F. S. RAND.

WARPING MACHINE.

APPLICATION FILED NOV. 22, 1909.

1,022,755.

Patented Apr. 9, 1912.

6 SHEETS—SHEET 1.

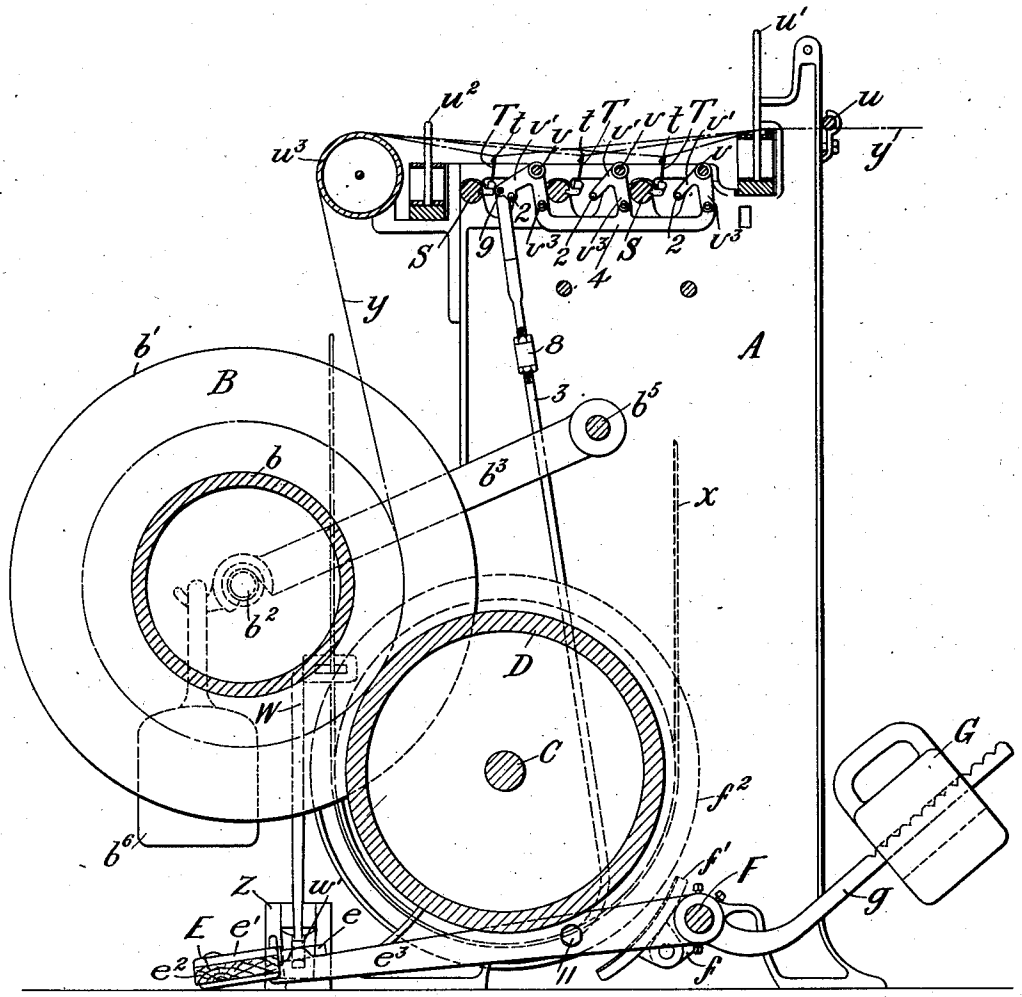

Fig. 1.

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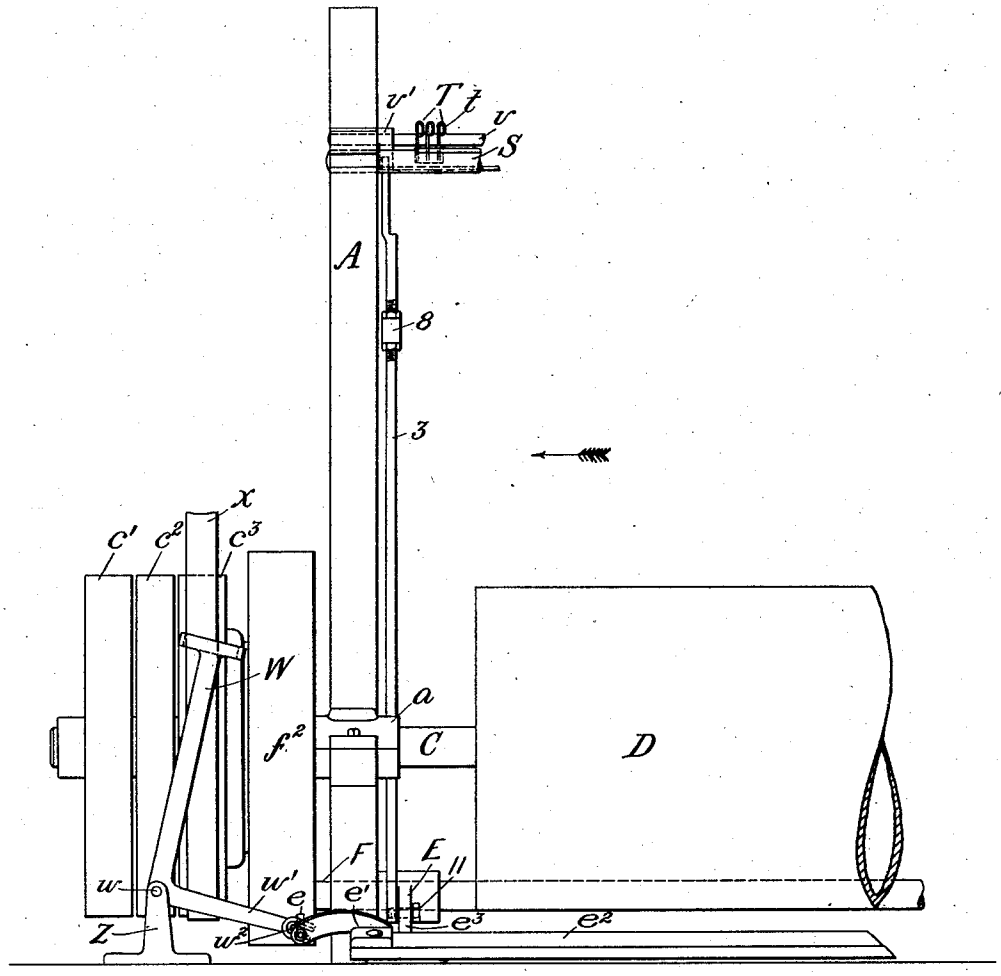

Fig. 2.

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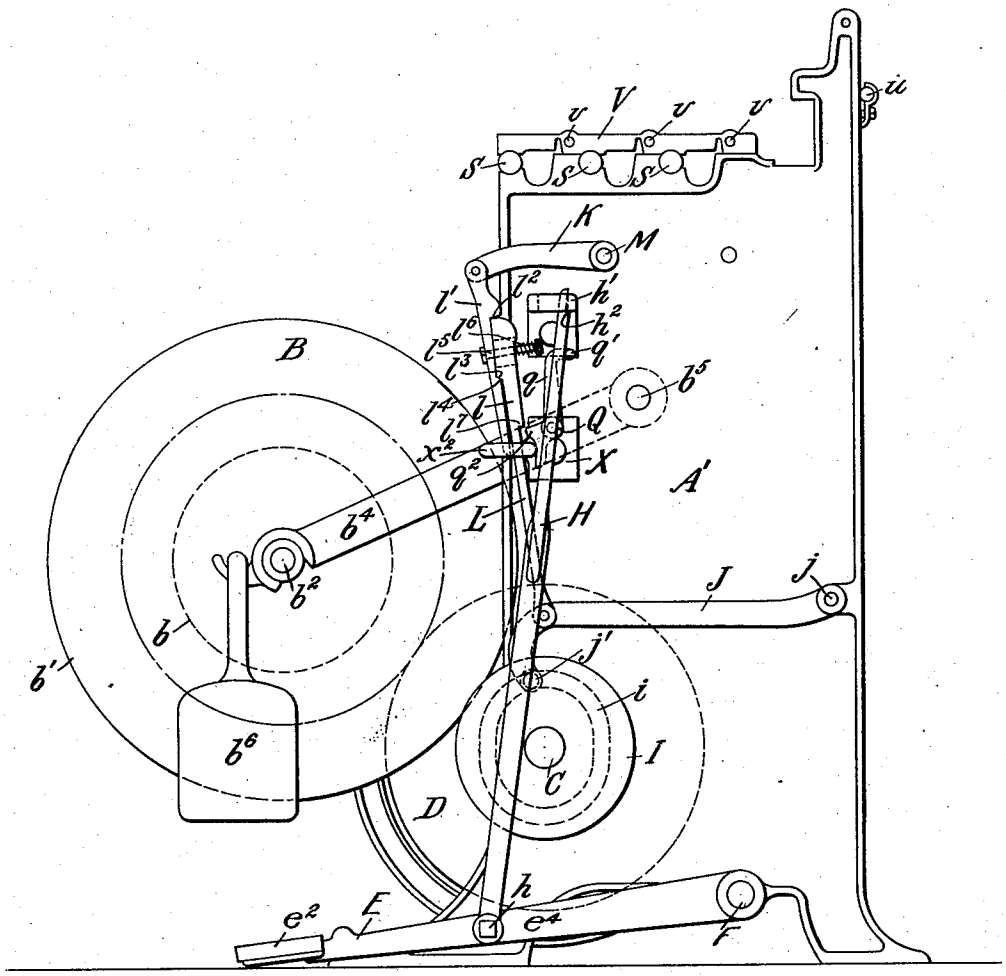

Fig. 3.

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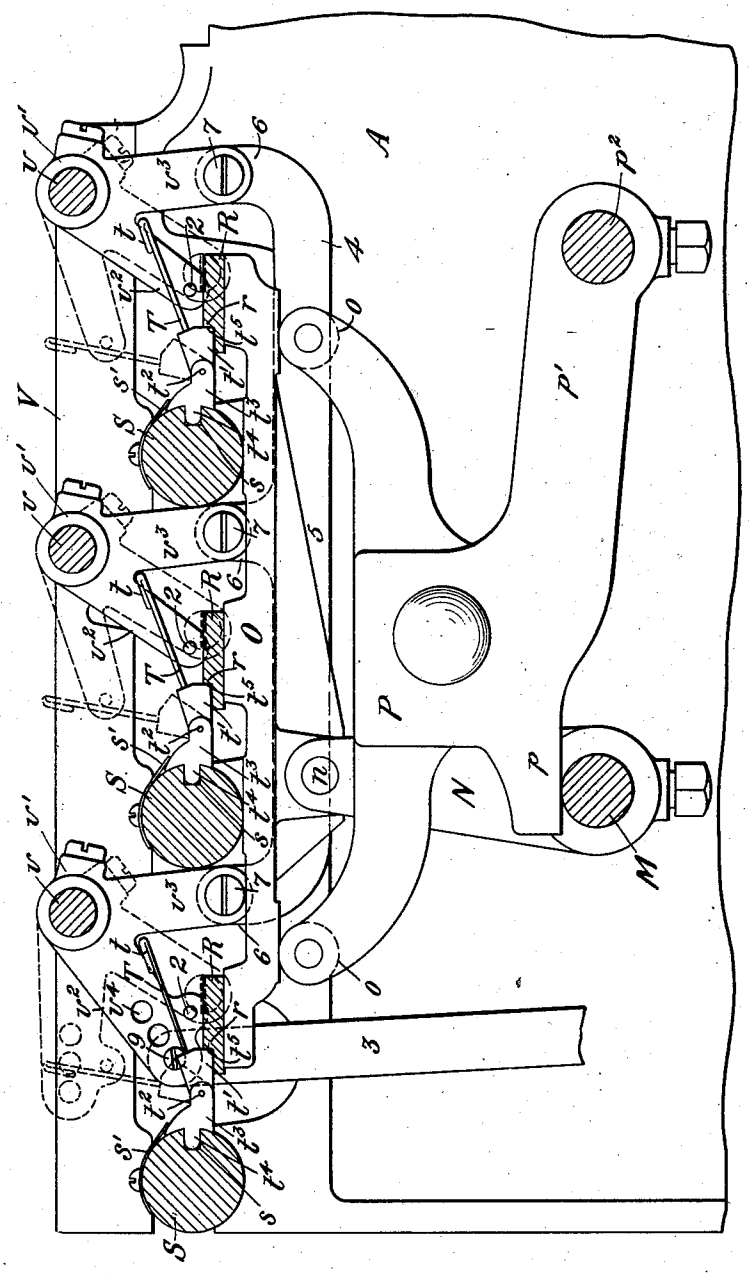

Fig. 4.

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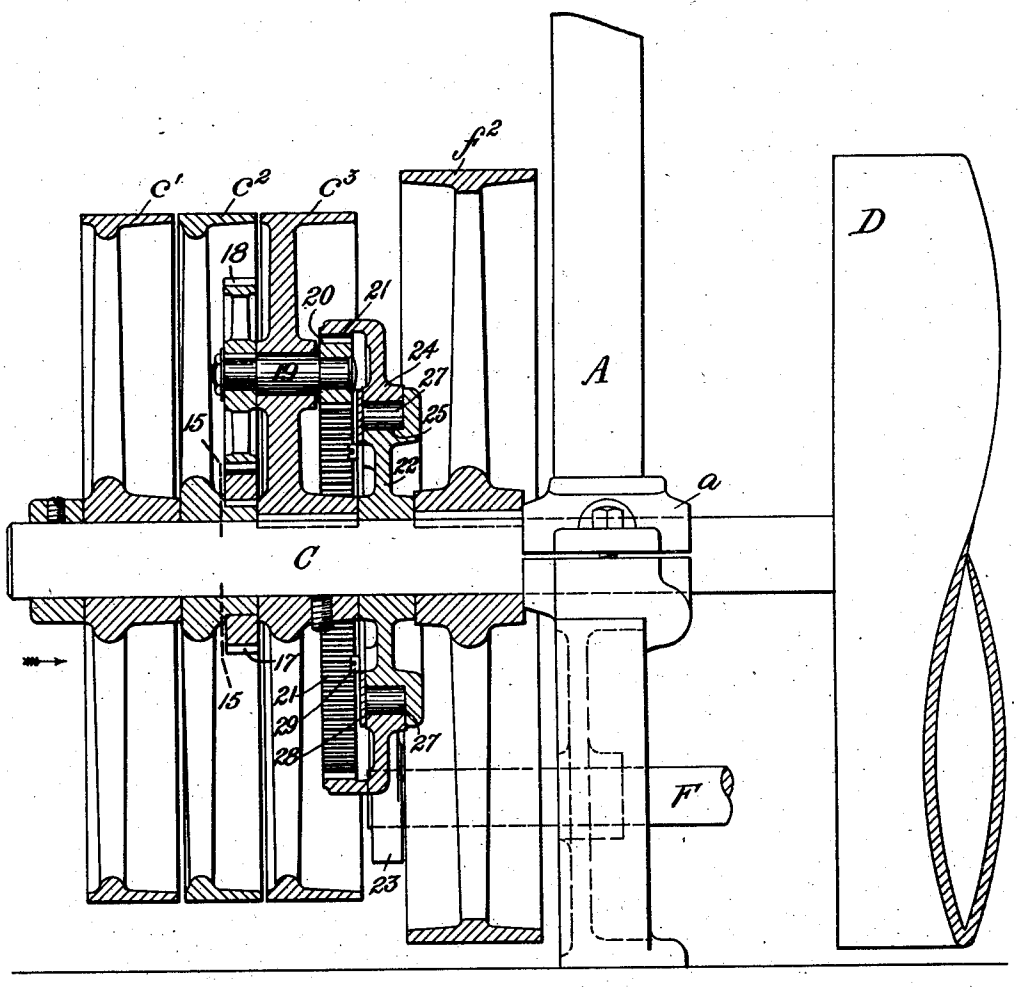

Fig. 5.

WITNESSES

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6 SHEETS—SHEET 6.

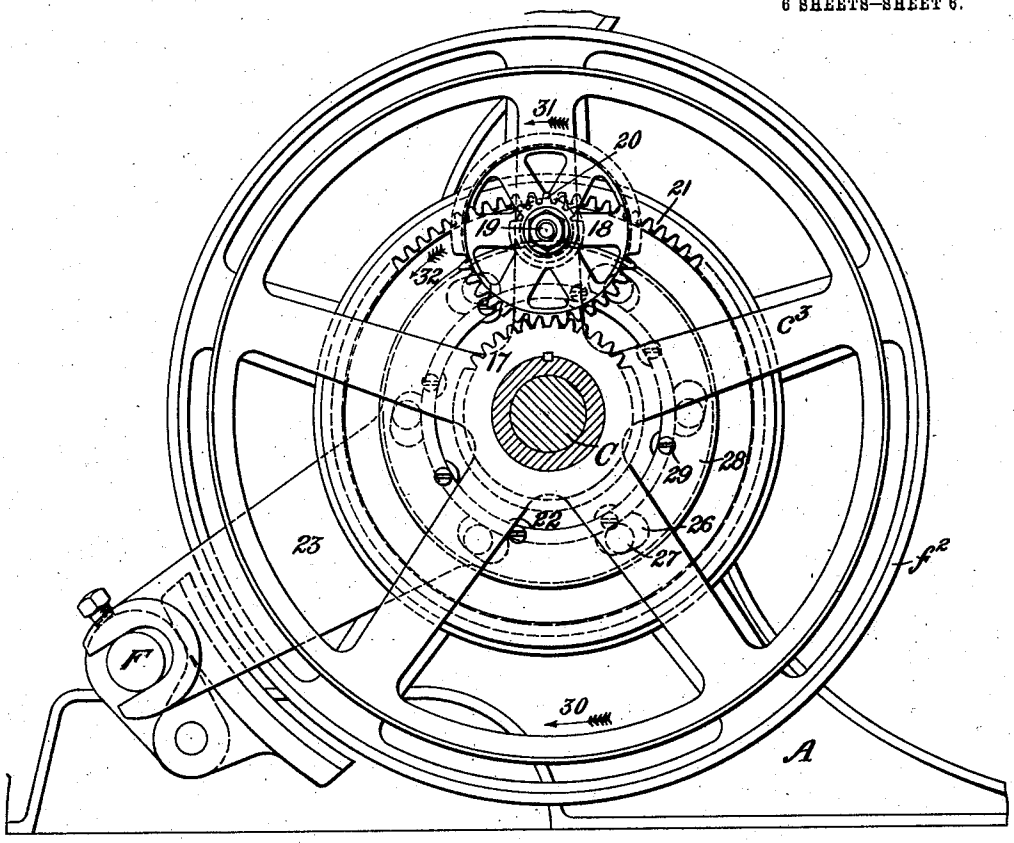

Fig. 6.

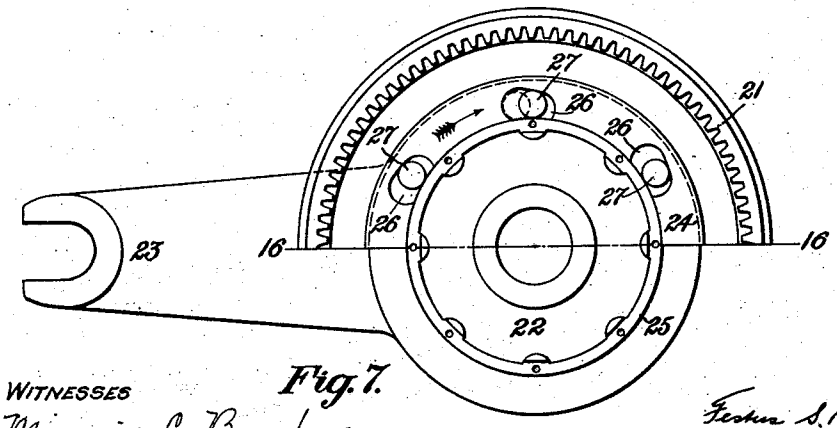

Fig. 7.

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UNITED STATES PATENT OFFICE.

FESTUS S. RAND, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO UNIVERSAL WINDING COMPANY, OF PORTLAND, MAINE, A CORPORATION OF MAINE.

WARPING-MACHINE.

1,022,755. Specification of Letters Patent. Patented Apr. 9, 1912.

Application filed November 22, 1909. Serial No. 529,394.

To all whom it may concern:

Be it known that I, FESTUS S. RAND, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Warping-Machines, of which the following is a specification.

My invention relates to warping or beaming machines and consists of improvements in the means for controlling the drop-wires which act to stop the machine when a thread breaks or becomes slack.

The object of my invention is to provide a simple device for returning the drop-wires to their initial positions after the operation of the machine has been arrested, so that they may be easily threaded up again in repairing the broken threads, and to prevent their acting on the stop-motion when the machine is started with the threads slack.

My invention is fully described in the following specification, illustrated by the accompanying drawings, in which:—

Figure 1 is an elevation showing one side of the warping machine, viewed in the direction indicated by the arrow in Fig. 2, with my new device applied thereto; Fig. 2, a front elevation of the left-hand end of the machine, showing the driving-pulleys and brake-wheel; Fig. 3, an end elevation of the right-hand side of the machine, showing the knock-off arrangement for the stop-motion; Fig. 4, an enlarged detail view of the drop-wires and stop-motion vibrator, showing the relation of my improved device thereto; Fig. 5, an enlarged sectional view of the driving mechanism for the machine, taken on a vertical plane extending through the axis of the driving pulleys; Fig. 6, an end view of the same looking in the direction indicated by the arrow, Fig. 5, and part sectional on the line 15—15 with the parts at the left of this line removed; Fig. 7, a face view of the locking device or clutch mechanism for connecting the internal gear with the driving shaft C, with the lower portion of the internal gear removed beyond the line 16—16.

In the drawings I have shown a usual form of warping or beaming machine adapted for winding yarns in multiple from a creel or other supply-holder or to a warp- or section-beam.

The machine consists essentially of two upright frames A and A′ at either end, carrying suitable bearings a in which the driving shaft C is rotatably mounted, see Fig. 2. The shaft C carries a driving roll or drum D arranged between the end frames of the machine and adapted to bear on the barrel of the beam B to rotate the latter by frictional contact with the yarn wound thereon. The beam B on which the yarn is wound consists of the cylindrical barrel b having heads or flanges b' secured at its ends and provided with trunnions b^2 which rotate in bearings at the ends of the arms b^3 and b^4. The arms b^3 and b^4 are hinged on a rod b^5 extending between the end frames of the machine and weights b^6, dependent from the ends of the arms, serve to keep the beam in contact with the driving-drum D. The drum D is of a length to adapt it to fit between the heads on the beam and as the yarn is wound on to the barrel b the beam rises up from the drum, supported on the swinging arms b^3 and b^4, see Fig. 1. Preferably the shaft C is rotated through a system of driving-pulleys c' c^2 and c^3 driven from a belt x and arranged to start the rotation of the drum D at a relatively slow speed. The pulley c' is an idler on which the belt runs when the machine is inoperative and to start the rotation of the shaft C the belt is shifted on to the pulley c^2. The pulley c^2, like the pulley c', is free to rotate on the shaft C, but is connected therewith by a train of gears, through which its rotation is imparted to the shaft at a slower rate of speed.

The means for imparting rotation from the pulley c^2 to the shaft C at a slower rate of speed might be of any well known arrangement, but I have preferred to illustrate in Figs. 5, 6, and 7, the system of planetary gearing shown and particularly described in my application for Patent, Serial No. 527,270, filed November 10th, 1909. This consists of the essential elements as follows: The hub of the pulley c^2 carries a gear 17 and meshing with this gear is a gear 18 fast on a stud 19 which rotates in a bearing in one of the arms of the pulley c^3. At the opposite end of the stud 19 is a fast pinion 20 which meshes with an internal gear 21. The gear 21 is mounted on a clutch member 22 held on the shaft C between the hubs of the pulley c^3 and brake-wheel f^2. The member 22 is held from rotation with or on the shaft C by an arm 23, see Fig. 6, which is forked at its

outer end to straddle the rod F extending through the frame A of the machine. The internal gear 21 is rotatable on the member 22 in the direction indicated by the arrow, Fig. 7, but is held from rotation in the opposite direction by means now described: The gear 21 is formed with a ring 24 fitted to the rim 25 of the member 22 and provided with wedge-shaped pockets 26, 26, etc. Mounted in these pockets are rolls 27, 27, etc., which ride on the rim 25, being retained in position by a thin ring or washer 28 secured to the face of the rim 25 by screws 29, see Fig. 5. The rolls 27 are of a diameter to adapt them to fit loosely in the large ends of the pockets 26, as indicated by dotted lines, Fig. 7; but at the small ends of the pockets they bind tightly to lock the ring 24 of the gear 21 against the rim 25. This arrangement is a familiar principle in clutch mechanisms and when the gear 21 is turned in the direction indicated by the arrow, Fig. 7, the rolls are carried into the large ends of the pockets and the gear rotates freely on the member 22. When the gear 21 is turned in the opposite direction the rolls will be carried into the small ends of the pockets and after a slight movement the gear will be held from further rotation.

The operation of the device is as follows: When the belt x is shifted on to the pulley c^2 it turns the latter in the direction indicated by the arrow 30, Fig. 6, and the gear 17 fast on its hub turns the gear 18 in the direction indicated by the arrow 31. The gear 18 being keyed on the stud 19 and the stud being fast in the pinion 20, the latter will be turned in the same direction to tend to rotate the internal gear 21 in the opposite direction as indicated by the arrow 32, Fig. 6. The tendency of rotation imparted to the gear 21 is therefore opposite to the rotation of the pulley c^2 and a slight movement of the gear in this direction locks the rolls 27 against the clutch-member 22 as previously explained. The gear 21 being locked against rotation under impulse of the pinion 20, the latter will then travel around said gear with a planetary motion, carrying with it the pulley c^3 on which it is mounted. Owing to the difference in ratios between the gear 18, pinion 20 and gear 21, the pulley c^3 will be turned at a slower rate of speed than that of the pulley c^2 and therefore the shaft C on which the pulley c^3 is keyed is likewise driven at a slower speed.

After the rotation of the shaft is started at a slow speed and the inertia of the moving parts has been overcome the belt is shifted on to the pulley c^3 which is fast on the shaft and therefore drives the latter positively at the maximum speed, equal to the speed of the pulley.

When the shaft C is rotated directly by the pulley c^3 the friction of the teeth of the intermeshing gears 20 and 21 will cause the latter to rotate with the pulley in the same direction. When the gear 21 rotates in this direction the rolls 27 in the pockets 26 are freed from their clutching contact so that the gear turns freely on the member 21. The friction between the intermeshing gears 17 and 18 will also act to rotate the pulley c^2 with the pulley c^3 and therefore all of these elements rotate together as a single unit with the shaft C and the gears are saved from wear.

For shifting the belt from one pulley to another I have shown a usual form of belt-shipper W, pivoted at w on a standard Z secured to the floor, and operated through a bell-crank arm w', see Fig. 2. The end of the arm w' is forked at w^2 and engaging the opening in the fork is a pin e secured in the arm of a bracket e' which is fastened on the treadle E adapted to be moved by the operator's foot. The treadle E consists of a foot-piece e^2 extending along the front of the machine and supported at the extremities of the arms e^3 and e^4 which are secured to the rod F. The rod F is pivotally mounted in the frames A and A' and extends out beyond the frame A at the left-hand end of the machine. Secured to this end of the rod F is an arm f carrying a brake-shoe f' at its outer extremity, adapted to bear on the periphery of a brake-wheel f^2 fast on the shaft C, see Fig. 1. An arm g is also secured to the rod F between the arms e^3 and e^4 and carries a weight G at its outer end. The weight G acts to lift the treadle E and through the connection of the latter with the belt-shipper W the belt x is shifted from the tight pulley c^3 back on to the idler pulley c'. As the treadle E is raised to shift the belt the brake-shoe f' comes into contact with the brake-wheel f^2 to apply a braking force to arrest the rotation of the shaft C.

To start the rotation of the shaft C the treadle E is pressed downward by the foot of the operator and the belt is carried first on to the pulley c^2 and then on to the pulley c^3, as previously explained. The belt is kept on the pulley c^2 in starting the operation of the machine by holding the foot on the treadle, but after the belt has been shifted to the pulley c^3 it is necessary to retain it in this position during the operation of the machine, and to effect this, means are provided to hold the treadle in its lowermost position. As shown in Fig. 3, the means for locking the treadle E consists of a detent staff or rod H pivoted at h on the arm e^4 with its upper end extending through a guiding loop or staple h' fastened to the frame of the machine. The upper extremity of the rod H slides in the staple h' and is formed with a shoulder h^2 which is adapted to engage one side of the staple when the rod

H is moved by gravity after the treadle has been moved to its lowermost position.

The detent rod H is arranged to be released to allow the treadle E to rise, under influence of its weight G, by a knock-off device shown in Fig. 3 and now described: Fast on the end of the driving-shaft C is a cam I having a cam groove i on its inner face. A lever J is pivoted at j on the frame A′ and at its opposite end carries a stud or roll j' engaging the cam groove i. A link L connects the lever J with an arm K secured to a rocker-shaft M. Mounted on the rocker-shaft M is an arm N, see Fig. 4, which is connected at n to a vibrator-plate or bracket O adapted to reciprocate transversely of the shaft M. The plate O is mounted to slide on rolls o, o pivoted on a bracket P, the latter formed with a lug p resting on the shaft M and an extending arm p' secured to the rod p^2. A corresponding plate O is located at the opposite end of the machine and with other similar plates placed at intervals between them they serve to support the horizontal bars R, R, etc. which extend the length of the machine. Extending between the end frames of the machine are three horizontal rods S, S, S which support the drop-wires T, T, etc. The drop-wires are shown in the form of wire loops t adapted to be hooked over the yarns or threads and having their lower ends secured in blocks t', t' etc. The blocks t' are pivoted at t^2 in the hinge-members t^3, the latter having tongues t^4 fitted to longitudinal slots s in the rods S. A spring clamp s' serves to bind the hinges t^3 against the rods S and the tongue-and-groove arrangement prevents lateral displacement while allowing the hinges to be slid along the rods to adjust the drop-wires to the positions of the yarns. The blocks t' are formed with shoulders t^5 adapted to engage shoulders r, r on the bars R.

The yarns y lead from the creel, not here shown, to the back of the warper, and passing under a lease-rod u and through a separating comb u' are individually hooked through the loops of the drop-wires T, T, etc., the latter being arranged in several groups or banks to prevent crowding and to facilitate their threading up. From the drop-wires T the yarns lead through a second comb or reed u^2 and thence pass over a roll u^3 and down to the beam B. As the beam is rotated the yarns are drawn taut to support the drop-wires in their upright positions, as shown in Fig. 1. When a yarn breaks or becomes slack the drop-wire with which it engages will be caused by gravity to fall into the position shown by full lines in Fig. 4. The vibrator-plate O is reciprocated continuously during the operation of the machine through its connection by the arm N to the rocker-shaft M, the latter being oscillated by the arm K rocked by the lever J through the link L. The lever J is oscillated from the cam I and is operated continuously during the rotation of the shaft C. When a drop-wire falls its block t' drops down on to the bar R and as the latter is moved backward in its reciprocation with the plate O the shoulder t^5 will engage the shoulder r on the bar R. This engagement prevents the forward movement of the vibrator-plate O and acts to disconnect the lever J from the arm K and stop the machine, as now described: The link L is made in two parts l and l' connected inductively by an arrangement which allows it to be extended when the arm K is held from movement. The end of the member l of the link engages an abutment l^2 on the portion l' to give a positive connection for lifting the arm K, and at l^3 the member l is formed with a beveled shoulder engaging a corresponding shoulder l^4 on the member l'. The two members l and l' are spliced together by a yielding arrangement consisting of a stud l^5 extending from the member l through a slot in the member l' and carrying a spring l^6 adapted to press the two members together. Under normal stress the engagement of the beveled shoulders l^3 and l^4 gives a connection between the two members l and l' sufficiently strong to cause the link L to be reciprocated longitudinally as one piece. When, however, the plate O is held from movement by a fallen drop-wire, and the arm K thereby retained from downward movement, the shoulder l^3 will rise up on the bevel l^4 and the two parts of the link L will separate, against the action of the spring l^6, to allow the member l to move downward without the member l'.

The link L is guided in its movement by a staple x^2 on a bracket X and pivoted on this bracket is a knock-off lever Q. The lever Q is formed with an upwardly extending arm q formed with a tail q' adapted to engage the detent rod H, and a toe q^2 adjacent the link L. The link L has a shoulder l^7 which normally reciprocates in a path to just clear it from the toe q^2. When, however, the member l is separated from the member l' the shoulder l^7 will be carried into position to engage the toe q^2 on the downward stroke of the link L and, through this engagement, will rock the lever Q to move the rod H and release its detent shoulder h^2 from the staple h'. When the detent rod H is released the treadle E will be free to move upward under influence of the weight G to shift the belt and arrest the operation of the machine.

The essential feature of my invention consists of means for automatically returning the fallen drop-wires to their upright positions after the machine is stopped. Fastened to the top of end frames A and A′

are clamps V which secure the rods S, S, etc. in position on the frames. The clamps V are drilled with holes for receiving horizontal rods v, v, v, which extend between the frames A, A' longitudinally of the machine. Mounted on the rods v are bell-crank levers v', v', etc. having arms v^2 and v^3. Secured in the ends of the arms v^2 are wires 2 which extend the whole length of the machine and are supported by levers similar to the levers v' arranged at intervals along the rods v. With the levers v' in the positions shown by full lines in Fig. 4 the wires 2 will be in positions just below their adjacent lines of fallen drop-wires; and by rocking the levers to the positions indicated by the dotted lines in Fig. 4 the wires 2 will be carried up against the drop-wires to raise the latter to their upright positions. To operate the levers v' I provide a means for connecting them with the treadle E consisting of a rod 3, fastened to the arm v^2 of the forward lever, and a link 4 connecting the several levers of the series. The link 4 is preferably formed with a straight bar 5 having offset lugs 6, pivoted to the arms v^3 by the screws 7. The offsets in the link provide for a clearance between the bar 5 and the rods S when the levers are rocked upward. The rod 3 is preferably in two parts connected by a turnbuckle 8 which provides for adjusting the length of the rod, see Figs. 1 and 2. The upper end of the rod is connected to the lever v' by a stud or pin 9 screwed or driven into the arm v^2 and several holes v^4 are provided in the arm so that the connection may be shifted to adjust the operative length of the lever. At its lower end the rod 3 is connected to the arm e^3 of the treadle E by a bolt 11.

The operation of the device is as follows: The machine is started to operate by pressing downward on the treadle E to shift the belt as previously described. As the treadle moves downward the levers v' are rocked, through the link 3, to move the wires 2 away from the drop-wires so that the latter will be free to fall to act on the stop-motion. With the treadle held in its lowermost position under restraint of the detent rod H the wires 2 will be in the positions shown in Fig. 1. When a thread breaks or becomes slack the drop-wire which it supports falls and engages the vibrator-plate O to release the detent rod H. As the rod H is released and the treadle E rises to effect the shifting of the belt to stop the machine the connecting rod 3 acts to rock the levers v' upward. This movement of the levers carries the wires 2 up against the adjacent drop-wires of the several banks and retains them in their upright positions. The drop-wires are therefore held from falling when the threads become slack, as the beam ceases to rotate, and are all retained in position to be easily accessible for rethreading when the ends are pieced up. Without such an arrangement the operator would be obliged to reach down through the great mass of yarns and between the closely spaced drop-wires to restore a fallen drop so that it could be threaded in piecing up and, obviously, this is a difficult task. Another advantage of my improvement is that the device prevents the drop-wires from chattering on the vibrator-plate to interfere with the movement of the latter when the operation of the machine is first started. When the machine is started the beam is rotated slowly at first as previously explained so that the yarns will not be subjected to a too sudden tension of draft. As the yarns are taken up slowly at first, the tension on them will not be sufficient to hold the drop-wires in their raised positions, but as the wires 2 are only moved down half way when the belt is shifted on to the second pulley the wires 2 will therefore be in position to keep the drop-wires away from the vibrator-plate until they are taken up under the maximum tension of the yarns when the rotation of the beam is accelerated. The drop-wires are therefore prevented from holding the vibrator-plate so that the detent rod H cannot be engaged to lock the treadle.

My invention provides a simple, efficient means for automatically controlling the drop-wires, operated from the starting mechanism of the machine without the intervention of complicated mechanism, and adapted to give greater convenience in operating the machine.

I have shown my device applied to a machine having a usual form of belt shipping device, detent means and knock-off mechanism and I do not claim this part of the machine by itself, nor do I claim the improved form of drop-wires and co-acting feeler mechanism herein described, the same being subject of a separate application, Serial No. 552,425, filed March 30, 1910.

What I do claim is:—

1. In a warping-machine, the combination with a driving-shaft, of means to rotate the shaft at slow or fast speed, mechanism to control said means, a treadle to operate said controlling mechanism, means to shift the treadle to arrest the rotation of the shaft, pivoted drop wires held upright by the yarns and adapted to tilt to actuate the treadle-shifting means, and means to prevent the drop-wires from acting when the machine is operating at slow speed and to return them to their initial positions when the machine is stopped.

2. In a warping-machine, the combination with a driving-shaft, of means to rotate the shaft at slow or fast speed, mechanism to control said means, stop-motion devices to operate the controlling mechanism, pivoted drop-wires adapted to be suspended by the

yarns and arranged to tilt to actuate the stop-motion devices to stop the machine, and means to prevent the drop-wires from acting when the machine is operating at slow speed.

3. In a warping-machine, the combination with a driving-shaft, of an idler pulley on said shaft, a second pulley connected to rotate the shaft at a relatively slow speed, a third pulley fast on the shaft to rotate the latter at a maximum speed, means to shift the belt from one pulley to another to start the machine, stopping mechanism to operate the belt-shifting means to stop the machine, pivoted drop-wires suspended by the yarns and adapted, when the machine is operating at maximum speed to tilt to actuate the stopping mechanism, and means to control the position of the drop-wires to prevent them from tilting when the machine is operating at slow speed and to return them to their initial positions when the machine is stopped.

4. In a warping-machine, the combination with a driving-shaft, of means to rotate the shaft at slow speed, means to rotate the shaft at a greater speed, means to render one or the other of said means operative, stopping mechanism to arrest the rotation of the shaft, pivoted drop-wires held upright by the yarns and adapted to tilt to actuate the stopping mechanism, and means to regulate the positions of the drop-wires to prevent them from acting on the stop-motion when the machine is operating at slow speed and to return them to their initial positions when the machine is stopped.

5. In a warping-machine, the combination with a driving-shaft, of an idler pulley on said shaft, a second pulley connected to rotate the shaft at a relatively slow speed, a third pulley fast on the shaft to rotate the latter at maximum speed, a belt-shipper to shift the belt from one pulley to another, a treadle to operate said belt-shipper, means to move the treadle to shift the belt on to the idler pulley to stop the machine, knock-off devices to cause the action of the treadle, drop-wires held upright by the yarns and adapted, when the belt is on the third pulley, to tilt to actuate the knock-off devices, and means controlled by the treadle to hold the drop-wires in their upright positions when the machine is stopped and arranged to prevent the drop-wires from actuating the knock-off devices when the treadle is moved to shift the belt on to the second pulley.

6. In a warping-machine, the combination with a driving-shaft, of means to rotate said shaft, devices to control the operation of said means, drop-wires held upright by the threads and adapted to tilt to cause the stopping of the machine, said drop-wires arranged in banks extending along the machine, bell-crank-levers pivoted on rods adjacent the several banks of drop-wires, wires carried by said levers and adapted to contact with the drop-wires when the levers are rocked, a link connecting the levers to act in unison, and means to rock one lever to cause the action of all the levers to carry the drop-wires to an upright position.

In testimony whereof I affix my signature in presence of two witnesses.

FESTUS S. RAND.

Witnesses:
GRACE W. BROWN,
ARTHUR I. HARVEY.