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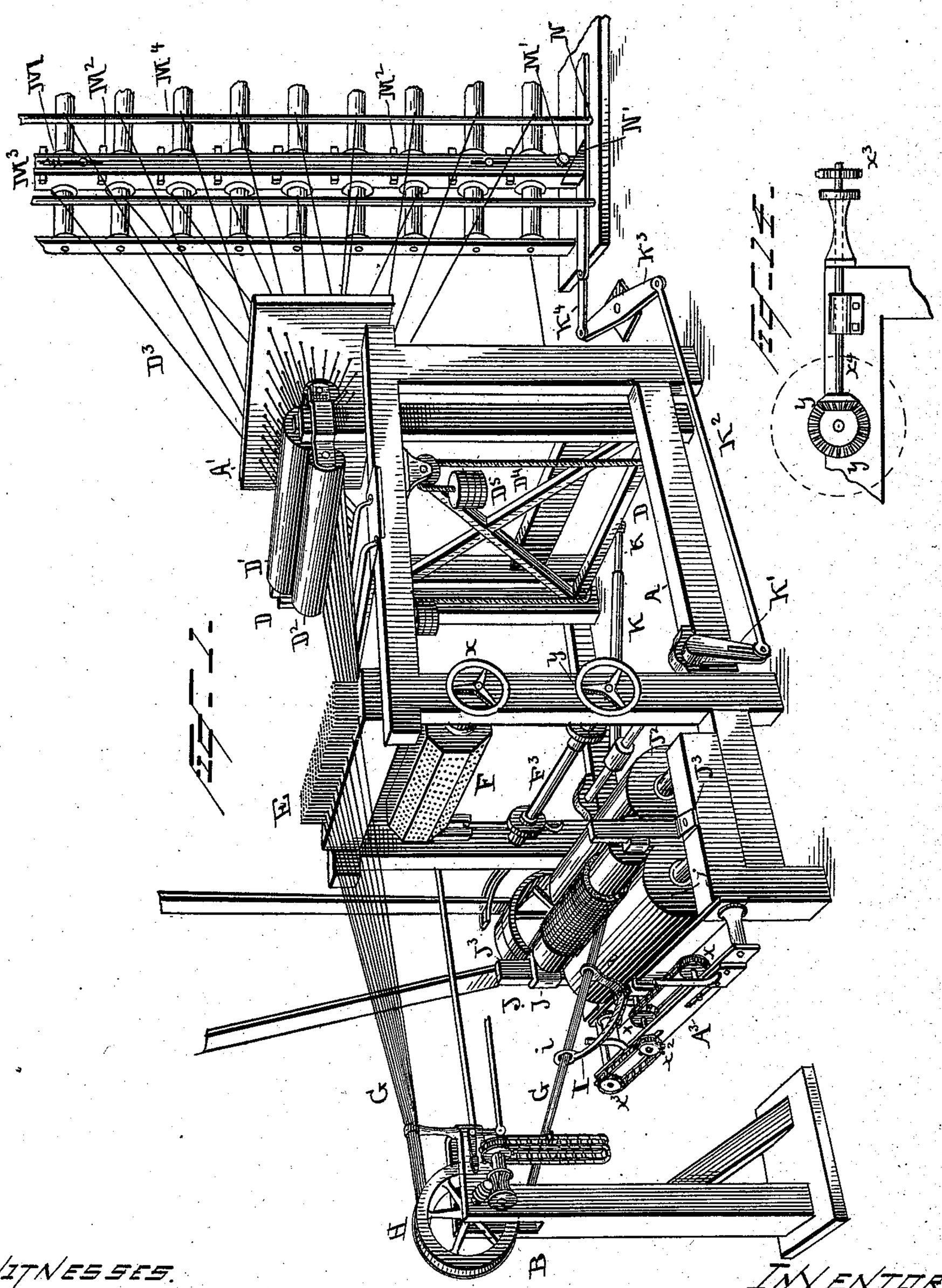
E. E. ORRELL.

WARPING AND BALLING MACHINE.

No. 381,164. Patented Apr. 17, 1888.



WITNESSES.

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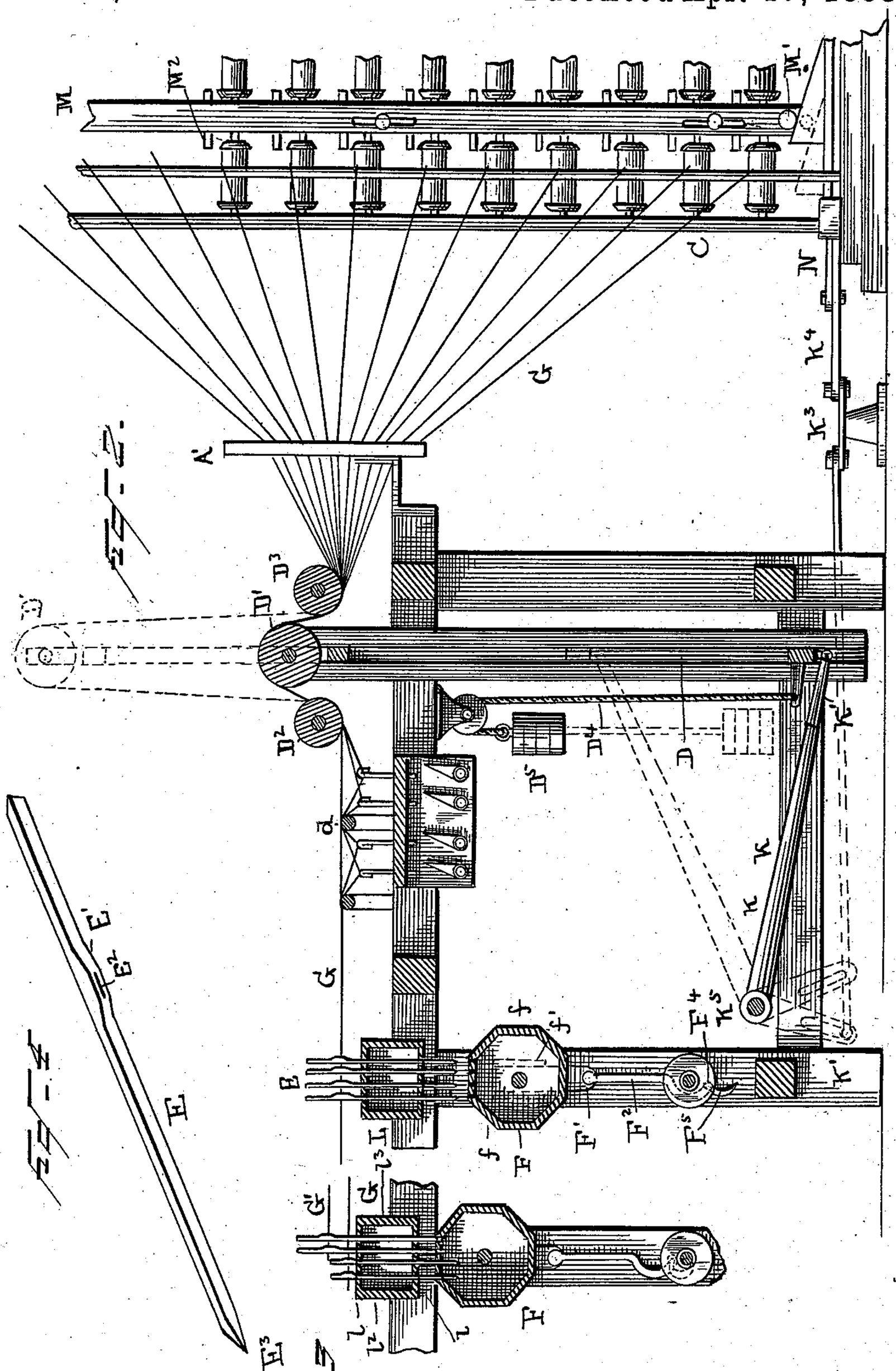
(No Model.) 4 Sheets—Sheet 2.

E. E. ORRELL.

WARPING AND BALLING MACHINE.

No. 381,164. Patented Apr. 17, 1888.



WITNESSES.

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(No Model.) 4 Sheets—Sheet 3.

E. E. ORRELL.

WARPING AND BALLING MACHINE.

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Fig. 5.

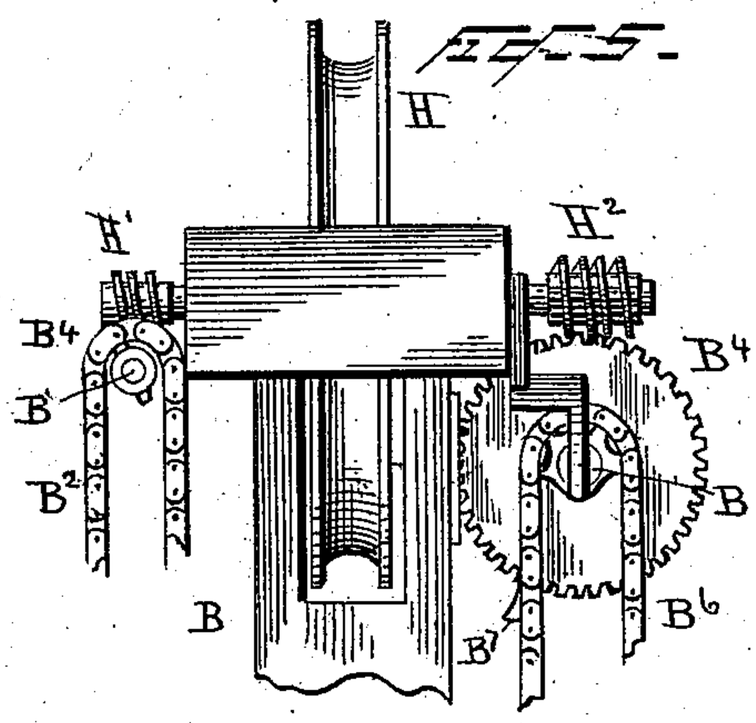


Fig. 6.

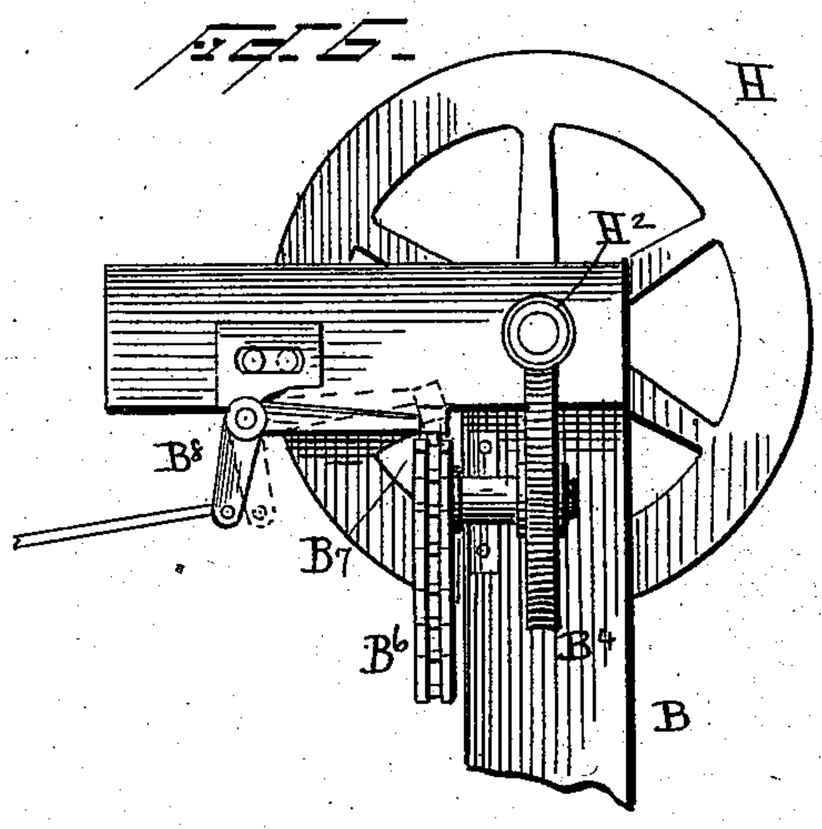


Fig. 7.

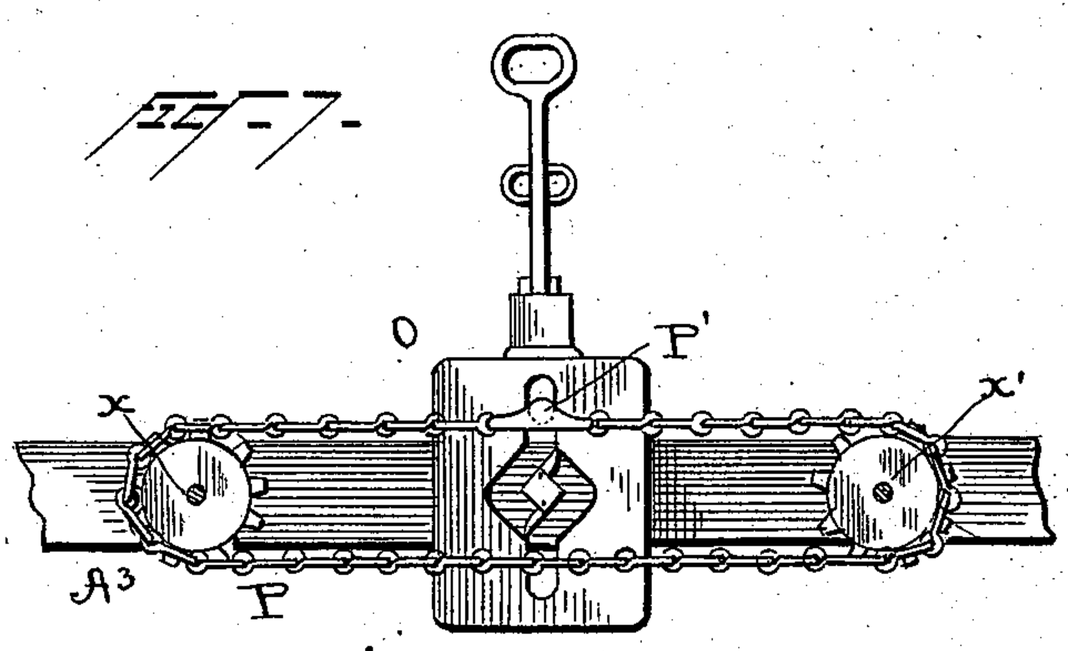


Fig. 8.

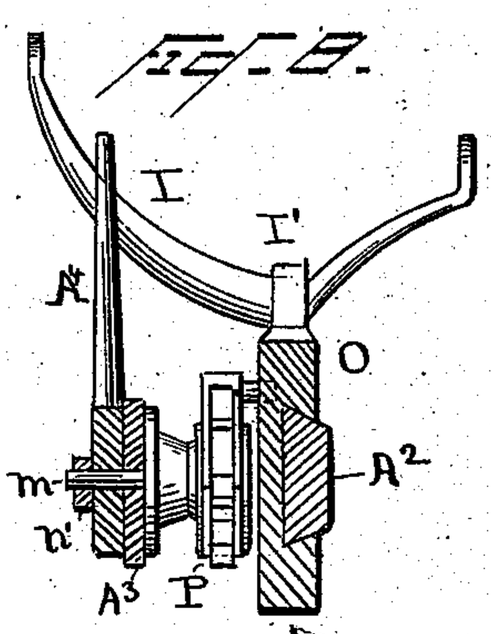


Fig. 9.

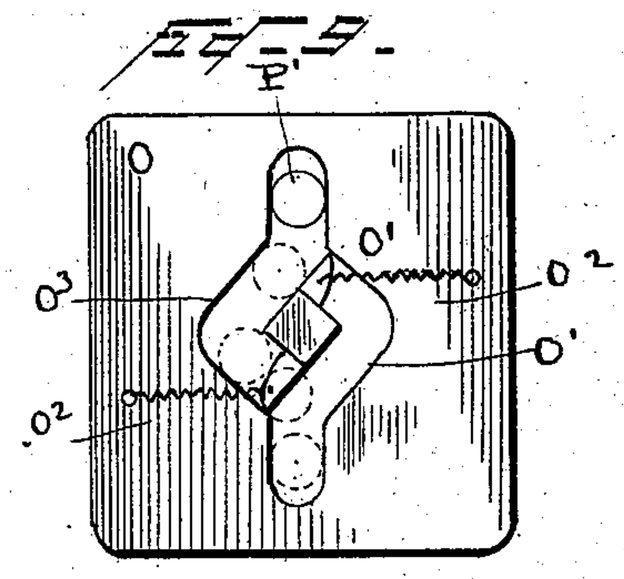


Fig. 10.

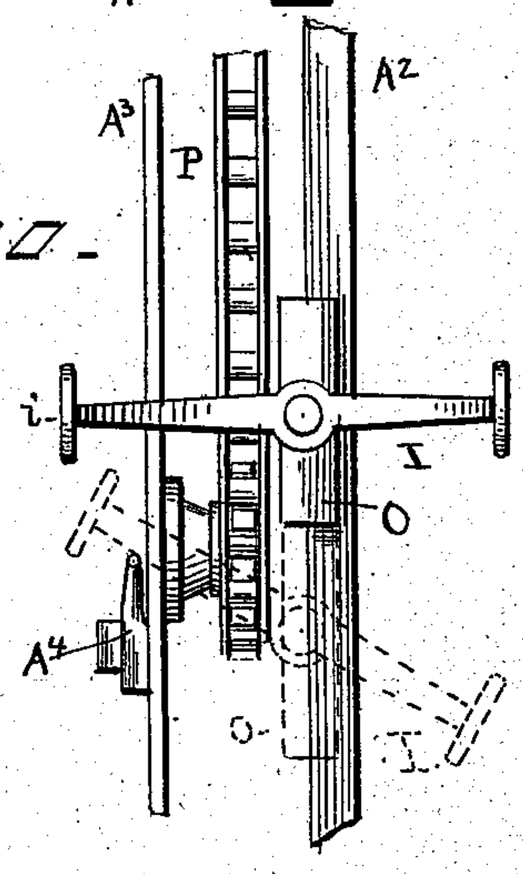
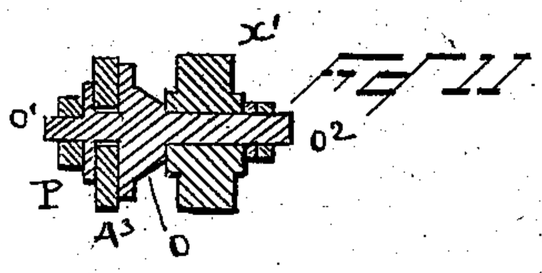


Fig. 11.



WITNESSES,
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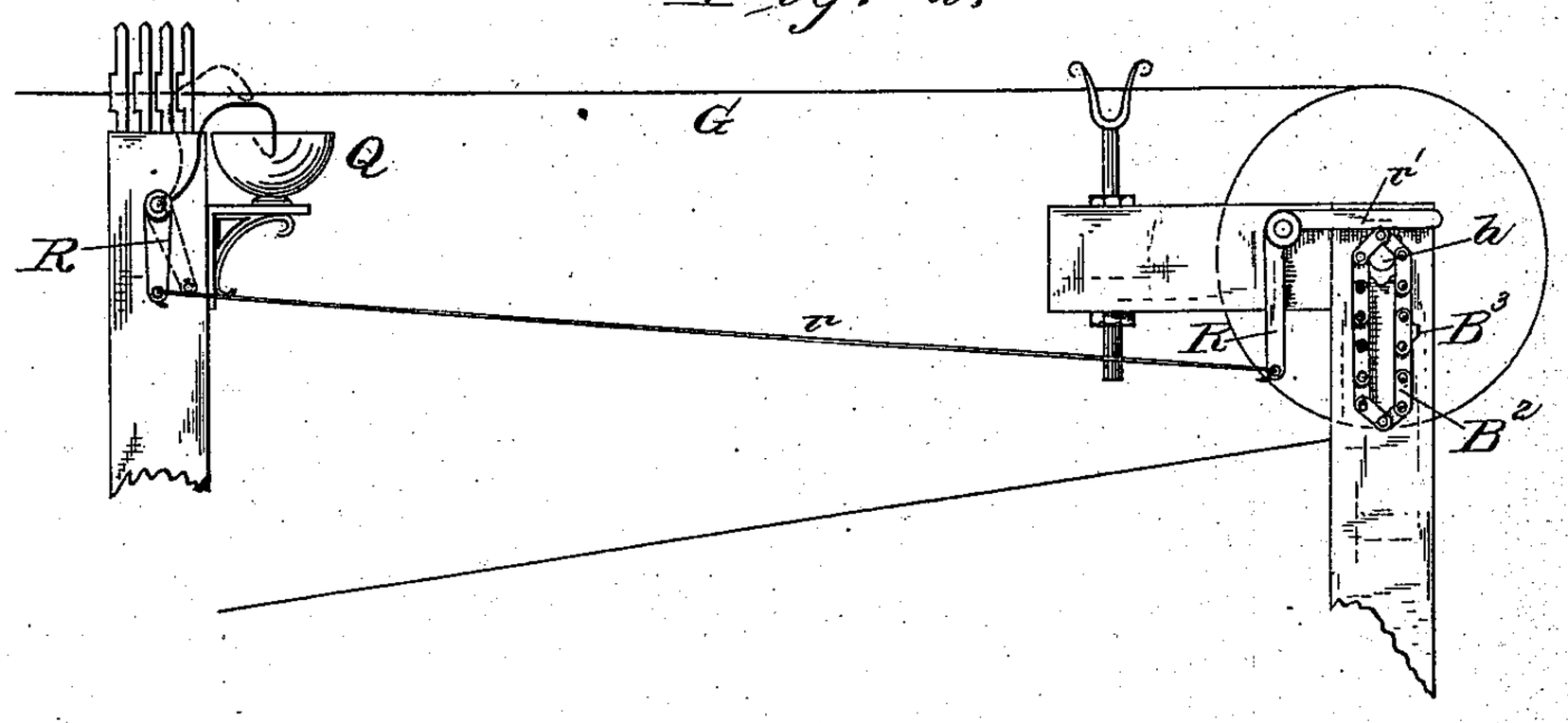
(No Model.) 4 Sheets—Sheet 4.

E. E. ORRELL.

WARPING AND BALLING MACHINE.

No. 381,164. Patented Apr. 17, 1888.

Fig. 12.



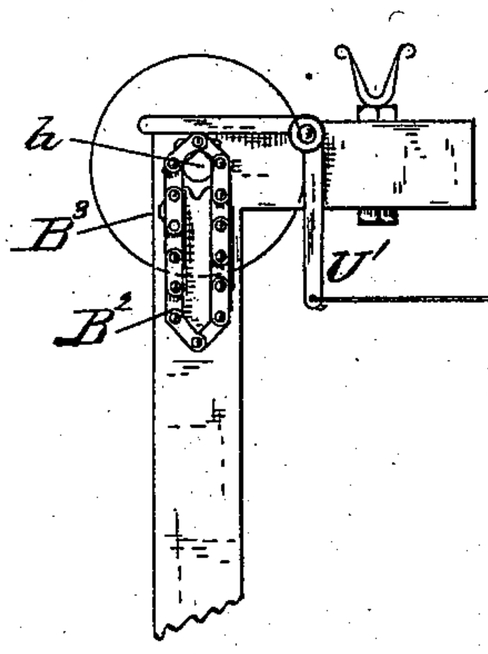
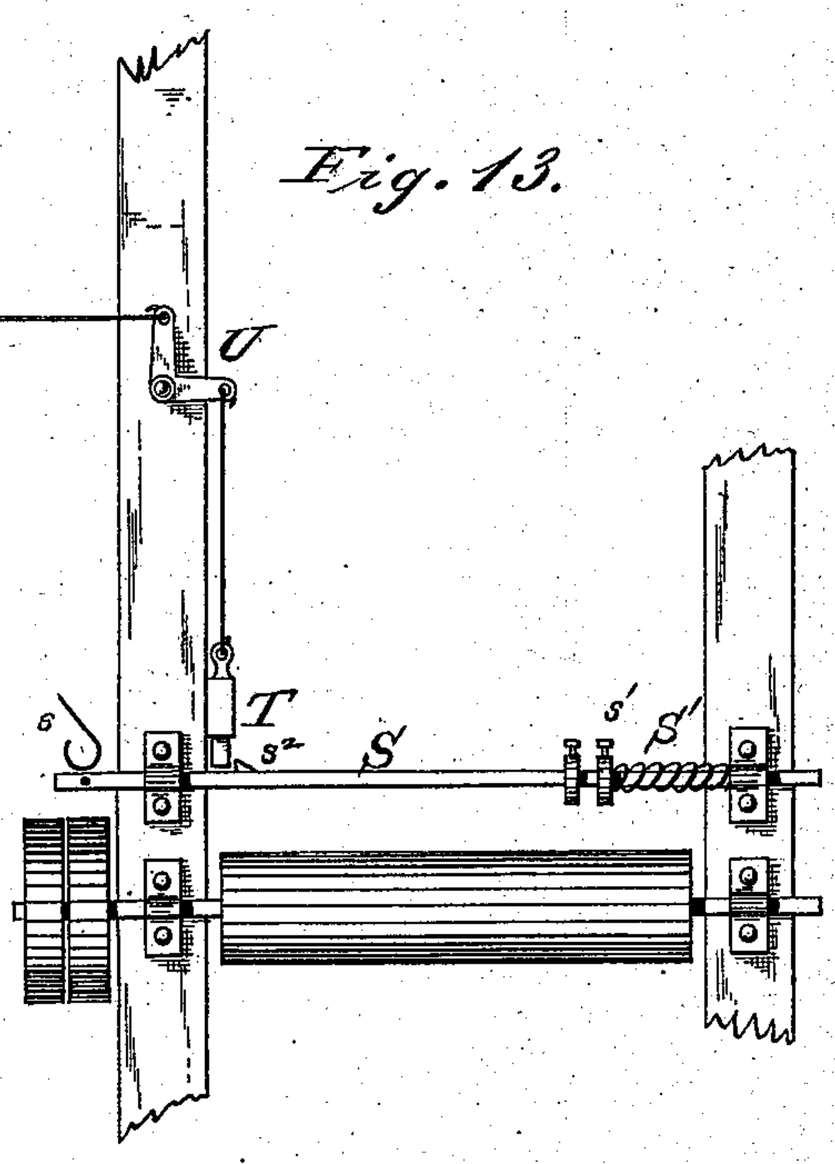


Fig. 13.



Witnesses.

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UNITED STATES PATENT OFFICE.

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WARPING AND BALLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 381,164, dated April 17, 1888.

Application filed June 22, 1886. Serial No. 205,943. (No model.)

To all whom it may concern:

Be it known that I, EPHRAIM E. ORRELL, of Ware, Hampshire county, State of Massachusetts, have invented Improvements in Warping and Balling Machines, of which the following is a specification.

My invention consists in certain combinations and arrangements of parts, as hereinafter set forth, and particularly pointed out in the claims.

Figure 1 represents my invention as applied to a warping and balling machine in a perspective view. Fig. 2 shows portions of the apparatus in longitudinal section. Figs. 3, 4, 5, 6, 7, 8, 9, 10, and 11 show details of my invention. Fig. 12 shows the cut-marker, and Fig. 13 the automatic stopping mechanism. Fig. 14 is a further detail of construction.

Referring to Fig. 1, A is the frame-work of a warping-mill with hole-board A′, rolls D′ D^2 D^3, and creel C, of well-known construction. The yarn or thread from the spools in creel C passes under roll D^3, over roll D′, and under roll D^2, through drop-hooks of usual construction, to the leasing apparatus, and over the measuring-wheel H to the balling-roll J. The roll D′ is mounted in a frame, D, adapted to slide in vertically-arranged grooves formed in a part of the framing of the machine. Cords or chains D^4 are attached to the lower part of the frame D and run over pulleys secured to the upper part of the frame-work A, being provided with counter-weights D^5, which tend to raise this frame to its highest position, but it is normally held depressed by the tension of the passing yarn.

The adjustment of counter-weight to tension is such that upon the slightest tendency of the latter to slacken, the roll rises and maintains the tension practically uniform.

To the frame carrying the roll D′ is attached a telescopic arm or lever, K, composed of a tubular portion, *k*, secured upon the rock-shaft K^5, and a sliding portion, *k′*, inserted within the portion *k* and pivotally attached at its outer end to the frame D. This lever, acting, through the arm K′, rod K^2, lever K^3, link K^4, bar N, and wedge-block N′, upon the stud or roll M′ on the vertically-sliding bar M, causes this bar to rise and fall with the roll D′. The bar may be allowed to fall by gravity alone, or its movement may be made more positive by means of spring M^3.

Pads M^2, of suitable material, are attached to the bar M, and are so arranged as to come into contact with the edges of the spools M^4, and by their flexibility exert a varying pressure and a varying degree of resistance to the turning of the spools as the bar rises and falls. If then there occur any material diminution in the tension of the passing yarn, the roll D′ rises, and the brake-pads M^2 are applied, causing the spools to turn with a sufficiently-increased resistance to counteract the slackening tendency. This tendency may arise from several causes, one of which is the difference in diameter between a full and an empty or partly-emptied spool. Another is the continuing to turn of the spools by momentum after the warping-mill has stopped. In this case the brake is suddenly applied to its full extent, acting to produce a prompt full stop.

By the employment of a friction-brake upon the spools, which is actuated by variation of tension in the yarn passing through the warping-mill, advantages are obtained over brakes operated by other known means, inasmuch as slackness is not only prevented at the moment of stopping the machine, but also the difference due to drawing yarn from full and partly-emptied spools is equalized, and any material difference of tension from any cause whatsoever is prevented by the described means of operating the spool-brakes. This results in improved quality as well as in increased quantity of work from the higher speed at which the machinery may be safely run.

The yarn G from the spools on the creel, after passing the rolls, as described, and the drop-hooks, of well-known construction and purpose, passes through the eyes of a set of needles, E, Fig. 2, each thread or group of threads having its separate needle. The needles must be loosely set in a support and capable of an upward and downward movement in this support. A convenient form of construction for the needles is shown in Fig. 4, and a suitable support may be two plates of sheet metal, *l l′*, which form, with side pieces, l^2 l^3, a hollow beam or box, L, shown as part of

the framing of the machine. The body of the needles is made rectangular, and the plates are perforated in a corresponding shape to loosely hold and guide them, a shoulder, E′, preventing them from dropping through.

Below the needles is a polygonal roller, F, composed of a set of perforated plates, *f*, and suitably journaled in the bars F′, which slide vertically in ways *f′*, secured to the frame A. Links or connecting-rods F^2 connect these bars with cranks F^4, carried by the shaft F^3, which is provided with a hand-wheel, Y, by which it may be rotated. The connecting-rods F^4 extend beyond their point of attachment to the cranks, and are formed into hooks F^5, which, when the cranks are turned up to raise the roller F and pass slightly beyond their highest point, come into engagement with the shaft F^3 and prevent the roller from descending, as shown in Fig. 3.

In use the plates are so adjusted that when raised they encounter the ends of the suspended needles, and where not perforated push them up; but if a perforation agrees in position with a needle the latter enters and the plate passes up, leaving the needle in its normal position. A hand-wheel, X, enables the roller to be turned, so as to present either of the plates *f* at will.

The practical operation of the described devices is that by the raising of needles in groups corresponding to the pattern perforated in the plates certain portions of the yarn are raised, forming an opening or shed enabling the leases to be made. In this way I produce all kinds of web drawers and beamers' leases and still make a beerless skein, as every thread may run through a separate eye, as hereinbefore stated, the difficulties encountered in known methods from twisted beers are entirely obviated, and I can produce a full score of leases without rethreading, which is an advantage not afforded by previous devices.

The needle E, Fig. 4, is pointed at E^3 to readily enter the perforations in the plate *f*, described, is provided with a shoulder at E′ to properly hang in box L, and has an eye at E^2 to normally hold the thread passed therethrough in a proper relation to other parts of the mechanism or apparatus.

As a part of the machine I include a measuring apparatus intermediate in the process between the aforedescribed leasing devices and the balling-rolls, by means of which, when a given length of yarn has passed through, the machine may be automatically stopped, or a cut-marker may be set into operation, or any other device for indicating lengths be put into action. By means of this measuring apparatus, in connection with and as a part of a warping-machine, I am enabled to automatically govern the length of a cut and of a warp or skein, to stop the machine at any predetermined limit, and to set into operation any of the well-known devices for indicating the length of a cut by marking or staining the yarn. This apparatus is shown in part in its relation to the whole machine in Fig. 1 and in detail in Figs. 9 and 10.

H is a grooved wheel of known circumference, over and around which the yarn passes on its way to the balling-rolls. For a given length the wheel turns a certain number of revolutions, and these revolutions are transmitted to worm-wheels B^4 B^4 by worms H′ H^2 upon the axle of the wheel H. Upon the same axle as the worm-wheels are sprocket or chain wheels B^5, upon which are hung the endless chains B^2 B^6. Each chain is provided with a projecting link, B^3 B^7, acting as a tappet and adjusted to come into contact with and to operate bell-crank levers B^8, only one of which is shown. These levers are connected by rods or wires to such parts of the machine as they are intended to put into operation—for instance, to a trigger which sets into action an automatic device for shifting the driving-belt from a tight to a loose pulley, thus stopping the machine, or to a vibrating blade which by the action of the lever is caused to dip its edge in some marking-fluid and then press the same on the sheet of warp-threads, thus marking off the cuts, or to any other devices for any purpose when such may be set in operation by the rods or wires connected to and operated by the measuring mechanism, as aforesaid.

It is evident that by providing worm-wheels and chains of proper proportions and relations to the circumference of the measuring-wheel the desired automatic action of the rods or wires on some part of the mechanism can be brought about at the moment when a certain predetermined length of warp has passed through the machine. It is also evident that any number of chains of any lengths can be connected to and operated by the measuring-wheel, thus automatically setting into action any number of mechanisms, each at its own and differing time, as may be desired. A cut-marker is shown in Fig. 12, consisting of a vessel, Q, suitably supported beneath the yarn G at a point between the leasing mechanism and the measuring-wheel, and containing a staining-fluid, and a lever, R, adjacent to the vessel, having a curved arm reaching over into the staining-fluid. The other end of the lever is connected by a rod or cord, *r*, with an elbow-lever, R′, fulcrumed upon the frame of the measuring device and having one arm, *r′*, lying close to the sprocket-wheel *h*, so as to be struck and moved by the lug or tappet B^3 on the endless chain B^2. When the measuring-wheel has made a given number of revolutions, the tappet strikes the lever R′, and thereby causes the curved end of lever R to rise against the yarn, thus staining it at given intervals.

The automatic stopping mechanism shown in Fig. 13 consists of a belt-shipper, S, carrying an eye or guide, *s*, through which the belt runs, a spring, S′, tending to throw the belt over on the loose pulley, a bolt, T, which normally engages with a lug, s^2, on said belt-shipper and holds it in the position in which

it is shown in Fig. 13, with the belt on the fast pulley, and suitable mechanism—such as an elbow-lever, U, and wire *u*—for communicating to the bolt the motion of an elbow-lever, U′, operated by a tappet, B³, on an endless chain, B², said chain running over a sprocket-wheel, *h*, on the axle of the measuring-wheel H. An adjustable collar, *s*′, enables the tension of the spring S′ to be regulated. When a given length of yarn has been measured off, the tappet B³ moves the lever U′ and withdraws the bolt T from the lug s^2, thus allowing the spring S′ to act and force the shipper-bar to the left, carrying the belt to the loose pulley and stopping the machine.

A further improvement in my machine is in the balling apparatus. (Shown in Figs. 1, 7, 8, 9, 10, and 11.) The yarn, after passing over the measuring-wheel, is wound upon a balling-roll, J, Fig. 1, constructed and operated in a well-known manner—that is to say, the balling-roll rests loosely upon and between two horizontal rolls, J′ J², suitably journaled in the frame-work A. These rolls may be driven by means substantially such as shown in the United States patent to F. A. Clark, No. 336,389, February 16, 1886. Roll J, with its accumulating ball of thread, is rotated by friction when the roll J² is turned. In order to guide it and prevent it from accidental displacement, the balling-roll is journaled in flanged blocks *j*, which are arranged to slide vertically on standards J³, erected on the frame-work A. In its progress the skein passes through the eyes i' i^2, formed on a bar, I, the office of which is to guide the skein and build the ball on the balling-roll. The guide-bar I is mounted upon a slide-block, O, adapted to slide on the bar A². A reciprocating motion is imparted to the slide-block by means of a chain, P, having one of its links formed into a stud, P′, which engages with a cam-slot in the block O in such manner that as the chain is carried around on the revolving sprocket-wheels *x* *x*′ the block is causedto traverse back and forth on the slide-bar A², as aforesaid, and thereby to build the ball upon the roll.

The shaft of the wheel *x* extends out through the bar A³ and carries a sprocket-wheel, x^2, which is connected by a chain with a sprocket, x^3, on the end of a shaft, x^4, running along the side of the frame-work A and provided at its other end with a bevel-gear, *y*. On the shaft of the roll J³ is a similar bevel-gear, *y*′, meshing with the gear *y*, so that when the roll J³ is rotated the motion will be communicated through the shaft x^4 and sprockets x^3 x^2 to the wheel *x*.

With the arrangement thus far described there must be a slowing up of the block at each end of its traverse, due to the passing of the stud P′ around the sprocket-wheels. Certain practical advantages in balling the skein will result if this slowing up can be obviated, and it is even desirable that a positive and considerable acceleration be given to the traverse motion of the skein-guide at each end of the stroke. To accomplish both these results is the object of this part of my invention. The slowing up is prevented by the peculiar formation of the cam-slot in the block O. (Shown in detail in Fig. 9.) Consider the chain P as moving in the direction of the arrow in Fig. 7. As the stud P′ reaches the sprocket-wheel *x*′ and begins to reduce its rate of longitudinal traverse it enters the inclined portion, O³, of the cam-slot, which is so proportioned that the traverse of the block is increased as that of the stud is decreased, and, again, as the stud increases its traverse the slot changes its direction of incline, to produce the opposite effect, the result being a practically-uniform rate of traverse from and to the end of the stroke. To produce this effect at each end of the traverse, it is necessary that the inclines be oppositely arranged, as seen in Fig. 7, and to insure the entrance of the stud P′ into its proper side of the slot there is arranged a pair of swinging wing-guides or switch-points, O′ O′, which are held in normal position by the springs O^2 O^2. As these guides can swing out of this normal position in one direction only, it is evident that, as indicated by the dotted lines, the stud must enter positively the side of the slot for which the guide is set, and that upon passing out of this part of the slot the wing-guide is pushed aside as the stud passes, and is returned by the spring to its normal position ready to switch the stud into the other side of the slot.

For a different direction of travel of the chain P, it is only necessary to reverse the position and action of the guides O′ O′ to obtain the same effect.

To obtain an acceleration of traverse at the ends of the stroke, the guide-arm I is movably mounted on the stud I′ on the block O, and upon some part of the frame of the machine is adjustably secured a pair of fingers or dogs, which are placed in such position within the path of motion of the arm I that contact ensues, whereby at each end of the traverse the eye i^2, delivering and feeding the skein to the balling-roll, is accelerated in its motion, producing certain desired results in building the ball on the roll.

In the several views, A⁴ A⁴ represent the fingers adjustably secured to the bar A³ by means of a threaded stud, *m*, projecting from the bar A³ and passing through a perforation in a plate formed at the base of the finger, and a nut, *n*, screwed upon said stud and clamping the plate to the bar A³, whereby upon loosening the nut the finger can be turned on the stud and again clamped by screwing up the nut. It is evident these may be so placed that the arm I, coming in contact with them upon approaching the end of the traverse, will be swung around on the stud I′, advancing the eye i^2, as shown by the dotted-line position in Fig. 10 and as described. The amount of this accelerated motion can be varied by changing the positions of the fingers in relation to the

arm. While not in contact with the fingers, the arm is held in normal position by the tension of the skein passing through the eyes i' i^2.

By the employment of the described devices for guiding the skein to the balling-roll, the traverse can be adjusted to any desired length or position by changing the length and position of the driving-chain and by duplication of driving-chains, slide-blocks, and guide-arms any number of skeins may be wound, or the skein may be divided into any number of parts and each part wound separately. For convenience of making these variations and adjustments I employ a detachable link-chain and mount the sprocket-wheels on studs o^2, projecting from blocks o, which are also provided with studs o', passing through slots in the bar A^3, the blocks being clamped to the bar by nuts p, screwed upon said studs o', whereby the sprocket-wheels can be adjusted nearer together or farther apart, as desired.

What I claim is—

1. The combination, with a creel having a brake mechanism to retard the revolution of the spools, of a warping-machine having two rolls, under which pass the threads of the skein, and an intermediate rising roll, over which said threads pass, means for automatically raising said roll to take up the slack when the tension of the skein is lessened, and mechanism connecting said roll with the brake mechanism of the creel, whereby the revolution of the spools is retarded when the roll rises, substantially as and for the purpose set forth.

2. In a warping-machine, the combination, with the rolls D^2 D^3, journaled in stationary bearings, of the roll D', a vertically-movable frame, D, in which roll D' is journaled, counterweights D^5, connected with said frame D, rock-shaft K^5, arm or lever K, arm K', rod K^2, lever K^3, sliding bar N, wedge N', creel C, and bar M, provided with pin M' and brake-studs M^2, substantially as and for the purpose set forth.

3. The combination, in a warping-machine provided with a leasing device, of a set of drawing-rolls, one of which is movable, a creel having a brake mechanism, and suitable levers connected with each other and with the movable roll and the brake mechanism for automatically taking up the slack and applying the brakes when the machine is stopped to tie a thread, substantially as described.

4. The combination, with frame or box L, carrying the needles E, of polygonal roller F, hand-wheel X, sliding bars F', connecting-rods F^2, shaft F^3, cranks F^4, and hooks F^5, whereby the roller is locked at its highest point, substantially as shown and described.

5. The combination, with the chain P, having the stud P', and the supporting and actuating wheels for said chain, of the block O, having the cam-groove, and switch-points O', springs O^2, and guide-bar I, substantially as described.

6. The combination, with block O, means for reciprocating the same, and guide-bar I, pivoted on said block, of stops or fingers A^4, substantially as and for the purpose described.

7. The combination, with chain P and its stud P' and wheels x x', of slide-block O, having the cam-groove, the switch-points O', springs O^4, the pivoted guide-bar I, and the fingers or stops A^4, substantially as and for the purpose described.

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ALLEN W. BOWEN.