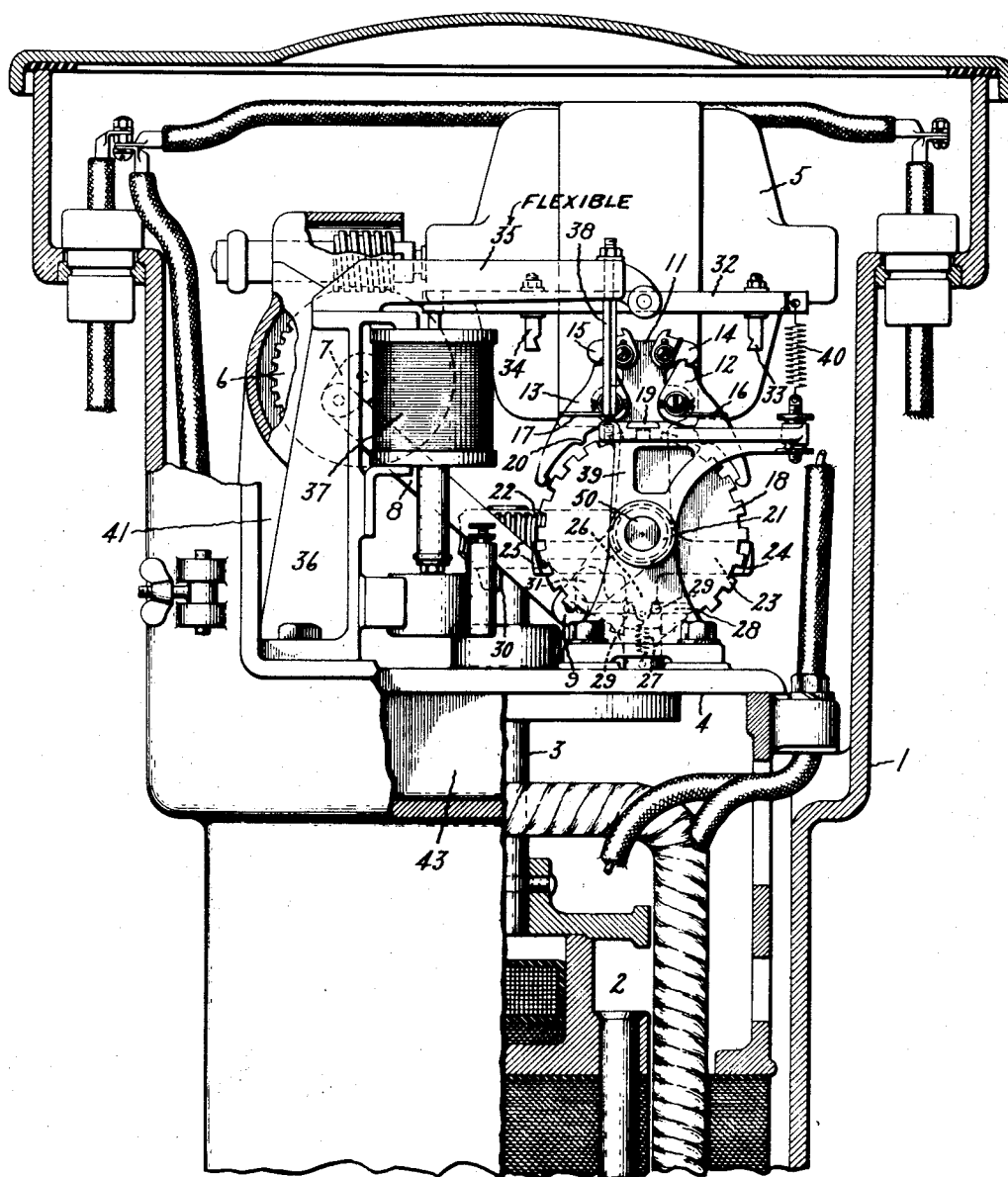


1,208,704.

Fig. 1.



Carl G. Klock
J. Ellis Glen.

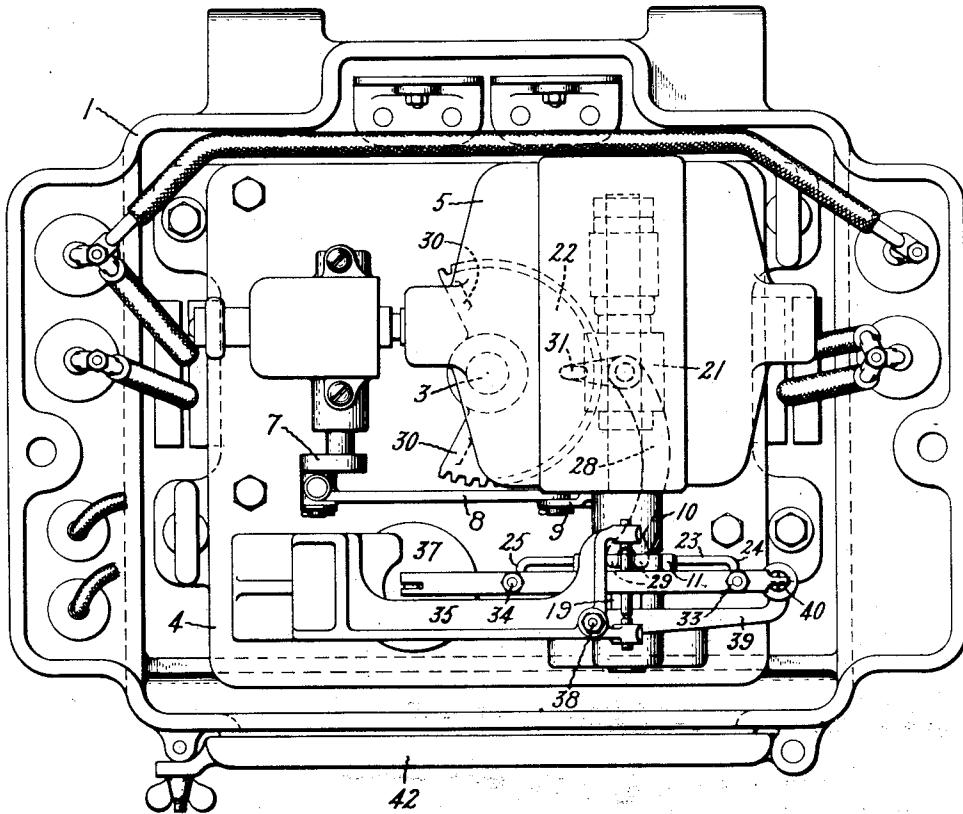
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M. UNGER.
FEEDER REGULATOR.
APPLICATION FILED JUNE 20, 1913.

1,208,704.

Patented Dec. 12, 1916.
2 SHEETS—SHEET 2.

Fig. 2.



Witnesses:
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UNITED STATES PATENT OFFICE.

MAGNUS UNGER, OF PITTSFIELD, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

FEEDER-REGULATOR.

1,208,704.

Specification of Letters Patent.

Patented Dec. 12, 1916.

Application filed June 20, 1913. Serial No. 774,778.

To all whom it may concern:

Be it known that I, MAGNUS UNGER, a citizen of the United States, residing at Pittsfield, county of Berkshire, State of Massachusetts, have invented certain new and useful Improvements in Feeder-Regulators, of which the following is a specification.

My invention relates especially to automatic regulators, particularly to those of the induction type for regulating the voltage on feeders.

The object of my invention is to provide an automatic operating mechanism particularly applicable to small regulators, of a rugged construction, accurate in operation, as simple as may be, and suitable for outdoor installation, subject as such regulators must be to lack of proper attention and care.

The novelties of my invention are involved in the operating mechanism, a means for preventing the operation of the device beyond fixed limits and the adjustment for the controlling mechanism, as pointed out in the appended claims.

In the accompanying drawings which form a part of this specification, I have illustrated a construction embodying my invention.

Figure 1 is an elevation, partly in section, of an induction regulator embodying my invention, and Fig. 2 is a plan view of the same with the top of the casing removed.

In the lower part of the regulator case 1 is located the regulator 2 which as shown is of the ordinary induction type; its general construction will be understood without further description. The rotatable parts are controlled and operated by the shaft 3. The connection of the regulator to the line is immaterial so far as my present invention is concerned. The base 4 carries the operating and controlling mechanism for the regulator; through this base passes the shaft 3. The motor 5 is designed to run constantly while the regulator is in service and to drive the gear 6 through a worm. This gear 6 in turn drives an arm 7 reciprocating the link 8 and oscillating the arm 9 which is, to obtain this result, longer than the arm 7. The arm 9 is carried by a sleeve 10 also carrying a rocker arm 11. The rocker arm 11 has pivoted to it at opposite sides of it-

self two latches 12 and 13, and two catches therefor 14 and 15; these engage with the upper ends of the latches 12 and 13 to hold them against the tension of their respective springs 16 and 17. The catches 14 and 15 also have springs tending to hold them in the positions shown in the drawing. A toothed wheel 18 is mounted to rotate about an axis in line with the axis of the rocker arm 11 and in the plane of the latches 12 and 13. The catches 14 and 15 when in engagement with the latches 12 and 13 hold these latches out of engagement with the wheel 18, but when either of these latches is released from its catch, its respective spring 16 or 17 moves it into engagement with the teeth of the wheel 18. The ends of the latches are so constructed that each may turn the wheel 18 in one direction, this direction being opposite to the direction in which the other latch may turn the wheel 18. It will be apparent from this that when the motor is rotated and one of the latches 12 or 13 is released from its catch 14 or 15, that latch will engage the teeth of the wheel 18 and, with each oscillation of the rocker arm 11, rotate the wheel 18 through approximately the same number of degrees as it is itself oscillated.

To disengage the latches from the teeth of the wheel I provide a trip or tripping finger 19 midway between the latches in the position shown in the drawings. On each latch also I have provided a projection 20 so shaped that when a latch, free from its catch, is oscillated over the finger 19 near the end of its operating stroke, it is raised from engagement with the wheel 18 sufficiently to engage with its catch 14 or 15, as the case may be. Its catch then retains it out of engagement with the wheel 18 until later released.

The wheel 18 is carried on a shaft also carrying a worm gear 21 meshing with a sector gear 22 attached to the shaft 3. The sleeve 10 is loosely mounted on this shaft. The shaft has a bearing in the bracket 39 and in another bracket at the opposite side of the case. Thus as the wheel 18 is rotated in one direction or the other, it rotates the regulator mechanism 2 in the corresponding direction.

The continued rotation of the wheel 18

in either direction would result obviously in carrying the sector gear 22 to such a position as to be out of engagement with the worm gear 21; thus the gear wheel 18 and worm gear 21 would be unable to return the regulator mechanism 2 to its original position. To prevent this action I have provided the member 23, which consists of a double L-shaped member pivoted about the same axis as the wheel 18, with two arms extending approximately diametrically across the wheel 18. The two free ends of these arms carry cam-shaped projections 24 and 25 extending over the teeth of the wheel 18. Normally these cam-shaped projections are beyond the travel of the latches 12 and 13. The third free end 26 of the member 23 is normally held in the position as illustrated by means of a spring 27. A lever 28 is provided with two fingers 29, see particularly Fig. 2, and these two fingers embrace opposite sides of the end 26 of the member 23, see Fig. 1. The under face of the sector gear 22 is provided with projections 30 near its ends. These projections 30 are so located as to engage with the end 31 of the lever 28 and rotate this lever whenever the regulating mechanism 2 is brought near a limiting position. When this lever 28 is thus actuated, it actuates the member 23 about its axis, carrying the proper cam-shaped projection 24 or 25 into such a position that it comes between the latch 12 or 13 and the wheel 18, preventing the engagement of the respective latch with the teeth of the wheel and retaining it in position to be engaged by the catch 14 or 15, as the case may be.

To control the operation of the mechanism above described, I have provided a lever 32 carrying two detents 33 and 34 and pivoted between these detents to the stationary arm 35. This stationary arm 35 is carried on the bracket 36 carrying also the solenoid 37 which controls the lever 32. If the regulator is to regulate for voltage, this solenoid 37 will be energized in proportion to the voltage of the line, as will be readily understood. The arm 35 is slightly flexible and an adjustment of the lever 32 is obtained by means of the adjusting rod 38 which makes a screw-threaded connection between the free end of lever carrying end of the arm 35, and the stationary bracket 39. By means of this adjusting rod 38 and its screw-threaded connection between the bracket 39 and arm 35, the position of the end of the arm 35 may be changed, raising or lowering the pivot of the lever 32 as necessary. A spring 40 is adjustably connected to the end of the lever 32 opposite the solenoid 37, and to the bracket 39. This spring 40 aids in supporting the core of the solenoid and for further adjusting the lever 32 and its operation. The detents 33 and 34

are normally just out of the path of travel of the catches 14 and 15.

The operation of this device is as follows: The motor 5 rotates constantly and oscillates the rocker arm 11 as heretofore pointed out. Thus the latches 12 and 13, engaged with their catches 14 and 15, are carried about the wheel 18 and out of contact therewith and there is no rotation of the wheel 18 or the regulating mechanism 2. As the voltage rises or falls, either the detent 33 or the detent 34 is lowered. I shall assume that the detent 33 is lowered into the path of the catch 14. On the oscillation of the rocker arm 11 to the right, the catch 14 engages with the detent 33 and is moved thereby out of engagement with the latch 12. The spring 16 then forces the latch 12 into engagement with the teeth of the wheel 18 and the oscillation of the rocker arm 11 to the left carries the wheel 18 with it, thus turning the worm gear 21 and the sector gear 22 and the regulating mechanism 2. Toward the end of travel of the rocker arm 11 to the left, the projection 20 on the latch 12 engages with the trip 19, near the end of its operating stroke raising the latch 12 out of engagement with the wheel 18 and bringing it into engagement with its catch 14 which retains it out of engagement with the wheel 18 on the return of the rocker arm 11 to the right. If now, this operation of the regulating mechanism 2 has been sufficient to bring the voltage back to normal, the detent 33 has been raised out of the path of travel of the catch 14. However, should this movement of the regulating mechanism 2 have been insufficient to accomplish the required regulation, the detent 33 is still in the path of the catch 14 and again disengages this catch 14 from its latch 12, allowing the latch to engage with the wheel 18 again. The movement of the regulating mechanism is then continued as before described until the detent is returned out of the path of the catch 14. If the change in voltage on the line has been beyond the capacity of the regulator to correct, the regulating mechanism 2 will be rotated until one of the projections 30 engages with the end 31 of the lever 28 when this lever 28 will move the cam face 24 to such a position as to prevent the latch 12 from engaging with the teeth of the wheel 18 and maintain this latch in such a position that when the catch 14 is released from the detent 33, it immediately reengages the latch 12. Thus as long as the cam projection 24 is in this position, the rocker arm 11 oscillates backward and forward without moving the wheel 18, even though the detent 33 is in its lowermost position.

It will be noticed that the regulating mechanism 2 must be operated through more or less of the mechanism of which the

rocker arm 11 and its latches are a part. The induction type of regulator offers considerable resistance to movement in one direction and it is necessary to hold such a regulating mechanism in position against a considerable tendency to rotate to a neutral position. Hence it is that the worm and sector gear connection between the tooth wheel 18 and the shaft 3 is peculiarly applicable. This connection prevents the backward rotation of the regulating mechanism due to its inherent tendency to rotate, and allows the regulating mechanism to be operated against considerable inherent stress with little pressure on the latches 12 and 13. This regulator is inclosed in a case 1 and adapted for outdoor use. An opening 41 in one side of this case or tank opposite the operating mechanism provided with a door 42, allows ready access to the operating mechanism for inspection and adjustment. To protect the regulator against dirt and moisture which is likely to beat in through the opening 41, even though closed by the door 42, I provide a pocket 43 in the tank 1 adjacent to and below the opening 41. Any moisture or dirt which may be beaten into the case through the opening is then deposited in this pocket 43 out of contact with the operating parts of the regulator.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In a regulator, the combination with means for operating the regulating mechanism comprising a toothed wheel, an oscillating rocker arm, a latch carried by said arm and engaging with the teeth of the wheel to rotate the same and means for controlling the engagement of the latch with the wheel, of means for limiting the total movement of the wheel comprising a member movable under the latch to prevent its engagement with the wheel, and means to move said member under the latch when the regulating mechanism has been operated to a predetermined position.

2. In a regulator, the combination with means for operating the regulating mechanism comprising a toothed wheel, an oscillating rocker arm, a latch carried by said arm and engaging with the teeth of the wheel to rotate the same, and a catch also carried by said arm to hold said latch out of engagement with the wheel, of means for limiting the total movement of the wheel comprising a cam movable to a position to engage with the latch to hold it in position to be engaged by the catch, and means to move said cam to such position when the regulating mechanism has been operated to a predetermined position.

3. In a regulator, the combination with means for operating the regulating mechanism comprising a toothed wheel, an oscillat-

ing rocker arm, a latch carried by said arm and engaging with the teeth of the wheel to rotate the same and a catch also carried by said arm to hold said latch out of engagement with the wheel, of a cam movable to a position between the latch and the wheel to prevent its engagement with the wheel and to hold it in position to be engaged by the catch, and means to move said cam to such position when the regulating mechanism has been operated to a predetermined position.

4. In a regulator, the combination with means for operating the regulating mechanism comprising a toothed wheel, an oscillating rocker arm, two latches carried by said arm and engaging with the teeth of said wheel to rotate it in opposite directions and two catches also carried on said arm to hold said latches out of engagement with the wheel, of a pivoted member having two cam faces movable to positions between the respective latches and the wheel, and a lever for moving said member operated by said regulating mechanism.

5. In a regulator, the combination with means for operating the regulating mechanism comprising a toothed wheel, an oscillating rocker arm and a latch carried thereby for engaging the teeth of the wheel and operating the same, of a tripping means located to engage the latch near the end of its operating stroke to disengage the latch from the teeth.

6. In a regulator, the combination with means for operating the regulating mechanism comprising a toothed wheel, an oscillating rocker arm, a latch carried thereby for engaging the teeth of the wheel and operating the same and a catch also carried by the rocker arm to hold the latch out of engagement with the wheel, of a tripping means located to engage the latch near the end of its operating stroke to disengage the latch from the teeth and to cause the latch to engage with the catch.

7. In a regulator, the combination with means for operating the regulating mechanism comprising a toothed wheel, an oscillating rocker arm, two latches carried on opposite sides of said rocker arm to engage the teeth of the wheel and rotate the same in opposite directions, the latches respectively rotating the wheel as the rocker arm moves toward its central position, and catches also carried by said rocker arm to engage the latches and hold them out of engagement with the wheel, of a stationary trip located between the latches to engage the same near the ends of their respective operating strokes to disengage the latches from the teeth and to cause the latches to engage the catches.

8. In a regulator, the combination with means for operating the regulating mechanism and controlling means therefor comprising a lever, detents thereon for engag-

ing the operating means and a stationary arm supported at one end and pivotally supporting said lever between said detents, of an adjusting rod between the arm and a stationary part to adjust the position of the lever.

9. In a regulator, the combination with means for operating the regulating mechanism and controlling means therefor comprising a lever, detents thereon for engaging the operating means and a stationary arm

supported at one end pivotally supporting said lever, of an adjusting rod between the free end of the arm and a stationary part to adjust the position of the lever.

In witness whereof, I have hereunto set my hand this seventeenth day of June, 1913.

MAGNUS UNGER.

Witnesses:

E. F. GEHRKENS,
F. J. CHAMPLIN.