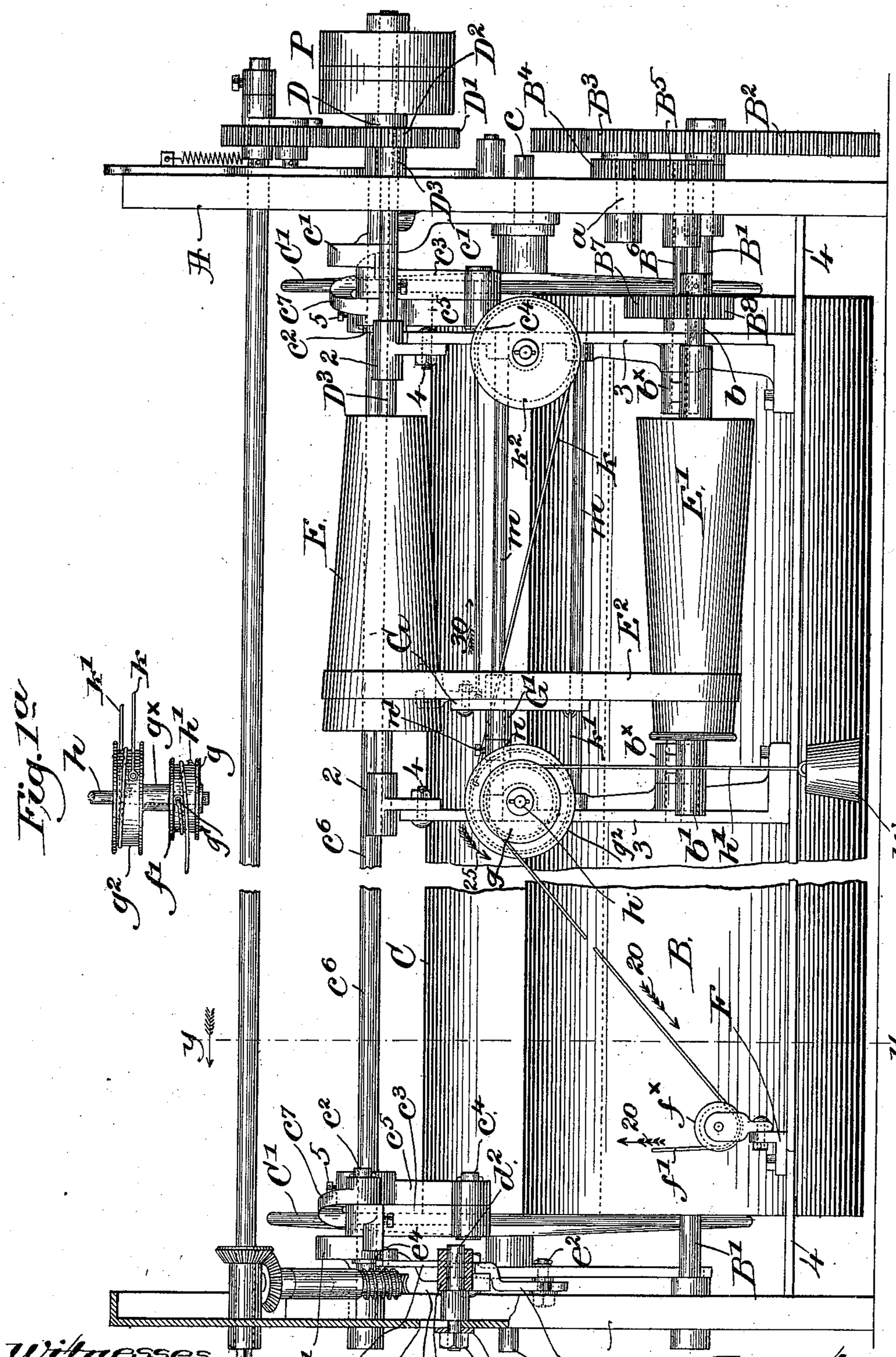
(No Model.)

2 Sheets—Sheet 1.

# A. E. RHOADES.

## WARPING MACHINE.

No. 504,459. Patented Sept. 5, 1893.



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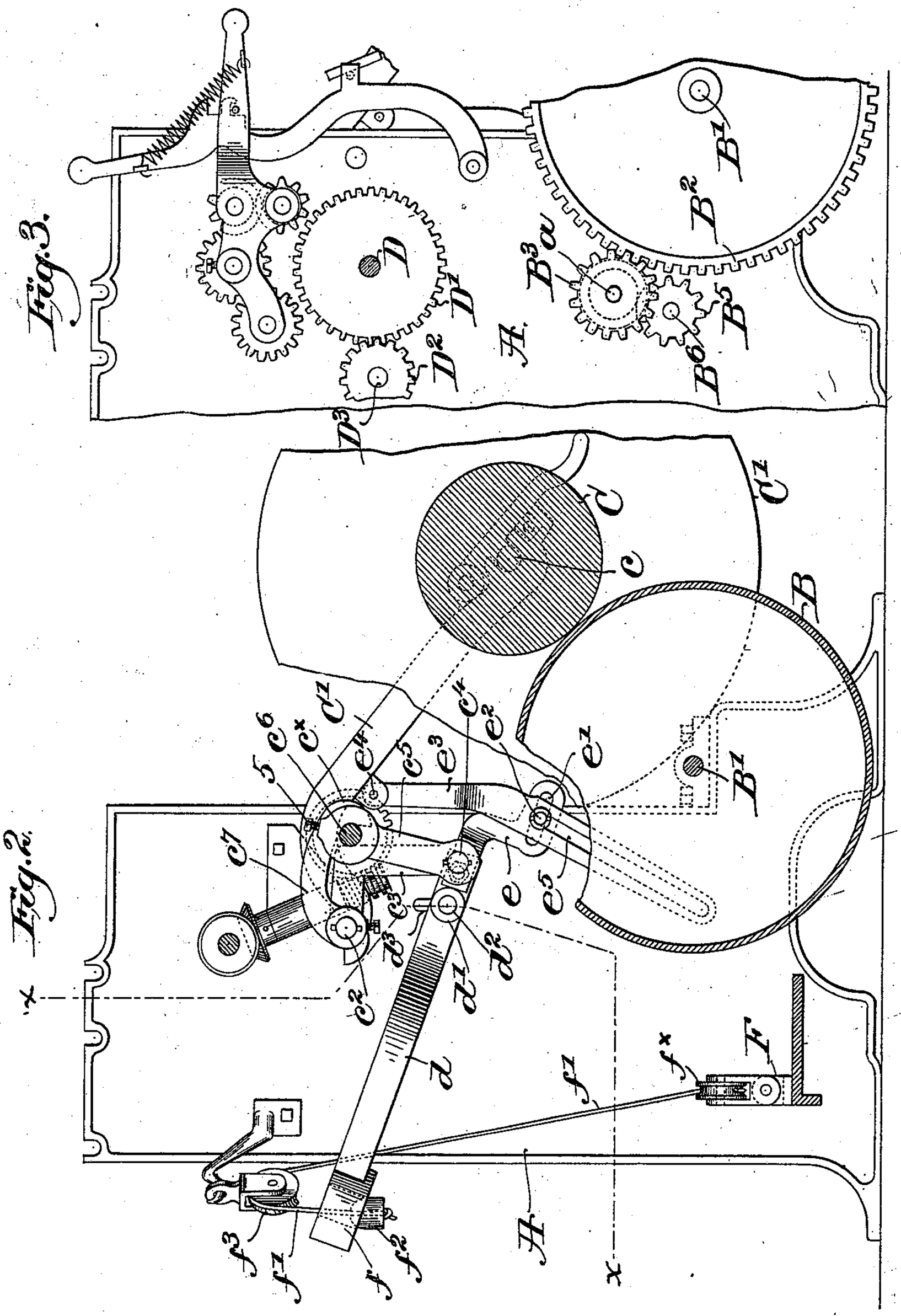


Witnesses.
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# UNITED STATES PATENT OFFICE.

ALONZO E. RHOADES, OF HOPEDALE, MASSACHUSETTS, ASSIGNOR TO THE HOPEDALE MACHINE COMPANY, OF SAME PLACE.

## WARPING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 504,459, dated September 5, 1893.

Application filed March 24, 1893. Serial No. 467,483. (No model.)

*To all whom it may concern:*

Be it known that I, ALONZO E. RHOADES, of Hopedale, county of Worcester, State of Massachusetts, have invented an Improvement in Warping-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

In warping machines of usual construction the beam upon which the yarn is to be wound rests upon and is rotated at a uniform surface speed by a revolving drum or cylinder, the yarn being drawn from a creel or other frame full of spools onto the beam. When a spool is full, although it is heavier, the yarn can revolve it much easier having greater leverage than when it is nearly empty, and as the yarn is strained largely by the force necessary to revolve the spool upon which it is wound, it follows that the strain exerted upon the yarn when winding from the nearly empty spool determines the speed of the machine. The minimum strain is thus put upon the yarn at the beginning of the operation, and the strain gradually increases until the spools are nearly empty, the speed of the rotating spools increasing from the beginning to the end of the process of warping. If the surface speed of the beam be made variable, in an inverse ratio to the variation of strain upon the yarn, it will be readily seen that the yarn could be wound on the beam much more rapidly from a full spool than is customary, the surface speed of the beam being gradually reduced from the start with full spools to the emptying of the same, with the result of making the strain upon the yarn much more uniform and saving much time in the operation.

This invention has for its object the production of a warping machine in which the beam is rotated at a variable surface speed, the variable speed mechanism being controlled directly from the beam and also automatically brought into operative position to start the apparatus when a new empty beam is put in place.

In accordance therewith my invention consists in the combination, in a warping machine, of a driving drum, variable speed mechanism to rotate it, and a yarn beam to rest upon the drum, and with connections between said beam and said speed mechanism to control the latter and to automatically restore said speed mechanism to its starting position when the beam is being doffed, substantially as will be described. Also, in the combination, in a warping machine, of a driving drum upon which the beam rests and by which it is rotated, variable speed mechanism to rotate the drum, and a controlling device therefor connected with and positively moved in one direction by the beam to gradually reduce the speed of the drum as the beam fills, with means controlled directly by the doffing of the beam to automatically retract the controlling device, substantially as will be described.

Other features of my invention will be hereinafter described and particularly pointed out in the claims.

Figure 1 is a rear elevation partly broken out, of a warping machine embodying my invention, the left-hand side being in section on the irregular line *x*—*x* Fig. 2. Fig. 1ª is a detail to be described. Fig. 2 is a vertical section on the line *y*—*y* Fig. 1, and Fig. 3 in elevation represents a portion of the right-hand end of the machine shown in Fig. 1.

The frame A, of suitable shape to sustain the operating parts, is provided with bearings to receive the shaft B′ of the usual driving drum B, the said shaft being extended beyond the frame at one side and having fast thereon a gear $B^2$ in mesh with a smaller gear $B^3$ sleeved on a short shaft *a* secured to the side of the machine, said sleeve having fast thereon a pinion $B^4$ in mesh with a pinion $B^5$ fast on a shaft $B^6$ having its bearings in the side frame and in the two uprights 3, 3, secured to the cross girt 4 connecting the sides of the frame near their lower ends, the shaft $B^6$, see Fig. 1, having fast thereon adjacent to one of the cross girts a gear $B^7$ engaging a smaller gear $B^8$ secured on the end of a shaft *b* to be referred to. A short shaft D extends from one side of the frame and has sleeved thereon a speed-changing pulley P of usual construction, and also a gear D′ secured to said pulley and in engagement with a smaller gear $D^2$, fast on a shaft $D^3$, having its bearings in the frame and in sleeve-like supports 2, 2, having, as herein shown, de-

pending ears by which they are secured to the uprights 3, 3, by suitable bolts 4, as shown in Fig. 1.

Motion is transmitted to the pulley P by a belt in usual manner and through the gears D′, D² to the shaft D³, which has fast thereon between the sleeve-like bearings 2, 2, the driving cone pulley E connected by belt E² with the driven cone E′ reversely arranged upon the shaft *b*, which is supported in long bearings *b′* pivotally supported upon the shaft B⁶ at *b*×, between and adjacent to the uprights 3, 3, as clearly shown in Fig. 1.

In the position shown in Fig. 1 the belt E² will drive the cone pulley E′ at its maximum speed, and through the gears B⁸, B⁷, B⁵, B⁴, B³ and B², will rotate the driving drum B, the parts in Fig. 1 being shown in position to begin the filling of a beam C, of usual construction, having the usual enlarged heads C′, and provided with journals *c* adapted to be supported in suitable bearings in the lower end of supporting arms *c′* bent inward and downward at their upper ends and each arm pivoted by a stud *c*² to one extremity of elbow-levers *c*³, the lower ends of said levers, see Figs. 1 and 2, being pivotally connected at *c*⁴ to arms *c*⁵ rigidly connected by suitable set screws 5 to a shaft *c*⁶, extending across the machine from side to side, a hooked link *c*⁷ being pivoted to each stud *c*² between the upper end of each supported arm *c′* and the elbow-lever *c*³, the hook *c*× engaging the shaft *c*⁶ and limiting the movement of the supporting arms in one direction.

An irregularly-shaped lever *d* is provided with a hub *d′* through which is extended the reduced end of a stud *d*² supported in a slot *d*³ in the side frame, see Figs. 1 and 2, the said stud being retained in adjusted position in the slot by a suitable nut *d*⁴ resting against a suitable washer 6 between it and the frame.

An extension *e* having a downturned end slotted at *e′* is bolted to the irregularly-shaped lever *d* and is connected by a stud *e*² to a link *e*³ pivotally connected at *e*⁴ to one of the supporting arms, the lower end of said link being slotted as at *e*⁵, through which slots the stud *e*² is extended, and by adjusting the stud with relation to the pivotal point *d*² of the lever *d* and with the pivotal point *e*⁴ of the link *e*³, by means of the slots *e′* and *e*⁵ respectively, the throw of the lever *d* will be varied for a purpose to be described. The outer end of the lever *d* is provided with a suitable opening *f*, through which a cord *f′*, provided at its end with a suitable retaining device *f*², is extended, said cord passing over a pulley *f*³, suitably supported at the side of the machine, and thence to a sheave or pulley *f*× pivotally supported at right angles to its axis by a suitable stand F secured to the cross girt 4, the cord extending from said sheave to a drum *g*, about which it is extended and secured at *g′*, see Fig. 1ª, said drum being loose on a short shaft *h*, secured to one of the uprights 3.

A weight W is suspended by a cord *h′* secured at its upper end to the drum *g* as shown in Figs. 1 and 1ª. A larger drum *g*² is made fast to the drum *g* by a sleeve-like connection or hub *g*×, and the ends of two cords or other flexible connections *k* and *k′*, are secured to the periphery of the drum *g*², one of the cords as *k* being extended around a like drum *k*² having its bearing in the other one of said uprights 3, the free end of the said flexible connection *k*, being secured to the belt shifter G carried upon guides *m*, *m*, between the uprights 3, 3, the flexible connection *k′* being wound around the drum *g*², as shown in Fig. 1ª, and having its free end also secured to the belt shifter G, the two cords or connections *k* and *k′* being so arranged, however, that when the drum *g*² is rotated to wind one of them, thereupon the other will be unwound at the same speed, and consequently the belt shifter G will be moved in one or the other direction upon the guides *m*, *m*, and shift the belt E² from one to the other end of the cones E, E′, thereby altering the surface speed of the driving drum B. As the yarn is wound upon the beam C by rotation of the drum B through the hereinbefore described mechanism including the speed-changing mechanism just described, the diameter of the mass of yarn being wound and resting upon the driving drum, will be increased, and the supporting arms *c′* will be turned upon their pivotal points *c*², lifting the link *e*³ and thereby turning the lever *d* upon its pivot to depress its outer end, such depression of the outer end of the lever drawing the flexible cord or chain *f′* in the direction of the arrows 20 Fig. 1, and rotating the drums *g* and *g*² in the direction of the arrow 25, the effect of such rotation being to unwind the cord or chain *f′* from the drum *g*, and the flexible connection *k′* from the drum *g*², at the same time winding the weighted cord *h′* upon the drum *g* and the flexible connection or cord *k* upon the drum *g*². As the cord or connection *k* is thus wound upon the drum, the belt shifter G will be moved from the position shown in Fig. 1 in the direction of the arrow 30 to the opposite ends of the cone pulleys, and as the driven pulley E′ actuates the driving drum, the surface speed thereof will be gradually decreased from the beginning of the winding operation as the belt is moved from the smaller to the larger end of the cone E′. When the beam C has been filled, the beam is doffed or removed from the warping machine by rotation of the shaft *c*⁶, the doffing operation forming no part of this invention, the same being described and claimed in another application, Serial No. 467,481, filed by me the 24th day of March, 1893, and when the new beam is placed in the bearings of the arms *c′* and brought into position against the periphery of the driving drum B, the parts will be in the position shown in Fig. 2, the link *e*³ having raised the outer end of the lever *d*, permitting the weight W to act upon its suspended cord *h′* which was wound upon

the drum $g$ during the winding of the preceding beam, as has been described, the weight causing the cord $h'$ to unwind from the said drum $g$ and rotating it as well as the drum $g^2$ in the direction opposite to the arrow 25 see Fig. 1, thereby winding up the flexible connection $k'$ upon the drum $g^2$ and putting out or unwinding the connection $k$ from said drum, the effect of such combined movements of the two connections $k$, $k'$, being to move the belt shifter G to the left in the opposite direction to the arrow 30 until the parts are in condition to begin the winding of the yarn upon the new beam.

A collar $n$ is adjustable upon the guides $m$, herein shown as the upper one, by means of a suitable set screw $n'$ to limit the movement to the left of the said belt shifter, the hub-like bearing G' thereof abutting against the said collar $n$ when the extreme position to the left has been reached. It will thus be seen that from the beginning to the end of the winding operation the surface speed of the driving drum is controlled by the beam itself through the intermediate connections as described, so that the surface speed of the drum, and consequently of the beam will be at its maximum at the beginning of the operation, gradually decreasing to the close thereof, thus making the strain upon the yarn uniform as it is drawn from the spools, and furthermore, the act of doffing the full beam and placing the empty beam in position to be filled automatically brings the variable speed mechanism into position to begin the winding of the empty beam at the proper speed.

I am not aware that prior to my invention a yarn beam has ever controlled variable speed mechanism by which the beam driving drum is rotated at a varying surface speed, the speed being regulated through the increased diameter of the yarn beam, the said speed mechanism being automatically restored to its starting position when the beam is doffed. I am aware, however, that it is old to rotate the driving drum by variable speed mechanism controlled by means entirely independent of the yarn beam, and accordingly this invention is not limited to the exact arrangement and construction of the co-operating parts, for it is obvious that the shape and arrangement of the connections between the variable speed mechanism and the beam may be changed without departing from the spirit of my invention.

I claim—

1. The combination, in a warping machine, of a driving drum, variable speed mechanism to rotate it, and a yarn beam to rest upon the drum, and with connections between said beam and said speed mechanism to control the latter and to automatically restore said speed mechanism to its starting position when the beam is being doffed, substantially as described.

2. The combination, in a warping machine, of a driving drum upon which the beam rests and by which it is rotated, variable speed mechanism to rotate the drum, and a controlling device therefor connected with and positively moved in one direction by the beam to gradually reduce the speed of the drum as the beam fills, with means controlled directly by the doffing of the beam to automatically retract the controlling device, substantially as described.

3. A beam driving drum, variable speed mechanism to rotate it, and supports for the beam which is to rest on and be rotated by the drum, combined with connections intermediate said speed mechanism and beam supports, to regulate the speed through the increased diameter of the beam said connections being controlled directly by the doffing of the beam to automatically place said mechanism in starting position, substantially as described.

4. A beam driving drum, and variable speed mechanism comprising reverse cones and a connecting belt, to rotate the drum, combined with a beam to rest on and be rotated by the drum, connections between the beam and belt to positively shift the latter along the cones and gradually reduce the speed as the beam fills, and means controlled directly by the doffing of the beam to automatically replace said belt in starting position when the beam is doffed, substantially as described.

5. A beam driving drum, pivoted actuating arms to support the yarn beam, and variable speed mechanism to rotate the drum, comprising reverse cones and a connecting belt, combined with adjustable connections between the belt and actuating arms to shift the former and reduce the speed as the beam is filled, and devices controlled directly by the doffing of the beam to automatically retract the belt when the beam is doffed and a new one put in its place, to thereby start the winding at maximum speed, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ALONZO E. RHOADES.

Witnesses:
GEO. E. STIMPSON,
H. W. BRACKEN.