

July 5, 1927.

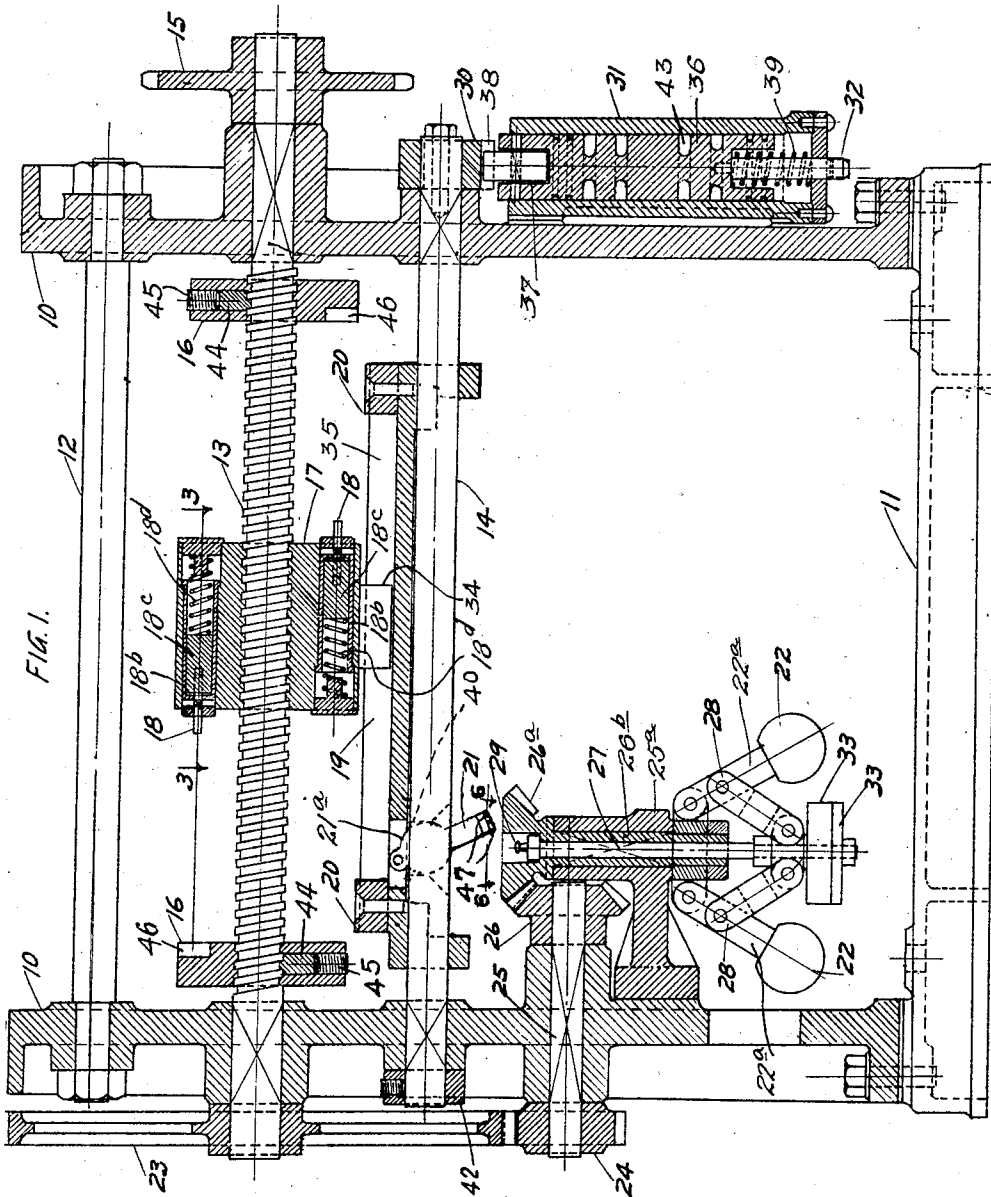
1,634,677

F. B. MILLER

CONTROLLER

Filed July 10, 1923

2 Sheets-Sheet 1



WITNESSES.
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July 5, 1927.

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2 Sheets-Sheet 2

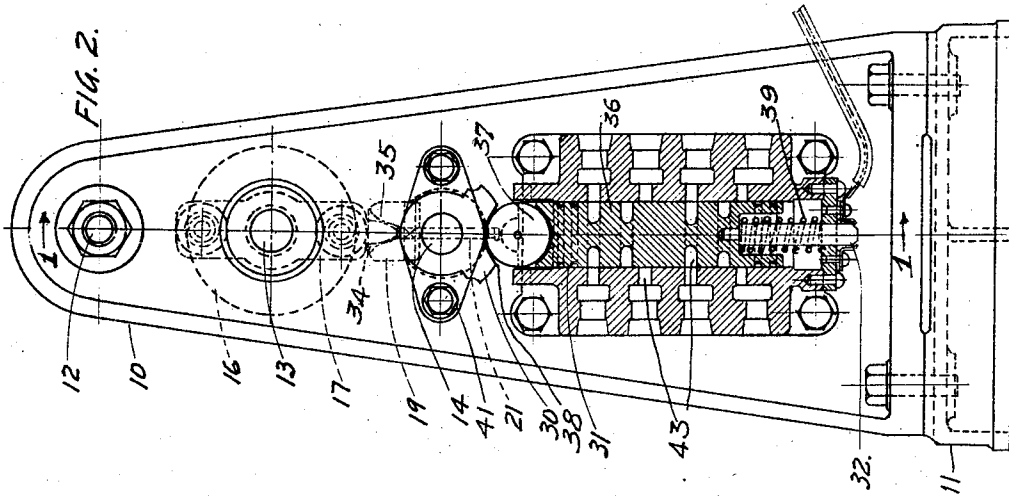


FIG. 3.

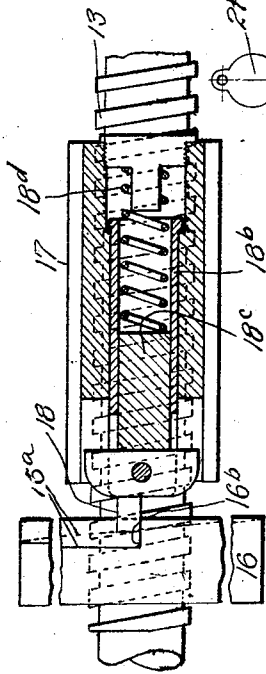


FIG. 5.



FIG. 4.

FIG. 9.

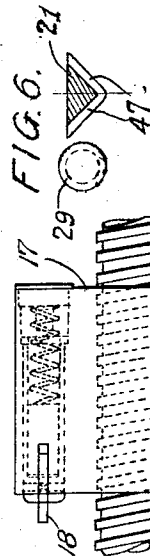


FIG. 6.

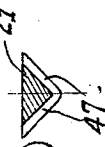


FIG. 8.

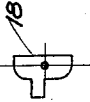


FIG. 7.



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This invention relates to controllers, and while not limited thereto, relates more particularly to controllers adapted to automatically limit the speed and travel of haulage or hoisting machines, and has for one of its objects the provision of a novel form of its apparatus, the operation of which will not be affected by the wearing of the parts thereof.

Another object is to provide an apparatus composed of few parts, which will be cheap to manufacture, and have a long life.

A further object is to provide an apparatus of the character described, composed of the novel design, combination and construction of parts hereinafter described and illustrated in the accompanying drawings.

In the drawings—

Figure 1 is a vertical sectional view of apparatus constructed in accordance with this invention, and taken on the line 1—1 of Figure 2.

Figure 2 is an end elevation of the apparatus, the valve and switch being shown in section.

Figure 3 is a sectional plan through the travel cam nut on the line 3—3 of Figure 1, and showing one of the pawls of the nut engaged with one of the stop collars.

Figure 4 is a side elevation of the actuating cam.

Figure 5 is an edge view of the same.

Figure 6 is an enlarged sectional view on the line 6—6 of Figure 1, showing the governor pin in the path of the actuating cam finger.

Figure 7 is an edge view and Figure 8 is a side view of one of the pawls of the travel nut.

Figure 9 is an enlarged side elevation, partly in section, of the travel nut.

Referring more particularly to the drawings, the numeral 11 designates the bed or base member of the apparatus, on which is secured a pair of spaced side or journal frame members 10 which are connected at their upper ends by a combined spacing and tie rod 12.

A thread screw shaft 13 is journaled in the frame members 10 and has a sprocket 15 secured to one end adapted to be operatively connected to the machine or source of power, the speed of which is to be controlled (not shown).

A traveler nut 17 is threaded on the shaft 13 and is adapted to travel longitudinally thereof when the shaft is rotated, and stop collars 16 are mounted adjacent the opposite ends of the shaft to limit the movement of the nut 17. The collars 16 are provided with filler plugs 44 and set-screws 45 for locking them in position.

A cam shaft 14 is journaled in the frame members 10 at a point below the screw shaft 13, and is provided at one end with a cam 30 and at its other end with a collar 42 which prevent endwise movement of the shaft.

An actuating member 19 is slidably mounted on the shaft 14 and held against rotation relative to the shaft by an actuating finger 21 pivotally secured to the member 19 and projecting downwardly through a slot 40 in the shaft 14.

The finger 21 is provided with a disk-like bearing portion 21^a adapted to loosely fit the upper or bearing portion of the slot 40 so as to permit a limited vertical movement of the finger 21 in the slot 40 when the member 19 is moved longitudinally relative to the shaft 14. The lower portion of the slot 40 is flared in a direction parallel with the longitudinal axis of the shaft 14 so as to permit free rocking movement of the finger 21 in a direction parallel with the longitudinal axis of the shaft 14.

The upper face of the actuating member is provided with a guide groove or slot 35, the ends of which are closed by stop blocks 20.

A guide block or tooth 34 is secured to the lower face of the nut 17 and extends into the groove 35 and is adapted to travel along the groove and engage the stop blocks 20 as the nut 17 is moved along the shaft 13. When the block or tooth 34 engages the stop blocks 20 the member 19 will be forced to slide along the shaft 14 until the nut 17 has engaged the stop collars 16, and during the sliding movement of the member 19, the finger 21 will be moved about its pivot for a purpose to be described.

The cam 30 is provided with a depression or crotch 38 which is fitted over a roller 37 operatively mounted on the upper end of a valve piston 36 which is reciprocally mounted in a valve casing or body 31. The valve piston 36 is normally urged upwardly by a

spring 39 so as to hold the roller 37 in engagement with the cam 30.

A switch 32 is operatively connected to the lower end of the piston 36, whereby operation of the piston 36 will operate both the valve and switch.

The valve body 31 is provided with ports 43 through which fluid is admitted to an engine brake (not shown), and a circuit is completed by the switch 32, to operate a suitable brake not shown, whereby a combined fluid and electric machine or either a fluid or electrically operated machine may be controlled by the same apparatus.

A ball-type governor is mounted on a bearing bracket 25^a and has its spindle 26^b provided with an integral gear 26^a at its upper end, which is in mesh with a gear 26 on a shaft 25. The shaft 25 is journaled in one of the journal frames 10 and carries a gear 24 which is in mesh with a drive gear 23 on the screw shaft 13.

The governor balls 22 are provided with stems 22^a which are pivotally mounted on a collar secured to the spindle 26^b of the governor so as to rotate with the spindle.

A plunger 27 is slidably mounted in the spindle 26^b and is connected with the stems 22^a of the balls 22 by links 28 so as to be reciprocated as the balls are raised and lowered by the centrifugal force caused by their being rotated with the spindle 26^b. The upper end of the plunger 27 is provided with an actuating head 29 adapted to be engaged by the finger 21 when the plunger is in raised position.

The lower end of the plunger 27 is provided with sectional counterweights 33 to provide for adjustment.

The movement of the cam 30 is limited in both directions by the cam stops 41—41.

The stop collars 16 heretofore referred to, are provided with tapered grooves 16^a in their inner faces adapted to receive the ends of yieldable pawls 18—18 which are carried by the nut 17. The grooves 16^a terminate in stop shoulders 16^b adapted to be engaged by the pawls 18—18. The nut 17 is bored out adjacent its top and bottom to receive sleeves 18^b and plungers 18^c. The plungers 18^c are backed up by coiled springs 18^a so as to be normally urged toward and bear against the pawls 18. The pawls 18 are pivotally secured to the sleeves 18^b which sleeves are slotted to permit the pawls to move about the axis of their pivotal mounting. It is necessary, however, for the pawls to depress the plungers 18^c as they move about their pivots since the plungers are resiliently in engagement with the pawls.

As the nut 17 approaches the end of its travel in either direction, one of the pawls 18 will enter groove 16^a of one of the collars 16 and, as the collar is rotated by the screw shaft 13, the pawl 18 will be engaged by the

shoulder 16^b of the slot 16^a forming a yieldable connection between the collar and nut, so that the nut will turn with the shaft 13 sufficiently to cause the block 34 to engage the side of the slot 35 in the member 19 and cause the member 19 and shaft 14 to rock, moving the cam 30 to actuate the control valve and switch. The yieldable connection formed by the pawl 18 will be sustained due to the pressure of the spring pressed plunger 18^c until the cam 30 engages the stop 41, at which time the tension of the spring 18^a will be overcome and the pawl will move about the axis of its pivot and ride past the shoulder 16^b to permit slight overrun of the apparatus being controlled.

The friction of the shaft 14, the cam 30 and parts actuated thereby, is normally sufficient to prevent the rotation of the nut 17.

The finger 21 is provided at its lower end with a cam surface 47 adapted to engage the actuating head 29 of the plunger 27, when the finger 21 is rocked by the operation of the actuating member 19 when the guide block 34 engages one of the stop blocks 20, provided the plunger 27 has been upwardly into the path of travel of the finger 21 by the ball governor as previously described and as illustrated in Figure 6 of the drawings. When the cam surface 47 engages the head 29 of the plunger 27 the cam surface 47 will serve to apply a rotating force, through the finger 21, to the shaft 14, thereby actuating the cam 30 which in turn will actuate the control valve and switch.

In operation, assuming that the machine to be controlled is operating at normal speed, the nut 17 will travel along the screw shaft 13. As the nut approaches the limit of its travel the block 34 will engage one of the stop blocks 20 and shift the member 19 along the shaft 14, thereby swinging the finger 21 in an arcuate path, due to the fact that the machine is traveling at normal speed. However, the plunger 27 will not be raised sufficiently to move the head 29 into the path of the finger 21.

The movement of the nut 17 will continue along the shaft 13 after the block 34 engages the member 20 until the plunger or pawl 18 enters the groove 16^a of one of the stop collars 16 and is engaged by the stop shoulder 16^b, whereby the collar and nut 17 will revolve together. As the nut 17 revolves with the shaft 13, the block 34 will bear against the side wall of the slot 35 so as to rotate or rock the shaft 14 and thereby revolve the cam 30 and actuate the valve plunger 36 and switch 32.

By providing the spring pressed plungers 18, the nut may be readily backed away from the stop collars 16 by reversing the direction of rotation of the shaft 13.

If the machine to be controlled is being

operated at excessive speed, the governor will elevate the plunger 27 so as to move the head 29 into the path of the finger 21 so that when the finger 21 is rocked as the nut 17 approaches the end of its travel, the cam face 47 of the finger 21 will engage the head 29 and cause a rotation of the shaft 14, thereby actuating the cam 30 which will operate the valve plunger 36 and switch 32 to close the same and, therefore, permit a longer braking action before the nut 17 reaches the limit of its movement.

While I have shown and described one specific embodiment of my invention, it will be understood that I do not wish to be limited thereto, since various modifications and applications of the device may be made without departing from the scope of my invention as defined in the appended claims.

I claim—

1. A controller comprising a frame, a screw shaft journaled in said frame and adapted to be operated by the source of power to be controlled, a cam shaft journaled in said frame, a traveling nut on said screw shaft, means operable by said nut for operating said cam shaft under normal speed conditions to limit the operation of said source of power, and other means for operating said cam shaft to govern the speed of said source of power.

2. In a controller, a screw shaft, a traveling nut on said shaft, stop collars secured to said shaft adjacent each end thereof, means for forming a yieldable connection between said nut and said collars after said nut has traveled a predetermined distance along said shaft, whereby said nut will turn with said shaft.

3. A controller comprising a frame, a screw shaft journaled in said frame and adapted to be operated by the source of power to be controlled, a cam shaft journaled in said frame, a traveling nut on said screw shaft, an actuating member mounted on and movable longitudinally of said cam shaft, an actuating finger carried by said actuating member and projecting through a slot in said cam shaft whereby rotation of said actuating member relative to said shaft is prevented, means on said nut adapted to cooperate with means on said actuating member for reciprocating said member, a control cam on said rock shaft, a governor, and means operable by said governor at a predetermined speed adapted to cooperate with said actuating finger to rock said rock shaft and actuate said control cam.

4. A controller comprising a frame, a screw shaft journaled in said frame and adapted to be operated by the source of power to be controlled, a cam shaft journaled in said frame, a traveling nut on said screw shaft, an actuating member mounted on and movable longitudinally of said cam

shaft, an actuating finger carried by said actuating member and projecting through a slot in said cam shaft whereby rotation of said actuating member relative to said shaft is prevented, means on said nut adapted to cooperate with means on said actuating member for reciprocating said member, a control cam on said rock shaft, a governor, and means operable by said governor at a predetermined speed adapted to cooperate with said actuating finger to rock said rock shaft and actuate said control cam, and means operable by said cam for controlling the speed of the source of power being controlled.

5. A controller comprising a frame, a screw shaft journaled in said frame and adapted to be operated by the source of power to be controlled, a cam shaft journaled in said frame, a traveling nut on said screw shaft, an actuating member mounted on and movable longitudinally of said cam shaft, means for preventing rotation of said actuating member relative to said cam shaft, means operatively connecting said nut and actuating member, a control cam on said cam shaft, and means for forming a yieldable connection between said screw shaft and said nut as said nut approaches the end of its travel, whereby said nut will turn with said screw shaft and cause said rock shaft to be rocked so as to actuate said control cam.

6. A controller comprising a frame, a screw shaft journaled in said frame and adapted to be operated by the source of power to be controlled, a cam shaft journaled in said frame, a traveling nut on said screw shaft, an actuating member mounted on and movable longitudinally of said cam shaft, means for preventing rotation of said actuating member relative to said cam shaft, means operatively connecting said nut and actuating member, a control cam on said cam shaft, and means for forming a yieldable connection between said nut and said screw shaft as said nut approaches the end of its travel, whereby said nut will turn with said screw shaft and cause said rock shaft to be rocked so as to actuate said control cam.

7. A controller comprising a frame, a screw shaft journaled in said frame, means for rotating said shaft, a traveling nut on said screw shaft, a pair of stop collars mounted on said screw shaft, said nut being adapted to travel longitudinally of said screw shaft, means for forming a yieldable connection between said nut and either of said collars as said nut approaches the limit of its travel so as to cause said nut to turn with said shaft, a cam shaft journaled in said frame below said screw shaft, an actuating member mounted on said cam shaft, means for preventing rotation of said actuating member relative to said cam shaft, means

forming a sliding connection between said traveling nut and said actuating member whereby said nut is normally held against rotation, a control cam on said cam shaft, and control mechanism operable by said cam, said cam shaft, control cam, and control mechanism being adapted to provide sufficient friction to prevent the turning of said cam shaft by said nut under normal conditions and until said yieldable connection is formed between said nut and one of said collars.

In testimony whereof I affix my signature.

FREDERICK B. MILLER.