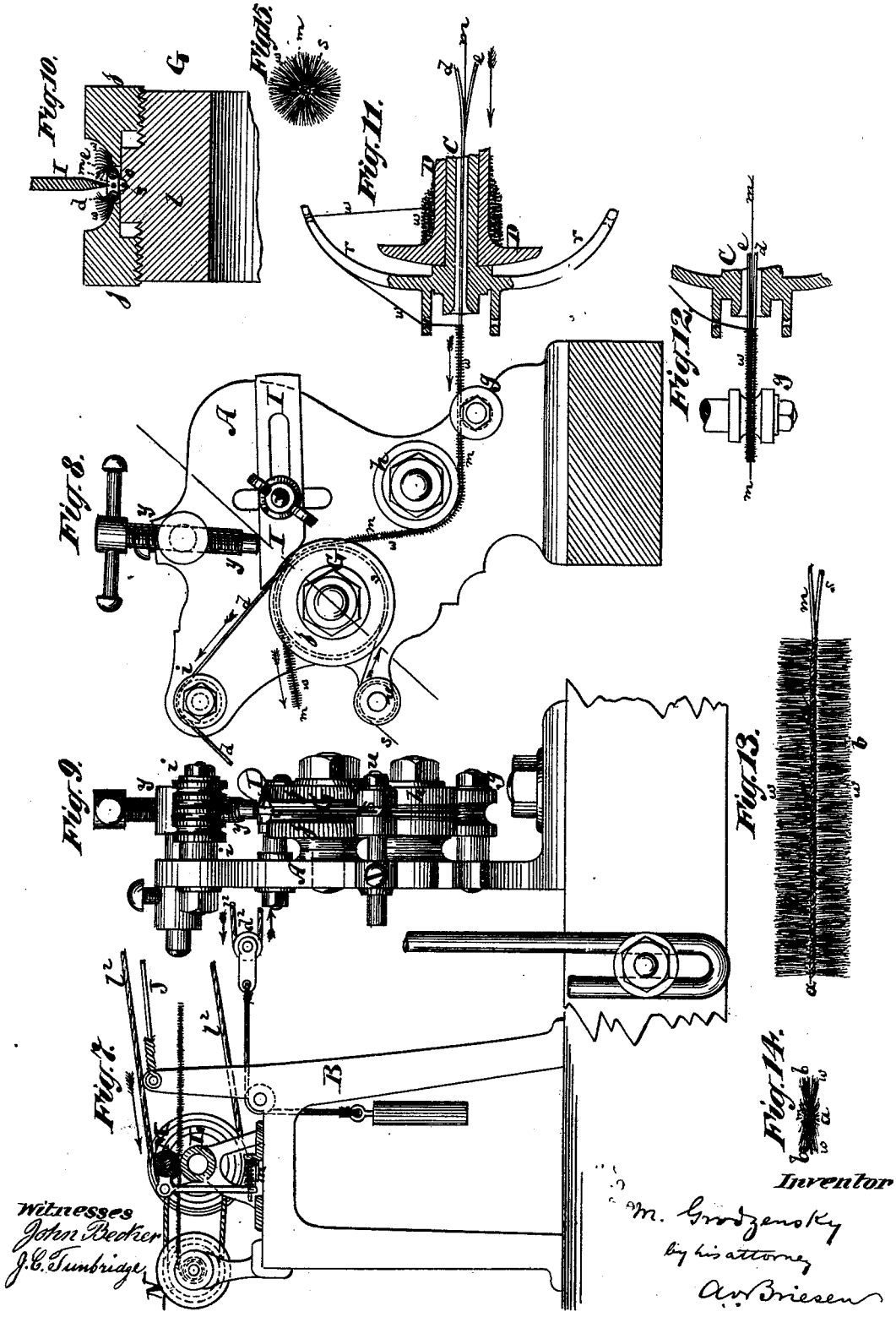

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UNITED STATES PATENT OFFICE.

MAX GRODZENSKY, OF NEW YORK, N. Y., ASSIGNOR TO M. S. HEYMANN & SONS, OF SAME PLACE.

IMPROVEMENT IN MACHINES FOR MAKING ARTIFICIAL FEATHERS, CHENILLE, &c.

Specification forming part of Letters Patent No. **220,918**, dated October 28, 1879; application filed July 11, 1879.

To all whom it may concern:

Be it known that I, MAX GRODZENSKY, of New York, in the county and State of New York, have invented a new and Improved Machine for Making Artificial Feathers, Chenille, &c., of which the following is a specification.

Figure 1 is a side elevation, on a reduced scale, of my improved machine for making artificial plumes. Fig. 2 is a plan or top view, on a larger scale, of part of said machine. Fig. 3 is a detail side view, on an enlarged scale, of the traveler or twister; Fig. 4, a cross-section of the same; Fig. 5, a top view of the same. Fig. 6 is a side elevation of that part of the machine which is shown in Fig. 2. Fig. 7 is a sectional side elevation of the extreme end of the machine, where the material is pressed or ironed. Fig. 8 is a detail side view, on an enlarged scale, of the part of the machine which contains the knife for opening the loops. Fig. 9 is an edge or end view of that part of the machine represented in Fig. 8; Fig. 10, a sectional view of the cutting portion of the machine, showing the knife above the grooved roller in the act of cutting. Fig. 11 is a sectional side view of the spool from which the covering silk or material is taken. This figure should be regarded as in connection with Fig. 8. Fig. 12 is a detail top view, partly in section, of said spool and the first receiving-roller. Fig. 13 is a top or face view of the material produced on the machine; Fig. 14, a cross-section thereof, and Fig. 15 a cross-section thereof before it is flattened down.

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

This invention has for its object to produce a machine for the manufacture of artificial feathers, or rather for the manufacture of the material used in artificial feathers, plumes, and analogous structures.

The material to be made on the machine is illustrated in Figs. 13 and 14, and consists really of a central stem, *a*, and sidewardly-projecting fibers *b*, which, on the stem, have the appearance of the fine downy vanes of a feather. In producing this fabric it is necessary to wind around a central core, which may be made of wire or any other material, the substance which is to produce the vanes or fibrous sides of the feather. For this purpose silken threads are usually employed; but any other material may be used.

The machine operates to wind the silk around the central core or wire, forming loops of any desired diameter, which loops, by a separate thread, are tied to the core or wire, immediately after or at the time they are cut open, by means of a knife, to form the fibrous projections onto the core or stem, as already stated. The core or stem carrying these projections is now twisted on its own axis, so as to be entirely surrounded, brush like, by the fibers, as indicated in Fig. 15, thus placing them at substantially equal distances apart; and, finally, this "cylindrical brush," as it may be termed, is flattened down in a sort of ironing-machine, to form on the core the two vanes, as already stated, both vanes being substantially flat, and yet downy in appearance, owing to the breaking or crushing down of those fibers that originally stood at right angles, or substantially so, to the fibers that are spread laterally. The machine operating on this principle produces a fabric which, when worked into imitation ostrich-feathers, plumes, or any other substance, has a remarkable resemblance to natural feathers, and which, aside from that use, may find several adaptations in the arts, which it is here unnecessary further to specify.

In the accompanying drawings, the letter A represents one of the frames of my machine, which frame carries the silk winding, applying, and cutting mechanism. B is another frame, placed at a suitable distance from the frame A, and made to carry the ironing or flattening-down mechanism. The frame A is more fully shown in its details of construction in Figs. 2, 6, 7, 8, 9, 10, and 11. It carries a tubular shaft, C, which supports a spool, D, that contains the threads or fibers or substances to be wound around the central core to form the feathery part of the fabric. Through the tube C, upon which is the spool D, are passed two wires, *d* and *e*, or stiff threads, which are unwound in their passage through said tube from two separate drums,

E E, which are placed side by side, and rewound upon separate drums F F, also placed side by side. These two wires pass substantially parallel to each other from the drums E E around suitable friction-rollers *f*, and then enter the tube C, passing through the same; thence they pass over a friction-roller, *g*, clearly shown in Fig. 8, under another friction-roller, *h*, then over a drum, G, and thence over another friction-roller, *i*, as indicated in Fig. 8. From the roller *i* they pass, respectively, to the drums F F, upon which they are wound.

The wires *d e*, being each taken from its own drum E and rewound upon its own drum F, are thus separately moved, and do not necessarily depend upon one another, thereby insuring a proper continuous operation of the machine, even though the diameters of the two wires *d e* are not always alike.

Rotary motion for feeding the wires *d e* is imparted to the shaft of the drums F F by belts $f^{\times}$, $g^{\times}$, and $h^{\times}$ and pulleys $i^{\times}$ and $k^{\times}$ from the pulley $l^{\times}$ on the driving-shaft *q*, as shown in Fig. 6.

The drum G is composed of two disks, *j j*, which are screwed upon a hub, *l*, from opposite ends, so that two rings, *j j*, may be brought closer together or farther apart from each other, and so that between them a narrow space or groove is formed on the drum G, in which the two wires *d* and *e*, with the matter which is wound upon them, are placed, as shown in Fig. 10. The distance between the two rings *j j* on the drum G determines also the distance apart of the wires *d e*, which distance is furthermore defined by grooves on the friction-roller *i*, in which grooves said wires are conducted. Through the tube C is furthermore passed, between the two wires *d e*, a third wire or thread, *m*, which constitutes part of the core of the imitation feather to be produced. This wire or thread *m* is unwound from a spool, *n*, and passes thence over suitable friction-rollers *f f*, through the tube C, thence over the roller *g*, under the roller *h*, and over the drum G. This drum, as already stated, is composed of the parts *j l j*, as shown in Fig. 10, and the hub *l* is grooved circumferentially between the rings *j j*, as shown at *o* in Fig. 10, so that the thread or wire *m* will be in line with and above said groove *o*. From the drum G the thread or wire *m*, with its coverings, passes to the traveler H, which will be hereinafter more fully described.

The wire *m*, if a metallic wire is used, is preferably, before being put into this machine, spun over with very fine silk or other substance, so as not to disclose its metallic character in the feather; otherwise it might by its luster destroy the illusion and injure the value of the fabric; yet I wish it distinctly understood that I do not limit myself to any substance from which any part of the fabric produced on said machine is made, nor to any use to which the fabric produced on the machine is put.

As already stated, the silk or other fiber which is to constitute the feathery part of the fabric is contained on the spool D, which embraces the tube C. To this tube rotary motion is imparted by a belt, *p*, from a driving-shaft, *q*, or in any other suitable manner. The tube C has in front of the spool D suitable wings *r*, which rotate with it, and are perforated, to carry the threads or silk fibers spirally around the two wires *d e*, that pass through the tube C. Thus it is that as the wires *d e* are gradually pulled through the tube C in the direction of the arrow shown in Fig. 11 they are loosely covered with the threads from the spool D, that are spirally wound around them, the distance between the two wires *d e*, which is determined by the position of the rings *j j* and grooves in the roller *i*, as already stated, determining in turn the diameter of the loops that are wound around them, and centrally within said loops is contained the central core or wire, *m*.

The next part of the operation to be performed after having formed these loops around the wire *m* is to tie them thereto. For this purpose of tying I use another thread, *s*, which is wound from a spool, *t*, and passes thence over a friction-roller, *u*, that is in front of the drum G, thence under said drum into the groove *o* of the drum and around said drum, where it lies directly beneath the thread or wire *m*. As the thread or wire *m* is afterward twisted together with the thread *s*, by means hereinafter stated, such twisting action serves to fasten the loops or parts of the fibers *w w* that are obtained from the spool D to such wire or thread *m*. But before the twisting operation commences it is necessary to destroy the loops of the threads *w*, and to this end a knife, I, is used. This knife is held by a pin, *x*, to part of the frame A. The pin *x* is in reality or preferably a screw-bolt for clamping the knife in any desired position. The knife has a longitudinal slot, so that it may be adjusted lengthwise. The frame A, where the pin *x* passes through it, has a vertical slot to permit vertical adjustment of the knife, and, more than this, a screw, *y*, is used to bear upon the knife, so as to regulate the pressure and position of the cutting-edge. The cutting-edge of the knife I is directly in line with the groove *o* of the drum G, as shown in Fig. 10, so that as the wire *m*, which is embraced by the loops *w*, passes over the drum G, between the rings *j j*, the loops will be cut by the knife I; but the knife is so nicely adjusted by means of the two slots and by the screw *y* as not to touch either the thread *s* or the thread *m*, but simply to cut through the loops that are drawn tight around the two wires *d e*.

I attach great importance to the arrangement of the knife and to the manner of adjusting the same, hereinabove described, because by this arrangement I am enabled to cut the loops before they are twisted or tied firmly to the thread or wire *m*, and yet not to interfere

with said thread or wire, nor with the fastening-thread *s*.

Immediately after escaping from the action of the knife, the fabric, consisting of the parts *m*, *s*, and *w*, begins to be twisted, in that its end is fastened to a rotating spindle, a^2, that hangs in the traveler H. The ends of the threads or wires *m s* are first twisted together, and then hooked on to the hook-shaped end of the spindle a^2, as indicated in Fig. 3, and thereupon the traveler H is caused to move on a stretched railway or wire, J, from the frame A toward and to the frame B. The traveler H is suspended by wheels a^3 a^3 from the railway J. In so traveling the spindle a^2 is rotated by a belt, b^2, and being rotated twists the threads or wires *m s* together, and tightens them around the fibers or cross-threads that are produced by the cutting of the loops *w*, so that finally a fabric looking in cross-section like that shown in Fig. 15 is the result.

The belt b^2 derives its motion from a drum on the shaft *q*. It passes from said drum, which hangs in the frame A, to and over a friction-roller, d^2, that hangs on the frame B. From d^2 it extends over a friction-roller, e^2, that hangs on the traveler H; thence it passes around a cone-pulley, f^2, of the spindle a^2; thence over another cone-pulley, g^2, of another spindle, h^2, which also hangs in the traveler H; thence upward, crossing its former direction on the cones g^2 and f^2, over another friction-roller, i^2, which also hangs on the traveler H; thence over a friction-roller, j^2, which hangs on the frame A, and down from these to and around the drum on the shaft *q*. The belt b^2 is held taut by a weight, as shown in Fig. 7.

Thus it is that by the continuous motion of the belt b^2 the traveler H is moved toward the frame B, and at the same time the spindles a^2 and h^2, hanging in it, are also rotated in opposite directions. The speed of these spindles, and even their relative speed, can be regulated by putting the belt b^2 around different parts of the cone-pulleys f^2 and g^2, and the speed of the traveler and the tightness of the belt can be regulated by shifting the pulleys or friction-rollers e^2 and i^2, which are hung to an adjustable slotted plate, s^2, that is fastened to the upper part of the traveler H, as indicated in Fig. 5.

The fabric, being properly twisted during the travel of the carrier H from the frame A to the frame B, is, when H is near B, cut off near the frame A, the traveler moved back to the frame A, and that end of the fabric which was next to the frame A hooked upon the spindle h^2, its other end being inserted between two rollers, L and M, of the ironing apparatus, that is carried on the frame B. The spindle a^2 now receives the end of the fabric that comes from the drum G, and the traveler now repeats its motion from the frame A to the frame B. In so doing the new fabric produced is again twisted by means of the spindle a^2; but the detached piece, formerly produced and twisted, is further twisted by means of the spindle h^2, and is then received by and between the rollers L M, to be flattened, as hereinafter to be stated. Thus I produce pieces of fabric of the requisite design, in length equal to the distance between the frames A and B.

Whenever the traveler is near the frame B, the part which it had twisted is detached at the frame A, and reapplied in manner already stated.

The frame B, as already said, carries the rollers L and M. The roller L is a hollow iron roller, adapted to be heated by gas internally applied, or by a heated iron or brick, or in any other suitable manner. It receives rotary motion by a belt, l^2, from a shaft of the frame A, or in any other suitable manner. The roller M is of rubber or other elastic substance, and is not heated, and is, by a suitable spring, m^2, made to press upon the roller L with suitable degree of power.

The fabric or thread twisted or surrounded, like a cylindrical brush, with the radially-projecting fibers, is, as it arrives between the rollers L M, ironed and flattened, so that the fibers project laterally, as indicated in Figs. 13 and 14, and yet, at the same time, it will receive a feathery or downy appearance by having some of the fibers, which originally stood up vertically, or nearly so, brought down upon the flat, radial, or lateral fibers, thereby giving the entire fabric an appearance similar to that of a very fine and delicate feather, in which the inner core or part, *m s*, constitutes the quill *a*, while the threads *w*, which are left by cutting the loops and then flattening, as already stated, constitute the vanes *b*.

I desire it to be understood that, instead of using a traveler, a twisting apparatus of different construction might be applied to the ironing apparatus B L M, so that a continuous operation may be effected, instead of alternating in manner already described.

Having passed the ironing apparatus L M, the fabric is wound upon a suitable spool, N, which derives rotary motion by a belt or other means either from the shaft of the roller L or in any other suitable manner.

I claim—

1. The drum G, composed of the hub *l*, having groove *o*, and of the two rings *j j*, which are screwed upon the ends of the said hub from opposite sides, substantially as specified.

2. In combination with the grooved drum G, the laterally and vertically adjustable knife I and pressure-screw *y* and frame A, substantially as and for the purpose specified.

3. The combination, in one machine, of the frame A, actuating-belt *p*, tube C, drum G, having groove *o*, knife I, bearing-roller *u* for the thread *s*, bearing-roller *i*, spreading wires *d e*, drums E F, traveler H, belt b^2, pulleys d^2, e^2, f^2, i^2, and j^2, ironing or flattening apparatus L M, and mechanism for imparting rotary

motion to the roller L, substantially as herein shown and described.

4. The combination of the frame A and tube C, having perforated wings *r*, spreading wires *d e*, grooved drum G, knife I, twisting apparatus, and flattening apparatus, with means for separately feeding the spreading wires *d e*, substantially as and for the purpose herein shown and described.

The above description of my invention signed by me this 14th day of June, 1879.

MAX GRODZENSKY.

Witnesses:
A. V. BRIESEN,
T. B. MOSHER.