(No Model.)

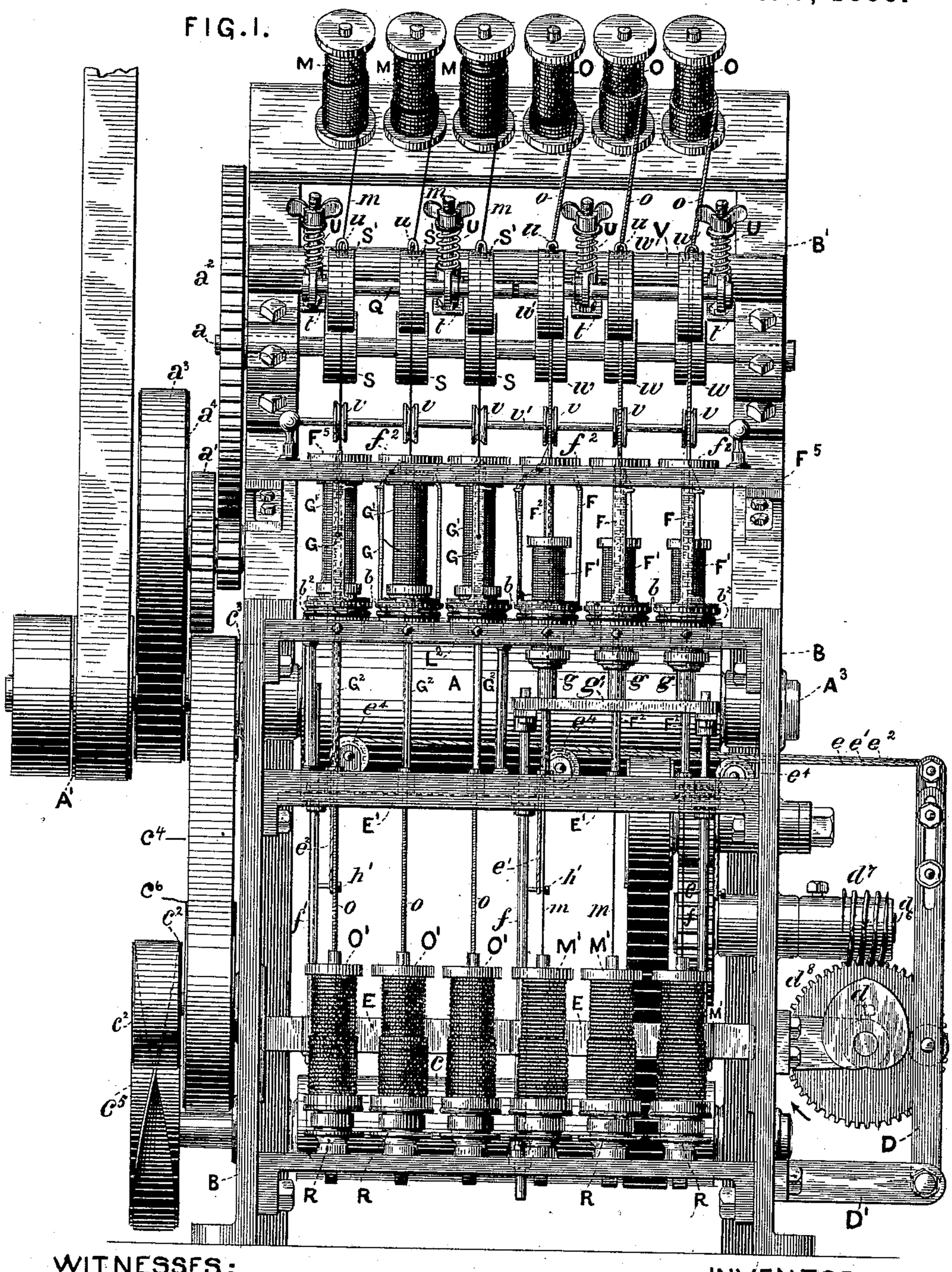
4 Sheets—Sheet 1.

T. HARRISON.

MACHINE FOR PREPARING ASTRAKHAN WARP THREADS.

No. 353,938. Patented Dec. 7, 1886.

FIG. 1.



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4 Sheets—Sheet 2.

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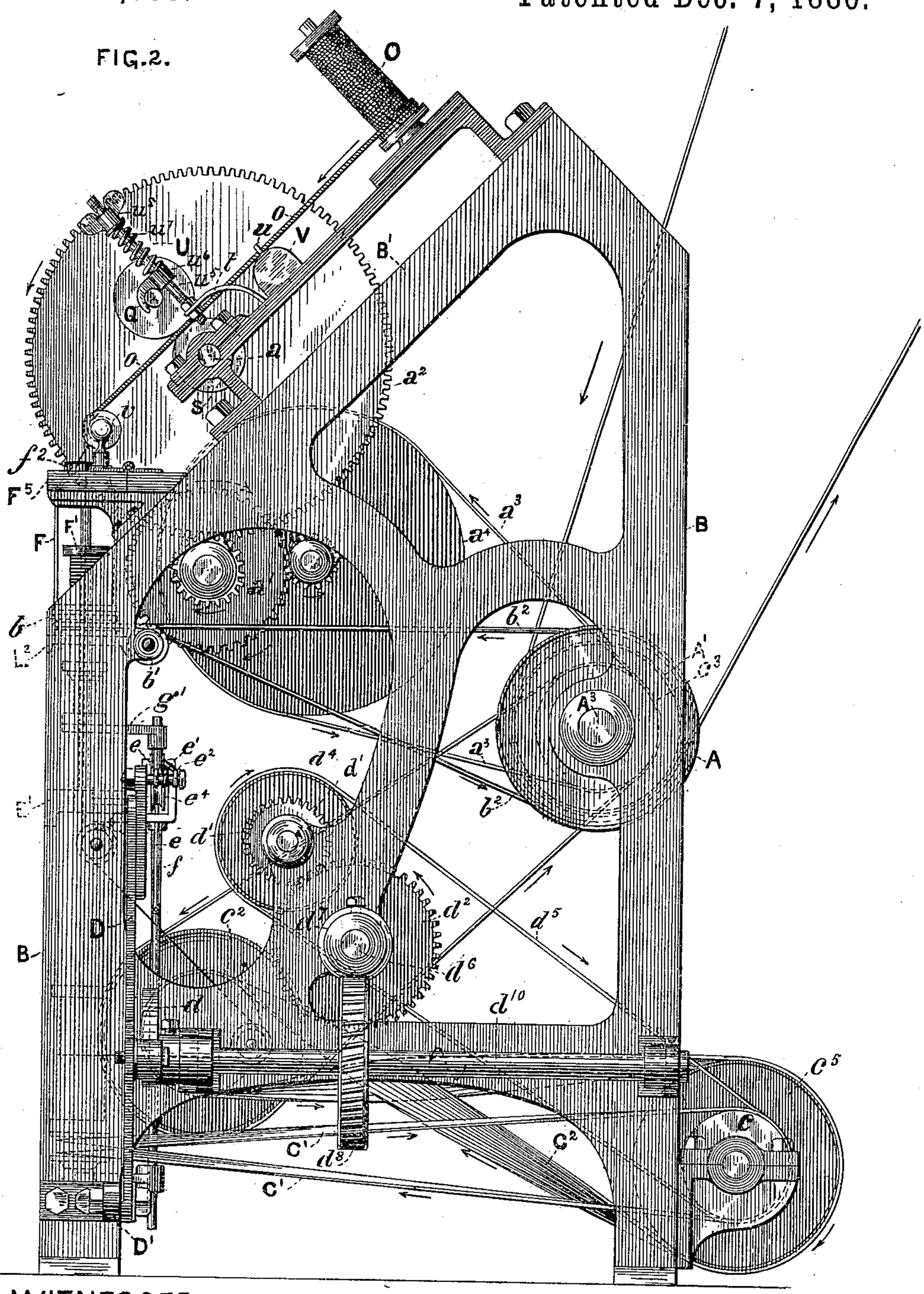
MACHINE FOR PREPARING ASTRAKHAN WARP THREADS.

No. 353,938. Patented Dec. 7, 1886.

FIG. 2.



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(No Model.) 4 Sheets—Sheet 3.

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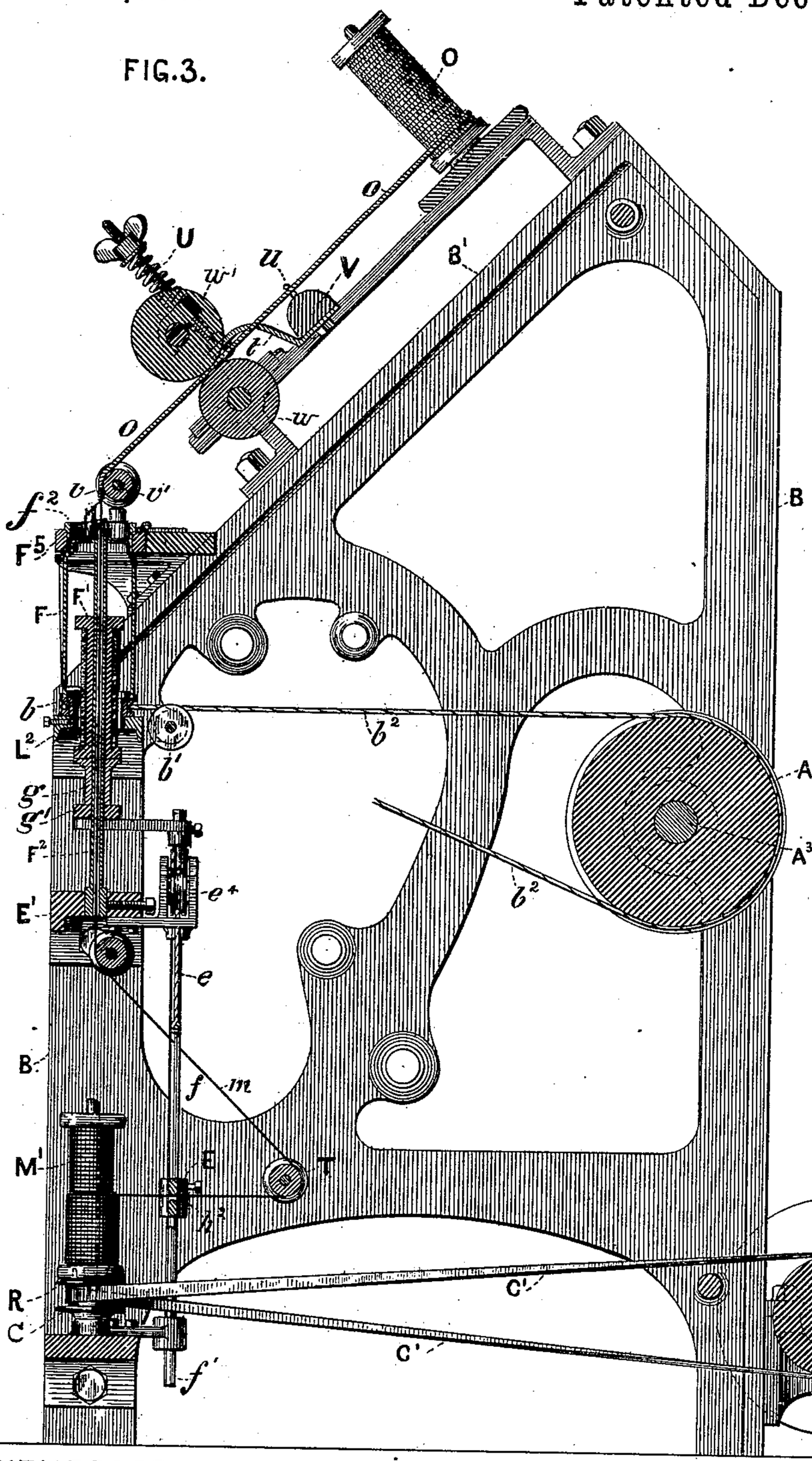
MACHINE FOR PREPARING ASTRAKHAN WARP THREADS.

No. 353,938. Patented Dec. 7, 1886.

FIG. 3.



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MACHINE FOR PREPARING ASTRAKHAN WARP THREADS.

No. 353,938. Patented Dec. 7, 1886.

FIG. 4.

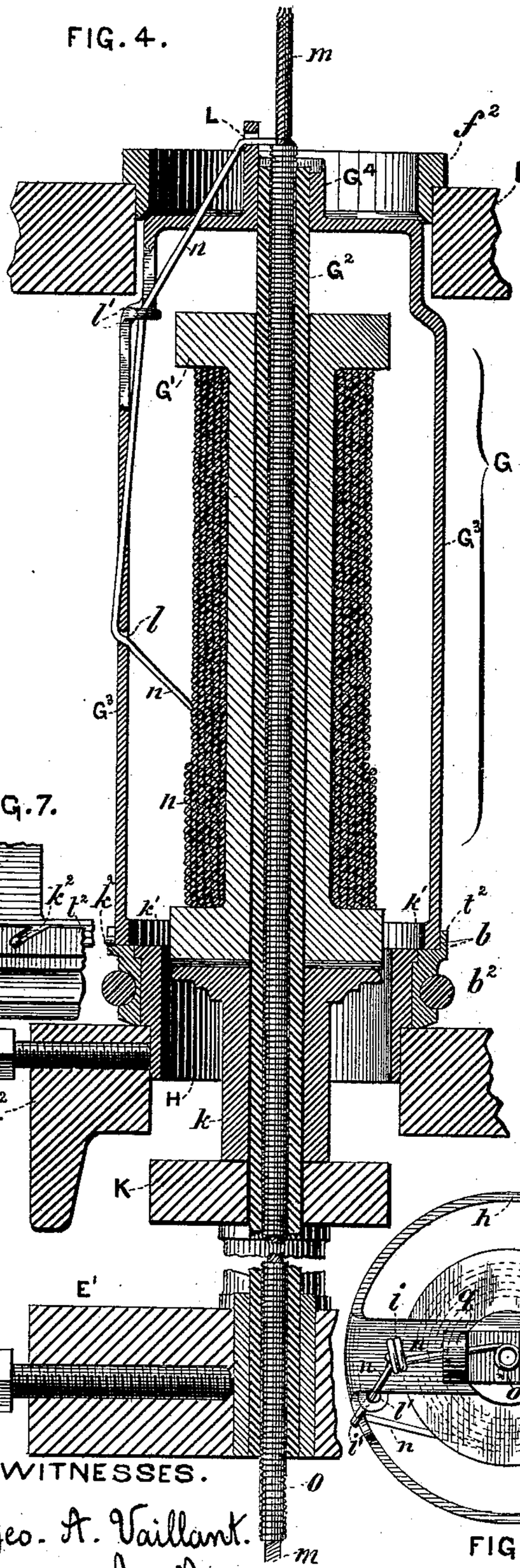

FIG. 5.

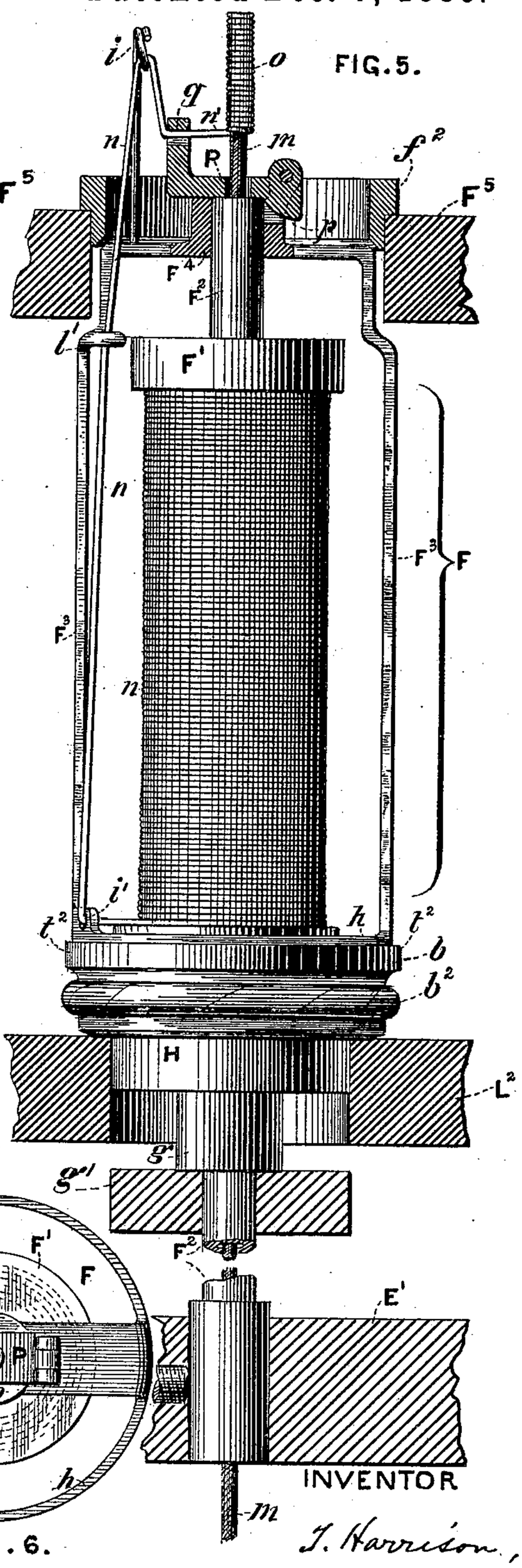

FIG. 7.

FIG. 6.

UNITED STATES PATENT OFFICE.

THOMAS HARRISON, OF PHILADELPHIA, PENNSYLVANIA.

MACHINE FOR PREPARING ASTRAKHAN WARP-THREADS.

SPECIFICATION forming part of Letters Patent No. 353,938, dated December 7, 1886.

Application filed April 17, 1886. Serial No. 199,161. (No model.)

To all whom it may concern:

Be it known that I, THOMAS HARRISON, of Philadelphia, in the State of Pennsylvania, have invented a certain new and useful Machine for Preparing Astrakhan Warp-Threads, whereof the following is a specification, reference being had to the accompanying drawings.

In the manufacture of the class of fabrics which are known as "astrakhan," &c., it is necessary to impart a permanent curl or twist to the warp-threads which are to form the astrakhan portion thereof. Heretofore this operation has been performed by hand, the general method being to wind by hand a continuous astrakhan warp-thread around a core of some material, then to steam it while in this position, and afterward to untwist it from the core by hand and wind it upon a bobbin for use. Both the coiling and uncoiling operations as performed by hand were necessarily slow, more or less uncertain, and it was difficult to coil the warp-thread with sufficient tightness around the core to produce a permanent curl.

The object of my present invention is to perform both the coiling and uncoiling of the warp-thread by machinery in such manner that the operation shall not only be performed with great rapidity, but that the coiling shall be even and tight.

I prefer to embody in a single structure both the coiling and uncoiling mechanism, not merely because of compactness of the machine and convenience of handling the materials, but because I find that the same motion or a derivative of the same motion which has coiled the warp is best adapted to uncoil it. The combination of machinery necessary to perform both operations side by side upon a single frame renders it also necessary to employ certain sub-combinations of the mechanism, by which the essential movements for the dissimilar operations are driven from the common driving-shaft.

In the accompanying drawings, Figure 1 represents a front elevation of the machine; Fig. 2, a side view thereof; Fig. 3, a vertical longitudinal section on a line a little to the right of the center of the machine; Fig. 4, a vertical central section through the coiling device; Figs. 5 and 6, respectively, a side elevation and top view of the uncoiling device; and Fig. 7, a view of the stop, by means of which a positive motion is imparted to the coiling mechanism.

B represents the frame of the machine, consisting of two parallel housings, with an inclined upper portion, B′.

A^3 is the driving-shaft of the machine, to which power is imparted by a belt upon the pulley A′. Upon the driving-shaft is mounted a drum, A, which extends entirely across the interior of the machine, and which is provided at intervals with grooves to receive a series of small driving cords or belts, b^2, which, after being brought into a horizontal plane by passing the inclined part of the belt over idlers b', pass around a series of horizontal "whirls," b, which are journaled (see Figs. 4 and 5) upon vertical rings H, secured in a series of openings formed in the transverse platform L^2. These whirls b are formed with a circumferential flange, t^2, on their upper side, thus providing seats for the "fliers" G F. The three fliers marked G (which are on the left-hand side of Fig. 1) are the coiling devices, the three marked F (upon the right-hand side of Fig. 1) being the uncoiling devices.

The coiling-fliers G each consists of the two uprights G^3, mounted at the bottom upon a ring, k', which fits snugly within the flange t^2 of the whirl b. At the top the two uprights are connected by means of radial pieces with a central sleeve or bearing, G^4. This sleeve revolves upon a vertical tubular stem, G^2, which passes downward through the axis of rotation of the flier, and for some distance below, where it is secured in the transverse piece E′, extending across from side to side of the machine at the front thereof. The spool or bobbin G′, upon which the warp that is to be coiled is wound in the first instance, fits snugly, but so as to revolve freely, upon the outside of this stem G^2, and rests upon a standard, k, through whose center the stem G^2 passes freely. Said standard k passes freely through the ring H and is supported upon a fixed platform, K.

The coiling-flier G is provided with eyes l l' L, the latter of which is situated at the top of the sleeve G^4, and is at right angles to the axis of rotation. At the bottom of the coiling-fliers G are stop-pins k^2, (see Fig. 7,) projecting

into slots in the flange t^2 of the whirls b. These stops make the rotation of the coiling-fliers G positive.

As before stated, there are in the machine shown in the drawings six of the horizontal whirls b, three of which drive the coiling-fliers G, the other three driving the uncoiling-fliers F. These latter resemble the coiling-fliers G in shape, having uprights F^3, connected by bottom rings, h, which rest loosely within the flanges t^2 of the whirls b, but which (unlike the coiling-fliers) are not positively connected therewith, the weight of the flier F alone being the means by which it receives its motion from the whirl b. The uncoiling-fliers F have eyes i i' at top and bottom, respectively, the latter being the eye which delivers the thread to the spool or body, and they have also at the top a brake mechanism, which will presently be described.

A tubular stem, F^2, extends down through the axis of rotation of each of the uncoiling-fliers, and is held in the cross-bar E'. These stems F^2 receive the bearings F^4 at the top of the uncoiling-fliers. The spools or bobbins F' of the uncoiling-fliers fit snugly around the stems F^2, and are supported upon standards g, which also surround said stems, but which are mounted upon a vertically-movable cross-piece, g', arranged to be reciprocated in a vertical direction, in the manner which will be presently described. The spools or bobbins F' of the uncoiling-fliers F are thus adapted to receive a rising and falling movement within the flier during the rotation of the latter, and in this respect differ from the spools of the coiling-fliers G, which are stationary so far as vertical movement is concerned. The upper ends of the fliers extend into openings in the shelf or platform F^5, provided with rings or bushings f^2, and are thus shielded during rotation. The shelf F^5 is hinged at the rear, so as to be thrown back when the fliers are to be removed.

The brake mechanism of the uncoiling-fliers is constructed as follows: Upon the top of each sleeve F^4 there is pivoted upon one side a lever, P, through the center of which there is a vertical hole coinciding with the opening of the stem F^2. This lever has at its rear end a cam-surface, p, which, when the lever is in a horizontal position, rests without substantial pressure against the stem F^2. At the front end of the lever P is an eye, q, through which the thread n, which is being uncoiled, passes, and thence rises to the eye i, mounted upon the top of the flier. So long as the portion n' of the thread n between the eye q and the axis of rotation of the fliers is substantially horizontal the lever will remain in a horizontal position; but if that portion of the thread rises to an angle with the horizontal, then the strain upon the eye q will raise the front end of the lever and bring the cam p gradually around, so as to press upon the top of the stem F^2. The cam-surface being eccentric, as it turns in the direction of its longest axis it will raise the flier F bodily by bearing upon the top of the stem F^2, and in so raising it will lift the flier clear of the whirl b, so that motion will be no longer imparted to the flier. If desired, the lift may be such as to bring the upper part of the flier F into frictional contact with the under side of the ring f^2.

As will hereinafter be explained, the normal position of the portion n' of the thread which is between the eye q and the axis of rotation is practically horizontal, and when it rises at an angle to the horizontal the flier F will stop rotating.

At the top of the machine I mount upon suitable pins the spools or bobbins M, which contain the cord which is to form the core for winding the astrakhan warp upon. These bobbins M, like the coiling-fliers G, are three in number, and the cord m from them passes through feeding mechanism, which will presently be described, down over pulleys v, mounted upon a horizontal shaft, v', and through the central stem, G^2, of the coiling-fliers.

Assuming for the present that a proper take-up device for the cord m is provided at the bottom of the apparatus, whereby a strong tension will be maintained thereon, I will now proceed to describe the method by which it is fed down through the stems G^2. A belt, a^3, conveys motion from the driving-shaft A^3 to a pulley, a^4, and thence by gears and pinions a' a^2 a very slow rotary motion is imparted to the shaft a, which extends entirely across the top of the machine, near the bottom of the incline b'. Upon this shaft a are mounted friction-rollers S, three in number, over which the cord m passes on its way from the spools M. Upon the cross-piece v are mounted overhanging arms t, which support the shaft Q, on which are mounted friction-rollers S', bearing down upon the rollers S. The shaft Q is provided with a spring-pressure device, U, the same consisting of a vertical stem, u^5, having a sliding collar, u^6, with a hook-shaped projection, as shown, which engages with the shaft Q, and a spring, u^7, whose tension is adjustable by means of a thumb-nut, u^8, said spring bearing upon the collar u^6. By means of this tension device the rollers s' can be caused to bear upon the rollers S with any desired degree of pressure. Although, therefore, the take-up devices at the bottom pull the cord m with some strain, it is fed to them by the positive motion of the rollers S, and cannot be drawn more rapidly than the rotation of the latter will permit. A similar set of feeding-rollers, w w', the latter mounted in similar spring-bearings, are arranged to deliver the cords o from the bobbins O to the three uncoiling-fliers F, upon the other side of the machine; but the diameter of the positive feeding-rollers w is less than that of the feeding-rollers S, for a reason which will be hereinafter explained, and with the effect of feeding more slowly to the uncoiling-fliers than to the coiling-fliers.

The take-up bobbins O' M' for the cords,

which pass from the coiling-fliers and uncoiling-fliers, respectively, are mounted upon horizontal rotating seats R, placed at the bottom of the machine and driven by the twist-belts C′, passing around pulleys C, secured to the seats R These twist-belts C′ are driven from a drum, *c*, which receives motion from the pulley c^5, driven by a belt, C^2, from the pulley c^2, which in turn is driven from the pulley c^3 on the driving-shaft A^3 by means of the belt c^4 and pulley c^6. The twist-belts C′ are so arranged that they can slip upon their respective pulleys C, in case the feed from above requires such slipping, and as it is desired to maintain a strain upon the cords which pass to the several bobbins O′ M′, this slipping occurs with more or less frequency.

In order to wind the cords upon the respective bobbins O′ M′ evenly, a traveling guide-bar, E, is provided, which receives a slow vertical reciprocating motion in a manner about to be described. This traveling bar E carries vertical rods *f f′*, which rise and fall with it, these rods being guided by suitable openings in the cross-bar E. The rod *f′* serves merely as a guide-rod, but the other two rods, *f*, carry at their tops the cross-piece *g′*, which supports the standards *g* of the bobbins F. Thus if a vertical reciprocation is imparted to the traveling bar E its motion will cause the bobbin F′ to rise and fall in the same manner.

The traveling bar E is provided with openings or eyes h^2, opposite to the bobbins O′ M′, as shown in Fig. 3, which openings guide the thread during the rise and fall of the bar, so as to distribute it equally upon the bobbins.

The mechanism for imparting a very slow rising and falling motion to the bar E is as follows: From the drum *c* a belt, d^5, communicates motion to the pulley d^4, which, by means of the gears d' d^2, rotates a horizontal shaft, d^6. This shaft d^6 carries a worm, d^7, upon its outwardly-projecting end, (see Fig. 1,) which worm imparts a very slow rotary motion to the worm-wheel d^8, fast upon the shaft d^{10}, carrying a heart-shaped cam, *d*. The cam *d* bears against a friction-roller upon the vertical lever D, pivoted to the projecting arm D′. The top of the lever D is slotted so that there may be adjustably secured thereto cords *e e′* e^2, each of which cords passes over one of the pulleys e^4, and thence descends to a projecting pin, *h′*, upon the rods *f f′*. As the worm d^7 rotates a very slow motion is imparted to the worm-wheel d^8, and the cam *d* upon its shaft, so that the lever D is reciprocated very slowly toward and from the sides of the machine, and by means of the three cords *e e′* e^2 raises and lowers the traveling bar E with a similar slow motion. This motion of the bar E is likewise communicated by means of the rods *f* to the cross-piece *g′*, and thence to the bobbins F′ of the uncoiling-fliers F.

The operation of the machine in coiling and uncoiling an astrakhan warp will now be described.

Upon the three bobbins M, at the top of the machine, (see Fig. 1,) are coiled cords *m*, which are to form the cores for winding the astrakhan warp upon. These cores *m* are carried down between the feeding-rollers S S′ over three of the rollers *v*, and on down through the axes of the three coiling fliers G, the passage being of course through the tubular shafts G^2. They then are brought down and passed through the three left-hand eyes of the traveling guide-bar E, and are secured to the three bobbins O′. The astrakhan warps which are to be coiled are wound in the first instance on the bobbins G′, and placed in position within the three coiling-fliers G. The ends of the astrakhan thread, having been brought through the eyes *l l′* L, are tied fast to the three cores *m* at a point just above the fliers G. Assuming now that the proper feeding and take-up movements occur, as before described, at top and bottom of the machine, respectively, and that the fliers G are rapidly rotated, it will be seen that the astrakhan thread is drawn off from its bobbin G′ and coiled tightly around the core *m*. As the coiling progresses the feeding and take-up movements cause the composite cords (indicated by *o*) to pass down through the tubular shafts G^2, and thence to the bobbins O′. The traveling guide-bar E causes the composite cords *o* to be evenly wound upon the bobbins O′.

When a sufficient quantity has thus been formed, the composite cord—that is to say, the core *m* with the astrakhan warp wound tightly around it—is removed, steamed, or otherwise treated to render its twist permanent, and is then ready for uncoiling. I leave a portion of the core *m* at the end of the composite cord uncovered.

The uncoiling operation is as follows: The uncovered end portion of the composite cord *o* (now upon the three bobbins O at the top of the machine) is brought down through its feeding-rollers *w w′* over the three right-hand rollers *v*, and thence down through the tubular shafts F^2, through the three right-hand end eyes of the guide-bar E, and secured to the three bobbins M′. The uncovered portion having been fed down until the commencement of the covered portion or composite cord *o* reaches the top of the uncoiling-fliers, I then carry a loose end of the astrakhan warp *n* through the eye *q* of the lever P up to the eye *i*, and then down to the eye *i′* at the bottom of the uncoiling-flier F, when it is taken across to the bobbin F′ and there fastened. The feeding movement at the top and the take-up movement at the bottom being continued and the uncoiling-fliers F being rapidly rotated in the proper direction, they will uncoil the warp from the composite cords and wind up the now twisted warp *n* upon the bobbins F′. These bobbins have the proper rising and falling motion to distribute the warp *n* evenly

upon them, said motion being derived, as before described, from the movement of the guide-bar E through the rods *f* and cross-piece *g'*, upon which are mounted the platforms *g*, that support the three bobbins F'.

The uncoiling movement is necessarily a trifle slower than the coiling movement, and hence the composite cords *o* do not require to be fed so fast as do the cores *m* upon the other side of the machine, and this difference of speed is effected by the smaller diameters of the feeding-rollers *w* as compared with the feeding-rollers S. The uncoiling operation continues and the cores *m* are wound up in a proper manner upon the bobbins M' at the bottom of the machine, so that they can be again transferred to the positions indicated by M, and the operation repeated.

If the uncoiling tends to progress too rapidly, it is checked by the brake mechanism upon the uncoiling-fliers. The mode by which this checking takes place has been previously referred to in the description thereof, and it is only now necessary to state that said brake mechanism is operated by the portion *n'* of the warp assuming an inclined position, instead of a substantially horizontal one, between the eye *q* P and the core *m*, from which it is being unwound.

It will readily be seen that if the uncoiling takes place too rapidly relatively to the downward feed of the core *m* the point of uncoiling will rise higher and higher upon said cord, and will thus produce that inclination of the warp at *n'* which is necessary to operate the brake mechanism. The uncoiling of the warp is thus automatically regulated by said brake mechanism and cannot progress with such rapidity as to tangle the warp or break it. I am thus enabled to both coil and uncoil the warp with great rapidity and with perfect precision, since by the use of interchangeable gears in the several driving parts of the machine I can derive any relation of the motions throughout the whole, and can adapt the machine to warps and cores of varying sizes while preserving a perfect uniformity in the product.

I am of course aware that it is not new to form a composite cord by wrapping a strand or strands around a central core, and I do not broadly claim the same; but, so far as I am aware, such composite cords have heretofore been the final product and were not again uncoiled. I believe, therefore, that not only is my uncoiling mechanism broadly new, but that the combination thereof with a coiling mechanism driven by the same motion or a derivative of the same motion which has affected the coiling is new also, and, as before stated, the combination of these two steps is not merely the convenient arrangement side by side of two independent operations, but, by reason of the definite relation between the method of coiling and uncoiling, is a combination, properly so speaking.

Having thus described my invention, I claim—

1. In a machine for curling warps, the combination of a coiling-flier, an uncoiling-flier, feeding and take-up devices arranged with respect to said fliers, substantially in the manner set forth, a common driving-shaft, and means, substantially as set forth, whereby the same motion which coils the warp is applied to the uncoiling thereof, substantially as described.

2. The combination of a flier provided with rotating mechanism, a hollow stem arranged in the axis of rotation, feeding and take-up devices at opposite ends of said stem, and a brake, substantially as described, operated by the warp-thread which is being uncoiled by said flier and operating to check the motion of the flier, substantially as set forth.

3. The combination, with the uncoiling-flier, the rotating device on which it rests freely, and the hollow stem arranged in its axis of rotation, of a lever pivoted to the flier and provided with a cam which bears against said stem, an eye upon said lever, and an eye upon the flier, through which the warp-thread passes after leaving the eye of the lever, the said eyes being disposed, substantially as described, whereby the normal position of the warp-thread in uncoiling will permit the lever and its cam to remain inoperative, but an abnormal position of the warp-thread will operate the lever and raise the flier from its seat, substantially as set forth.

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Witnesses:
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