C. H. TILLETT AND T. A. ALLAN.

CROSSING GATE.

APPLICATION FILED MAR. 5, 1920.

1,384,544. Patented July 12, 1921.

2 SHEETS—SHEET 1.

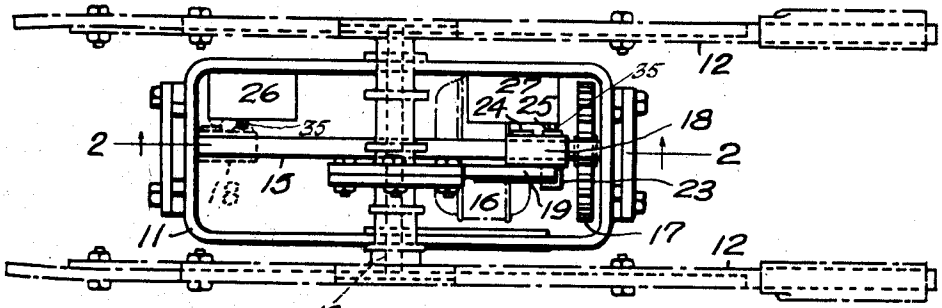


Fig. 1

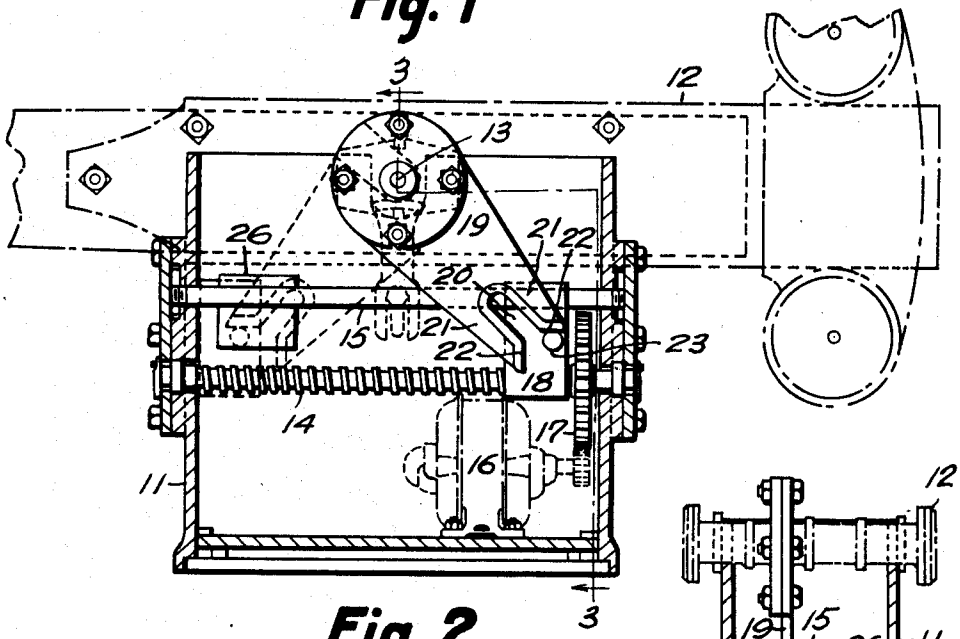


Fig. 2

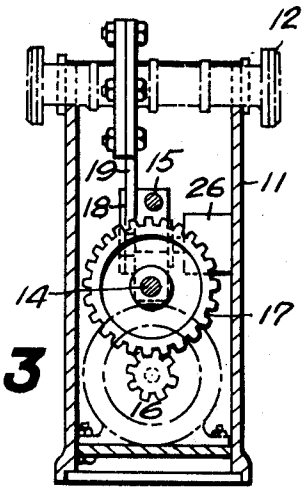


Fig. 3

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2 SHEETS—SHEET 2.

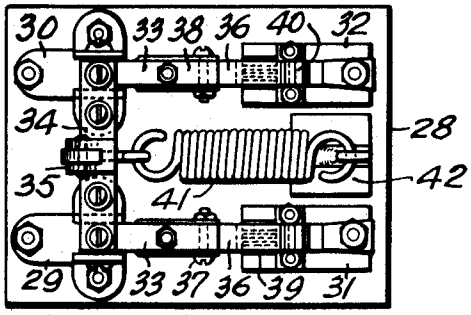


Fig. 4

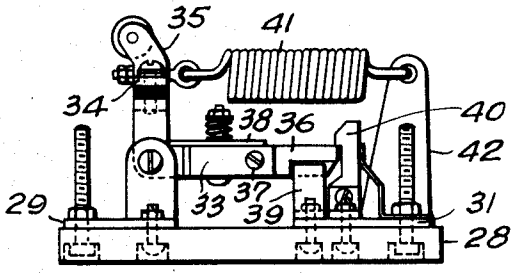


Fig. 5

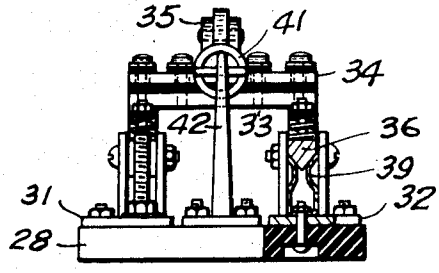


Fig. 6

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UNITED STATES PATENT OFFICE.

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CROSSING-GATE.

1,384,544. Specification of Letters Patent. Patented July 12, 1921.

Application filed March 5, 1920. Serial No. 363,465.

To all whom it may concern:

Be it known that we, CHARLES H. TILLETT, a citizen of the United States of America, and THOMAS A. ALLAN, a subject of the King of Great Britain, both residents of the city of Montreal, in the Province of Quebec and Dominion of Canada, have invented certain new and useful Improvements in Crossing-Gates, of which the following is a full, clear, and exact description.

This invention relates to improvements in crossing gates and particularly to gates operated by electric motors. The object of the invention is to provide means whereby the motor is allowed to attain its speed under no load conditions before movement of the gate commences.

A further object is to provide means permitting the motor a certain free run after the gate movement has ceased in order that the motor may come to a stop naturally and without the use of a brake.

A still further object is to provide means whereby the gate is moved at a variable rate of speed, the maximum speed being at an intermediate point of the travel without variation in the speed of the motor. Various other objects and advantages will be ascertained from the following specification.

The device consists briefly of a housing to which the gate is pivotally connected, the said housing containing a motor-driven screw operating a nut into and out of engagement with a lever connected to the gate. Stopping and starting switches for the motor are provided in position to be operated by the nut.

In the drawings which illustrate the invention:—

Figure 1 is a plan view of the device showing the casing open.

Fig. 2 is a section on the line 2—2, Fig. 1.

Fig. 3 is a section on the line 3—3, Fig. 2.

Fig. 4 is a plan view of one of the motor control switches.

Fig. 5 is a side elevation of one of the switches.

Fig. 6 is an end elevation, partly in section, of one of the switches.

Referring more particularly to the drawings, 11 designates a casing or pedestal of any suitable construction, upon which a crossing gate 12 of any suitable design is supported by a shaft 13.

Within the casing is a revolubly mounted screw or worm 14, and a fixedly mounted guide 15 arranged in parallelism with the worm, the worm and guide being at right angles to the shaft 13 and a suitable distance therefrom. A motor 16 is provided preferably within the casing and is operably connected by gears 17 with the worm 14. A nut 18 is provided on the worm and is disposed in slidable engagement with the guide 15, whereby the nut is held against revolution with the worm so that upon revolution of the worm the nut moves longitudinally thereof.

A lever or arm 19 is rigidly connected to the shaft 13 carrying the gate, the longitudinal axis of said lever being preferably at an angle of about 45° to the longitudinal axis of the gate. The free end of the lever is bifurcated providing a longitudinally disposed slot 20. Adjacent edges of the bifurcations or jaws 21 are flared as shown at 22. These flared edges are formed preferably at angles of about 45° to the longitudinal axis of the lever, whereby when the lever is at an inclination of 45° one of said flared edges will be horizontal and the other will be vertical, as shown in Fig. 2. A stud 23, which may, if desired, be provided with an anti-friction roller or sleeve, is mounted on the nut 18 axially parallel with the shaft 13 and in position to engage the horizontally flared edge 22 when the lever is in its extreme inclined position. The nut is additionally provided with bosses or the like 24 and 25 for operating the motor controlling switches 26, 27 respectively.

Each of the switches 26, 27 comprises a base 28 of insulating material upon which is mounted a pair of terminals 29 and 30 and a second pair of terminals 31 and 32. The terminals 29, 30 each carry a pivotally mounted switch blade 33, these blades being mechanically connected by a cross-bar 34 carrying a roller bearing arm 35 positioned for engagement with one of the bosses 24, 25.

Each of the blades 33 is provided with a tip 36 hingedly mounted to the body of the blade by a pin 37 and normally held in alinement by a spring-pressed finger 38 carried by the body of the blade. These blade extensions 36 rest normally between the spring fingers 39 of the terminals 31, 32 and are held in this position by spring-pressed, pivoted latches 40 forming part of the terminals 31, 32. The switch is normally held in closed circuit position by a spring 41 tensioned between the cross-arm 34 and a post 42.

The operation of the mechanism of the gate proper is extremely simple. The motor being started in the proper direction the screw is revolved and drives the nut toward the opposite end of the casing. It will be clearly seen in Fig. 2 that the stud 23 rests under the horizontally flared edge 22 so that the nut will have considerable movement before the stud strikes the vertical edge or the inclined edge of the slot 20. In this way the motor is allowed to work up to speed under no load conditions. As soon as the stud 23 engages in the slot proper it commences to move the lever 19 with it, so that the gate which is rigidly connected with the lever is also moved. As movement increases and the gate rises, the lever swings down toward a vertical position, thus bringing the point of contact with the stud 23 closer to the shaft 13. The result is, that with the reduced length of lever a given movement of the nut produces greater angular movement of the lever, so that the gate is moved more rapidly as the lever assumes a vertical position. In the same way the speed of the gate is decreased after the lever passes a vertical position and swings up to the inclined position shown in dotted lines Fig. 2. When the lever reaches this inclined position the stud leaves the slot 20 and travels under the horizontal flared edge 22, so that it produces no movement of the lever or gate. As the lever comes to rest in its dotted position it operatively engages the switch 26 and opens the motor circuit at exactly the moment that the stud 23 leaves the slot 20. In this way the driving power of the motor is applied to the gate until its movement is complete and then the motor is disconnected from the gate so that it is under no load and simultaneously deprived of power. Being under no load the motor runs of its own momentum at gradually decreasing speed and finally stops naturally and without the application of brakes after having carried the stud from the mouth of the latch 20 to the extremity of the flared edge. This movement of the stud during the stopping of the motor permits an equal and opposite movement of the stud when the motor is coming up to speed for the next operation of the gate. It will be noted that the stud does not disengage the flared edges 22 at the ends of its travel but remains as a stop holding the lever and gate against movement from their intended positions. This is clearly shown in Fig. 2, the lever is shown in full lines being in proper relation to the gate. Obviously, any attempt to lift the gate is resisted by the downward pressure of the lever on the stud 23.

The operation of the switches 26 and 27 by the nut is as follows:—Both switches are normally in the position shown in Figs. 4, 5 and 6, maintaining two circuits closed between the motor and a controller (not shown), these circuits being arranged for operating the motor in positive and reverse directions. As the nut approaches its position shown in dotted lines, Figs. 1 and 2, the boss 24 thereof engages the roller bearing lever 35 and tilts the same against the tension of the spring 41, so that the blades 33 swing upwardly and tend to draw their extensions 36 from between the contacts or spring fingers 39. Withdrawal of the blade extensions 36 is, however, momentarily prevented by the latches 40, with the result that the blade extensions swing on their pivots 37 and assume an angular relation with respect to the blade bodies 33. The tails of these extensions thus lift the spring-pressed plates 38. The arcuate movement of the pivot pins 37 and of the extensions themselves eventually withdraws the extensions 36 from the latches 40, and the spring-pressed plates 38 become operative to withdraw the extensions from between the contacts 39 and swing the extensions into alinement with the blades 33. In this way the circuit is broken very quickly and burning of the parts 36 and 39 avoided. When the motor is to be again started the controller is operated to open the circuit through the open switch 26 and establish the circuit through the closed switch 27. As the nut withdraws from the switch 26 the boss 24 releases the lever and the spring 41 closes the switch. As there is no current flow through this switch owing to the setting of the controller the slow closing of the switch as the nut leaves it will not have any detrimental effect. The spring 41 draws the blade extensions 36 down and past the latches 40 which are thrust back as the parts 36 pass and then returned to latching position over the parts 36 by their springs. When the nut resumes its position as shown in full lines the boss 25 strikes the lever 35 of the switch 27 which operates in exactly the same manner as the switch 26.

From the foregoing description it will be evident that the apparatus comprises a few simple parts not liable to get out of order. The motor is protected and complication of

starting resistance avoided by allowing the motor to come up to speed under no load. Similarly the complication of brakes and means for stopping the nut exactly at specified points is entirely overcome by permitting it a free run under no load after the power is cut off, so that it stops naturally by loss of momentum. The gate is locked in either of its positions against any unauthorized return to its former position and the locking is effected without the addition of a single part. The gate is not only operated at a speed gradually increasing from the start to a medio point and then decreasing to a stop but the power applied to the gate at the commencement and completion of its movement is greatest so that the gate's inertia and momentum are overcome without unduly loading the motor.

Having thus described our invention, what we claim is:—

1. In a device of the character described, the combination with a member to be operated and a motor driven worm of an operative connection between the worm and the member adapted to be continuously actuated by the worm during the operation of the motor and including engaging parts capable of relative movement in the line of nut travel only at the commencement and completion of the motor operation, so as to give free run to the motor at such times.

2. In a device of the character described, the combination with a member to be operated and a driving motor, of an operating connection including a traveling member operatively connected to the motor so as to travel continuously during motor operation, said traveling member being arranged to move freely for a substantial distance out of engagement with said member at the commencement and completion of its travel and in driving relation with said first member during the intermediate portion of its travel.

3. In a device of the character described, the combination with a gate and an operating motor therefor, of a connection between the motor and the gate including a lever carried by the latter, and a traveling motor-operated nut adapted to move in driving engagement with said lever during the intermediate portion of its travel and to have free movement at the commencement and completion of its travel so as to afford free run to the motor at said times.

4. In a device of the class described, the combination with a gate and an operating motor therefor, of a screw connected to said motor for revolution, an irrevolubly held nut on said screw, and a slotted lever rigidly connected with the gate and receiving said nut in the slot to transmit power from the motor to the gate.

5. A device according to claim 4, in which the lever slot is formed to permit of nut movement at the ends of lever travel without disconnection of the nut and lever.

6. A device according to claim 4, in which the lever is arranged to operate through an angle of approximately 90° from a position inclined approximately 45°, the edges of the lever defining the outer end of the slot being arranged at an angle of approximately 90° and occupying horizontal and vertical planes at the extremities of lever movement.

7. A device according to claim 4, in which the lever edges defining the slot at the extremity of the lever are flared, the angle between said edges and the angle through the lever movement being together equal to substantially 180°.

8. A device according to claim 4, in which the lever edges defining the outer end of the slot are flared, whereby at one extremity of lever movement one edge of the slot is in parallelism with the direction of nut movement and at the other extremity of lever movement the other edge is in parallelism with the direction of nut movement.

9. A device according to claim 4, in which the lever is so disposed that its point of contact with the nut approaches and then recedes from the center of lever oscillation.

10. In a device of the class described, the combination with a gate and an operating motor therefor, of mechanical power transmitting connection between the gate and motor, a pair of circuits adapted to energize said motor for operation in either direction and a normally closed switch in each of said circuits including a pair of blades, an insulated operating lever projecting into the path of the connection, extensions pivotally connected to said blades and spring actuated to normally maintain alinement with the blades, contacts located for engagement with said blade extensions, and spring actuated latches normally holding the blade extensions in engagement with said contacts and operative to move the extensions out of alinement with the blades during opening of the switch, whereby said extensions will be sharply withdrawn from the contacts by their alining springs on the disengagement of the extensions and latches, and a spring adapted to return the blade extensions into engagement with the contacts upon disengagement of the actuating lever and mechanical connection.

11. In a device of the class described, the combination with a gate and an operating motor therefor, of mechanical power transmitting connection between the gate and motor, a pair of circuits adapted to energize said motor for operation in either direction and a normally closed switch in each of said circuits including a resilient, flexible circuit maker, an operating lever connected to said

circuit maker and engageable by the mechanical connection to open the switch, and means releasably engaging said circuit maker and holding the same in closed switch position during part of the movement of said operating lever, whereby said circuit maker is flexed to cause by its resiliency a rapid opening of the switch upon disengagement of said holding means, and a spring arranged to close the switch upon disengagement of the switch and mechanical connection.

In witness whereof, we have hereunto set our hands.

CHARLES H. TILLETT.
THOMAS A. ALLAN.