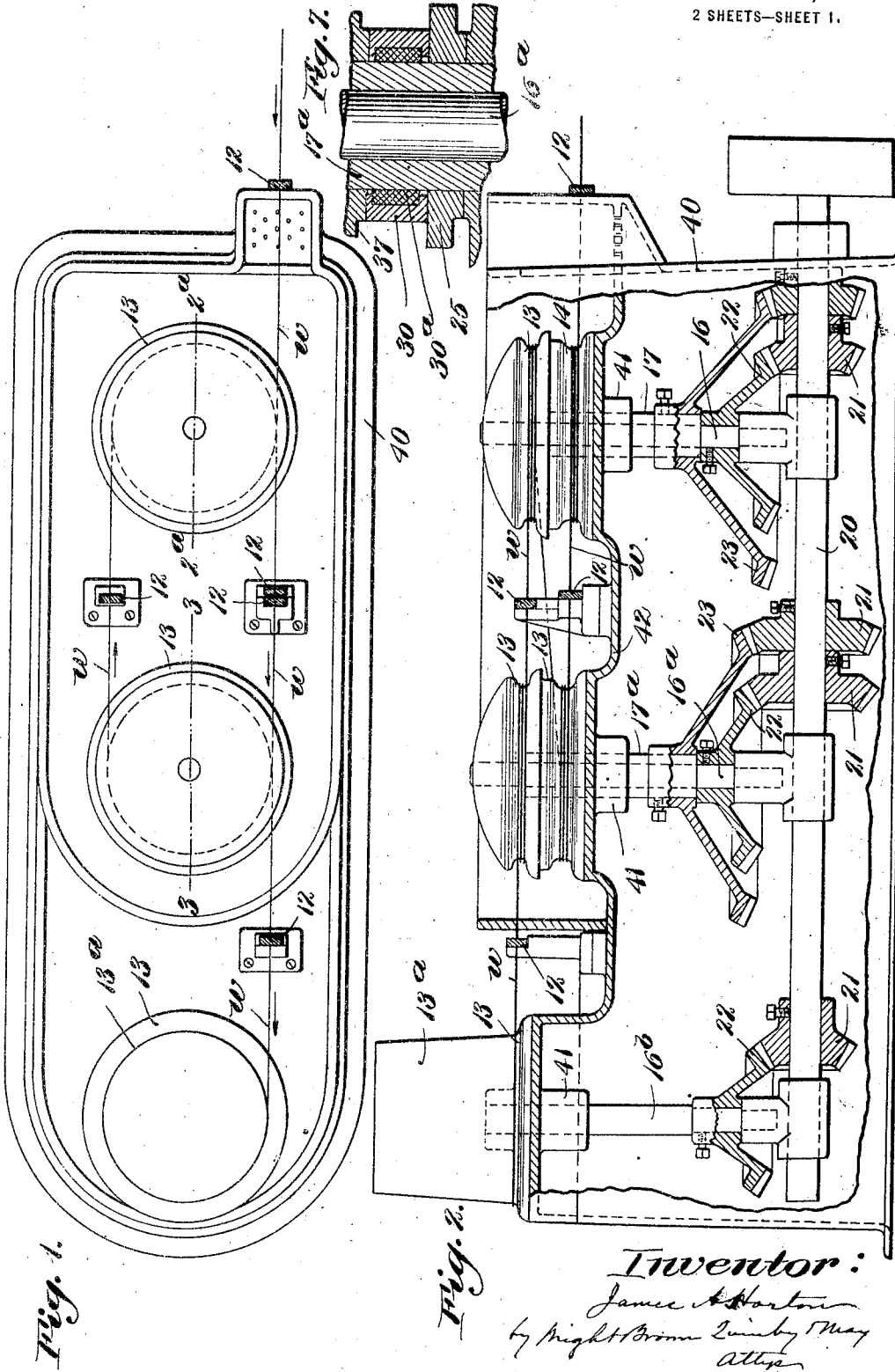


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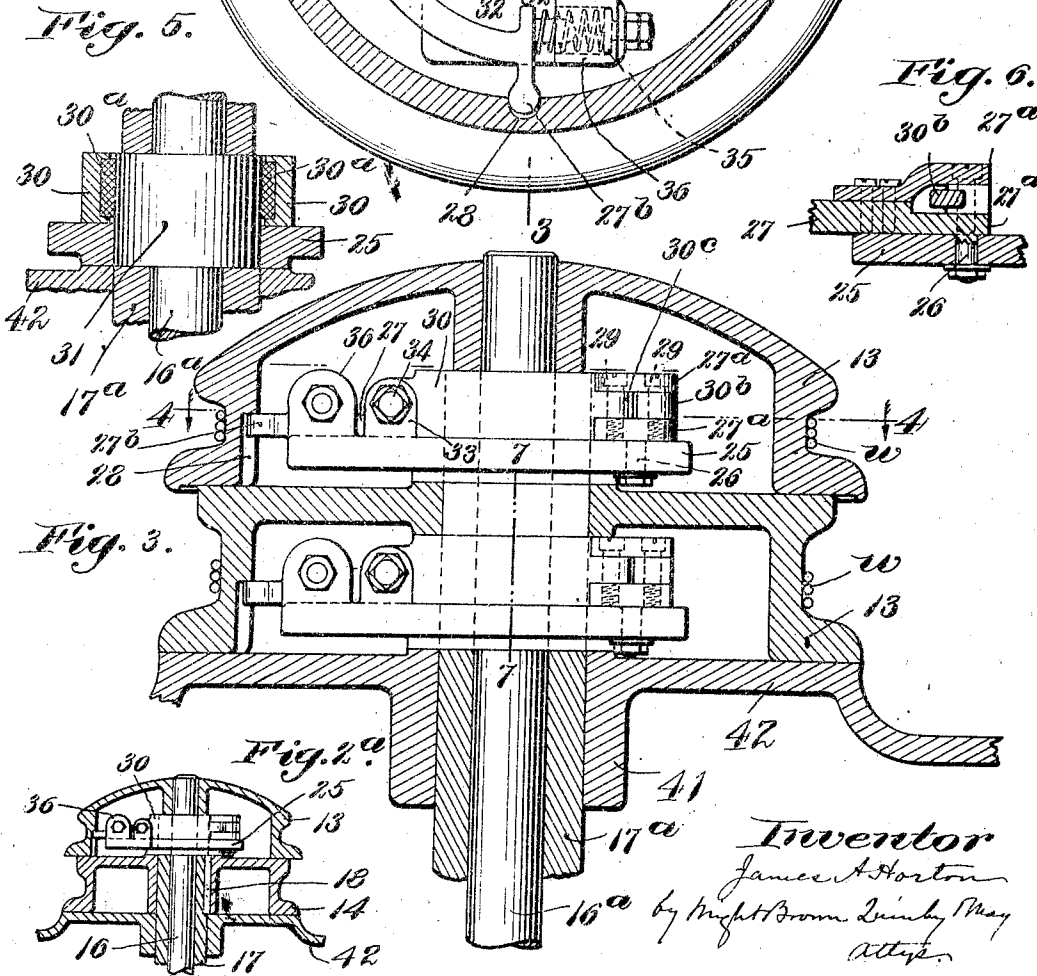
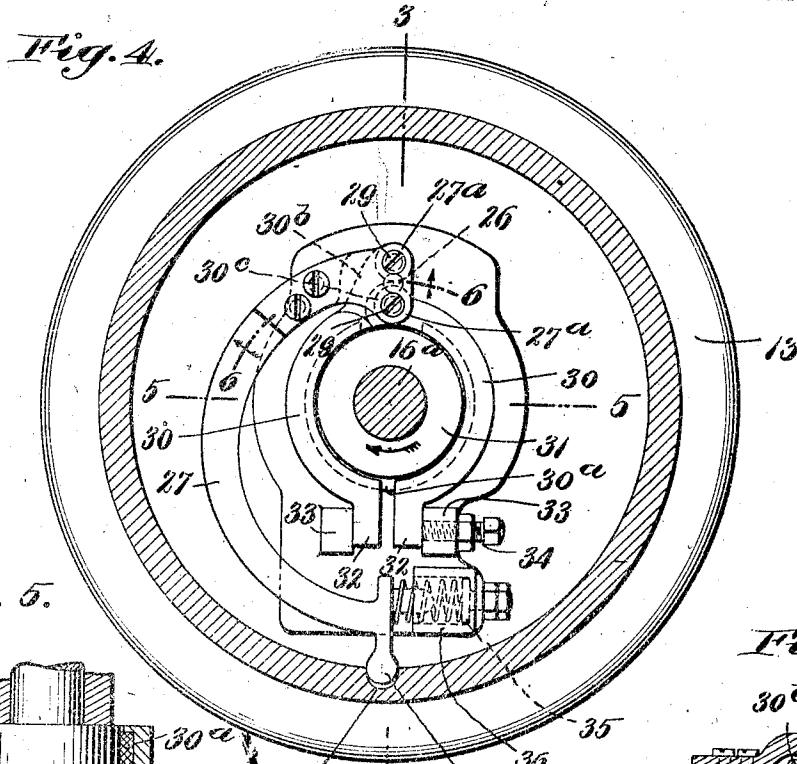
Patented Dec. 2, 1919.
2 SHEETS—SHEET 1.



J. A. HORTON.
WIRE DRAWING MACHINE.
APPLICATION FILED FEB. 21, 1918.

1,323,282.

Patented Dec. 2, 1919.
2 SHEETS—SHEET 2.



UNITED STATES PATENT OFFICE.

JAMES A. HORTON, OF BELMONT, MASSACHUSETTS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO CLINTON-WRIGHT WIRE COMPANY, A CORPORATION OF MASSACHUSETTS.

WIRE-DRAWING MACHINE.

1,323,282.

Specification of Letters Patent.

Patented Dec. 2, 1919.

Application filed February 21, 1918. Serial No. 218,435.

To all whom it may concern:

Be it known that I, JAMES A. HORTON, a citizen of the United States, residing at Belmont, in the county of Middlesex and State of Massachusetts, have invented new and useful Improvements in Wire-Drawing Machines, of which the following is a specification.

This invention relates especially to wire-drawing machines organized to draw wire through a series of dies at one continuous operation, making a fixed amount of reduction at each die.

The invention includes means by which the excess in breaking strength over the amount of pull on the wire to cause it to pass through a die, is utilized to gage the speed of the drum which is pulling the wire through the die.

In a continuous wire-drawing machine, the different drums are rotated at a progressive speed, from a comparatively slow speed for the first drum to an increased speed for each succeeding drum, above the next preceding drum, in order to take up the extra length of wire due to its reduction in diameter and consequent elongation at the die.

In practice, it is found that the dies are not always of the exact size for which the different speeds have been figured, due to the fact that the material of the wire may be so varied that the reduction at the dies has to be slightly varied, or that one or more dies in the series may wear slightly more than another, or others. Either condition causes the elongation to vary in proportion to the change in size due to wear, or as otherwise mentioned.

For these reasons, in continuous wire-drawing machines, the drawing drums have heretofore been rotated at a speed in excess of the travel of the wire, and the wire is allowed to slip on each drum, except the finishing or storing drum which heretofore has not been rotated as fast as the elongation of the wire calls for, but is slowed down so as to allow a slippage on all preceding drums. This slippage causes the drawing drums to be worn into grooves very quickly, so that they have to be trued off. Also the slippage removes the coating from the wire, which removal seriously interferes with the passage of the wire through the dies. In the present invention, the object is to so drive the drums that the speed of each will auto-

matically match the elongation of the wire at each preceding die. In accordance with my invention, when the wire is being drawn through a die, it is not pulled to the breaking point, but a margin is left above the breaking point, and when a preceding drum is not delivering fast enough, the load or pull through the die is increased, and the extra load on the drum drawing the wire through the die will cause the drum to be slowed down to match the wire delivered to the die, plus the elongation at the die.

This I believe to be a new feature, not disclosed in any previous continuous wire-drawing machine.

The means for accomplishing the result I will now proceed to describe.

Any suitable frame adapted to receive the various parts, is provided, and a suitable main driving shaft with gears for driving the wire-drawing drums through driving members connected with the drums, for driving the latter. Dies in number to correspond with the number of drawing drums are provided. In the machine described there are five dies and five drums. The first drum does not need the compensating or governing device hereinafter described, because it is receiving its wire in unlimited amount to fit its revolutions. The other drums are all fitted to compensate for variation of speed and each will automatically regulate itself to the speed at which the wire is delivered from a preceding drum, plus the elongation.

Of the accompanying drawings forming a part of this specification,—

Figure 1 is a top plan view of a continuous wire-drawing machine, embodying the invention.

Fig. 2 is a side elevation of the same, partly in section.

Fig. 2^a is a section on line 2^a—2^a of Fig. 1.

Fig. 3 is a section on line 3—3 of Figs. 1 and 4.

Fig. 4 is a section on line 4—4 of Fig. 3.

Fig. 5 is a section on line 5—5 of Fig. 4.

Fig. 6 is a section on line 6—6 of Fig. 4.

Fig. 7 is a section on line 7—7 of Fig. 3.

Each of Figs. 3 to 7 inclusive is on a larger scale than Figs. 1, 2 and 2^a.

My invention is embodied in a wire-drawing drum 13, of any suitable external form, a driving member here shown as a positively driven shaft on which the drum is loosely

mounted, and torque-transmitting means interposed between the driving member and the drum, adapted to automatically control the speed of rotation of the drum by the excess strain on the wire above that required to draw the wire through an ordinary wire-drawing die 12, accompanying and preceding the drum.

The drum may be one of a series of loosely mounted drums 13 in a continuous wire-drawing machine, a separate driving member and a separate drawing die being provided for each drum. The last loosely mounted drum of the series, namely, the drum shown at the left in Figs. 1 and 2, is a storing drum having an extension 13^a, on which the wire may be accumulated in coils after passing through the last die of the series.

An initial drawing drum 14 (Figs. 2 and 2^a) is provided, which is keyed rigidly to its driving member, instead of being loosely mounted thereon, said drum drawing the wire through the first die 12 of the series of dies.

As here shown, the drums, excepting the storing drum, are assembled in two tiers, note Figs. 2 and 3, each tier including two drums, the first tier being composed of the positively driven drum 14 and one of the loosely mounted drums 13, while the second tier is composed of two loosely mounted drums 13. The wire *w* passes from the initial drum 14 to the lower drum 13 of the second tier, then to the drum 13 of the first tier, then to the upper drum 13 of the second tier, and then to the storing drum. The arrangement of the drums in tiers requires the employment of two forms of driving members, to wit, shafts 16 and 16^a to drive the upper drums of the tiers, and quills or tubular shafts 17, 17^a, to drive the lower drums, said quills surrounding said shafts, and the hub of the initial drum 14, which is the lower drum of the first tier, being keyed rigidly at 18 (Fig. 2^a) to the quill 17, while the lower drum of the second tier is loosely mounted on the quill 17^a. The driving member of the storing drum is a shaft 16^b on which the storing drum is loosely mounted.

The several driving members are positively driven by any suitable mechanism, at successively increasing speeds. The quill 17 is driven at a relatively slow speed. The quill 17^a is driven faster than the quill 17. The shaft 16 is driven faster than the quill 17. The shaft 16^a is driven faster than the shaft 16, and the shaft 16^b is driven faster than the shaft 16^a. Said driving mechanism may include a main driving shaft 20, a series of bevel gears 21 fixed to said shaft, bevel gears 22 fixed to the shafts 16, 16^a and 16^b, and bevel gears 23 fixed to the quills 17 and 17^a.

I will now describe the preferred form of torque-transmitting means, interposed between the loosely mounted drums 13 and their driving members, said means being identical in each of said drums, so that a description of one will be sufficient.

Referring to Figs. 3, 4, 5, 6 and 7, 25 designates a clutch support formed as a plate located within the recessed body of the drum and having an aperture loosely surrounding the member which drives the drum, so that the plate and driving member may turn independently. To the plate 25 is connected by a pivot stud or fulcrum 26, (Fig. 6), a double bell-crank lever, composed of a curved longer arm 27 and two shorter arms 27^a formed as ears on one end of the longer arm and projecting oppositely from the fulcrum 26. The longer arm 27 has at its opposite end an ear 27^b engaging a recess 28 in the drum 13. To the shorter arms 27^a are connected by pivot studs 29 two arcuate shoes 30 constituting a friction clutch formed to embrace a portion of the driving member, one of said shoes having an offset ear 30^b receiving one of the studs 29, and the other shoe having an ear 30^c receiving the other stud 29. When the driving member is a shaft, the portion thereof embraced by the friction clutch is an enlargement 31 of the shaft, as shown by Fig. 5, and when the driving member is a quill, said portion is a part of the quill, as shown by Fig. 7. Each shoe 30 includes a metal body and a compressible frictional facing 30^a of material such as leather, inserted in a recess in the body and contacting with the driving member. Each shoe 30 has an ear 32, said ears being seated on shoe abutments 33 fixed to the support 25. One of said abutments may be provided with an adjustable portion 34 formed as a screw, and making provision for taking up wear of the facings 30^a. Seated at one end on an adjustable spring abutment 35 in a housing 36 on the support 25, is a spring 37, the other end of which is seated on the arm 27.

The stress of the spring 37 is such that it normally acts on and through the longer arm 27 and the shorter arms 27^a to maintain the shoes 30 of the friction clutch in gripping contact with the driving member, so that the drum is caused to rotate in unison with the driving member, through the connection afforded by the ear 27^b and recess 28. This condition prevails when the resistance to the advancing movement of the wire through the preceding die is such that the pull or strain on the wire by the drum is considerably less than that required to break the wire, the pull exerted on the wire by the drum being sufficient only to match the resistance of the wire due to its reduction in diameter by the preceding die, and being insufficient to break the wire, or, in

other words, less than the breaking strain of the wire between the preceding die and the drum.

Whenever, from any of the causes mentioned in the introductory portion of this specification, the resistance to the advancing movement of the wire is increased, the drum immediately slips on its driving member sufficiently to retard its rotation to that required to match the elongation of the wire. This result is due to the yielding of the spring 37, and the consequent relaxation of the grip of the friction clutch on the driving member. When the spring yields, the lever swings on the fulcrum 26 in the direction required to slightly move the pivoted ends of the shoes from each other, and thus relax the grip of the friction clutch on the driving member. There is, therefore, no slip of the wire on the drum, the slip being entirely between the friction clutch and the driving member, so that the perimeter of the drum is not worn by slippage of the wire thereon.

It will be seen that the lever composed of the longer arm 27 and oppositely projecting shorter arms 27^a, the fulcrum stud 26, the pivot studs connecting the shorter arms with the shoes 30, and the ear 27^b on the longer arm 27 and engaged with the drum, constitute connections between the spring 37, the friction clutch, and the drum, organized to transmit the pressure of the spring to the clutch and to transmit motion from the clutch to the drum. Said connections may be variously modified without departing from the spirit of the invention.

The frame 40 of the machine is provided with suitable bearings 41 for the driving members, these being preferably formed on the top plate 42 of the frame, as shown by Fig. 2. Suitable bearings are also provided for the main shaft 20.

As implied in the foregoing description and in the following claims, I am not limited to the specific mechanism of the preferred embodiment of my improvements shown by the drawings, except as otherwise required in certain of the more limited claims.

I claim:

1. In a wire-drawing machine, a wire drawing drum, a driving member therefor, and torque-transmitting means between the driving members and drum, variable as to its torque-transmitting power substantially in inverse proportion to the stress in the wire drawn by the drum.

2. In a wire-drawing machine, a wire-drawing drum, a driving member therefor, and torque-transmitting means between the driving members and drum, having provision for regulating the torque transmitted to the drum by the stress of the wire.

3. In a wire-drawing machine, in combination, a die, a drawing drum, a driving

member for said drum and torque-transmitting means between the driving member and the drum, automatically controlling the speed of the drum by the excess strain on the wire above that required to draw the wire through the die.

4. In a continuous wire-drawing machine, in combination, a series of dies, a series of driving members driven at successively increasing speeds, a series of drawing drums including an initial drum fixed to the first driving member of the series, and a plurality of drawing drums loosely mounted on the succeeding driving members, and torque-transmitting means between the said loosely mounted drums and their respective driving members, each adapted to regulate the speed of its associated drum by the excess strain on the wire passing to that particular drum.

5. In a wire-drawing machine, a driving member, a drum loosely mounted thereon, and torque-transmitting means between said driving member and drum, including a friction clutch adapted to variably grip the driving member, a clutch support loose upon the driving member, a spring for normally maintaining the clutch in driven engagement with the driving member, and connections between the spring, the clutch, and the drum, organized to transmit the pressure of the spring to the clutch, and to transmit motion from the clutch to the drum.

6. In a wire-drawing machine, a driving member, a drum loosely mounted thereon, and torque-transmitting means between said driving member and drum, including a support loose upon the driving member, and provided with shoe abutments and a spring abutment, a friction clutch composed of a pair of shoes adapted to grip the driving member and seated on said shoe abutments, a lever fulcrumed on said support and having oppositely projecting shorter arms pivoted to said shoes and a longer arm engaged with the drum, and a spring interposed between said spring abutment and the longer arm of the lever.

7. In a wire-drawing machine, the combination with a driver and a wire-drawing drum independently rotatable with respect to the driver, of a friction clutch engaged with both the driver and the drum, a spring tending to effect and maintain the torque-delivering engagement of the clutch, and means controlled by resistance of the drum to being driven for relaxing such engagement of the clutch.

8. In a wire-drawing machine, the combination with a driver having a cylindrical surface and a wire-drawing drum concentric with and rotatable relatively to said driver, of a clutch embracing said driver and having adjacent ends, a lever having two short arms engaged with the respective ends of said clutch; a support on which said

- lever is fulcrumed, and a spring mounted on said support and acting upon the lever with a tendency to move the same in the direction which causes the gripping of the driver by said clutch, said lever having an arm extending into engagement with the drum and being the means by which rotation of the clutch is transmitted to the drum.
9. In a wire-drawing machine, the combination with a wire-drawing drum and a driver, of a friction clutch interposed between the driver and the drum for transmitting torque from the former to the latter, and means whereby lagging of the drum causes relaxation of the clutch.
10. In a wire-drawing machine, the combination with a wire-drawing drum and a driver, of a friction clutch gripping the driver and having ends adjacent to one another adapted to be moved in opposite directions for respectively increasing and relaxing the gripping effect of the clutch, a support, a lever fulcrumed upon said support having arms connected with said ends and having a third arm in engagement with the drum, and a spring mounted on said support and pressing against said lever in the direction which tends to swing said lever in the manner causing an increase in the gripping effect of the clutch.
11. The combination with rotatable driving and driven members, of an expansible and contractible friction clutch engaged with one of said members, a device for expanding and contracting the clutch connected with the other of the members, and a spring bearing upon said device and tending to move the same in the manner which causes clutching engagement of said clutch.
12. The combination with rotatable driving and driven members, of a clutch embracing one of said members and adapted to be expanded or contracted so as to release or grip respectively the member which it embraces, said clutch having parts which are relatively movable to cause said relaxing and gripping effects, a lever for so moving the said parts of the clutch, and yielding means acting on said lever with tendency to move the same in a direction which causes the gripping of the clutch, the other of said members being engaged with said arm.
13. The combination with driving and driven rotatable members, of an expansible and contractible clutch adapted to be engaged with one of said members and to transmit torque to or from the same, a lever engaged with the other of said members and also engaged with said clutch, the clutch having two relatively movable parts and the lever having two arms connected with said parts, a support on which the lever is fulcrumed, and a spring bearing upon said lever with tendency to effect coupling of the clutch.
14. In combination with a driver and a driven member, a clutch engaging the driver frictionally, a clutch controller engaging the driven member and connected with the clutch in a manner causing relaxation of the gripping effect of said clutch upon lagging of the driver member, and a spring constantly applying force to said actuator tending to cause gripping engagement of the clutch with the driver.
- In testimony whereof I have affixed my signature.

JAMES A. HORTON.