Nov. 10, 1925. 1,560,724

L. M. POTTS

REGULATING SYSTEM

Filed Oct. 26, 1922 2 Sheets-Sheet 1

Fig. 1.

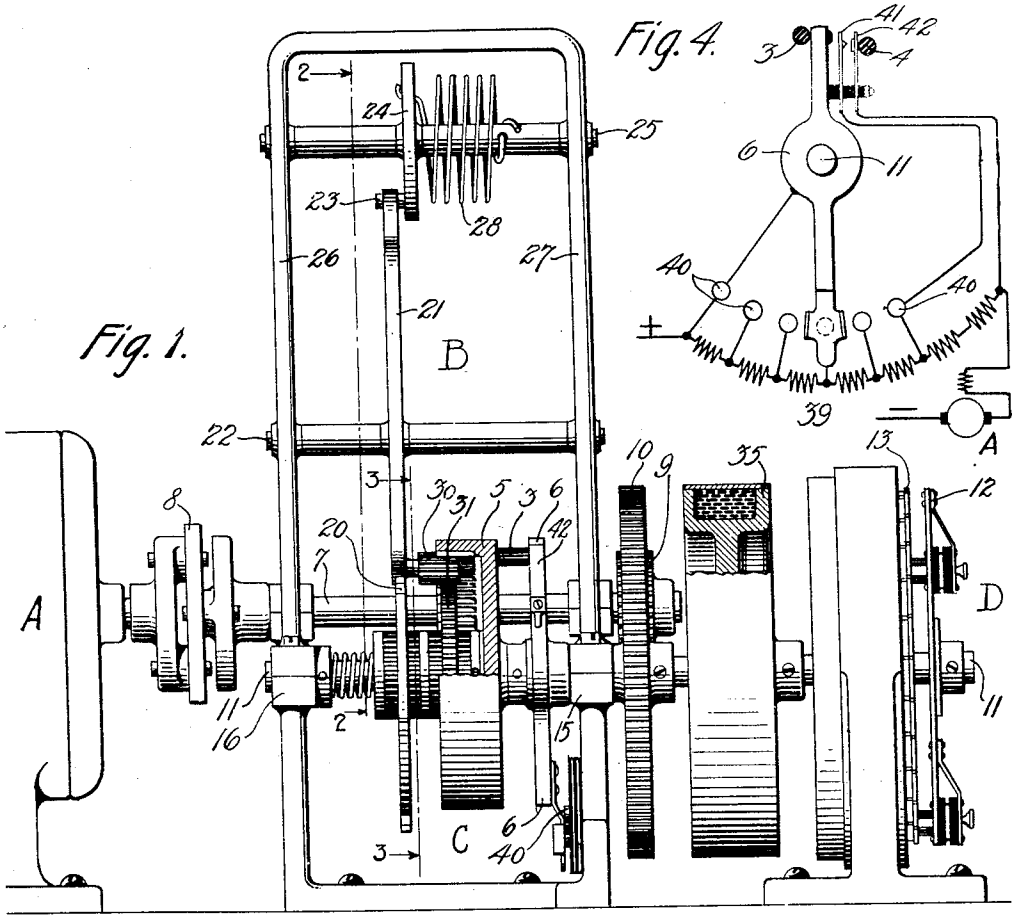


Fig. 4.

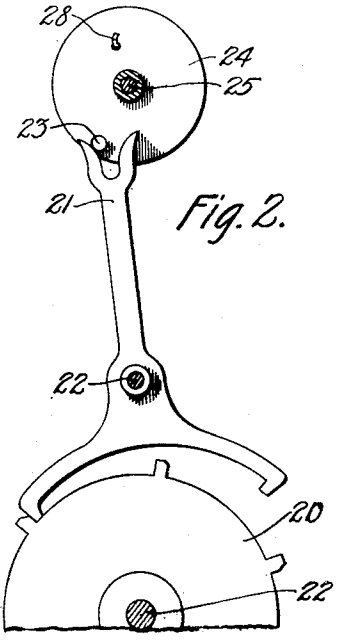
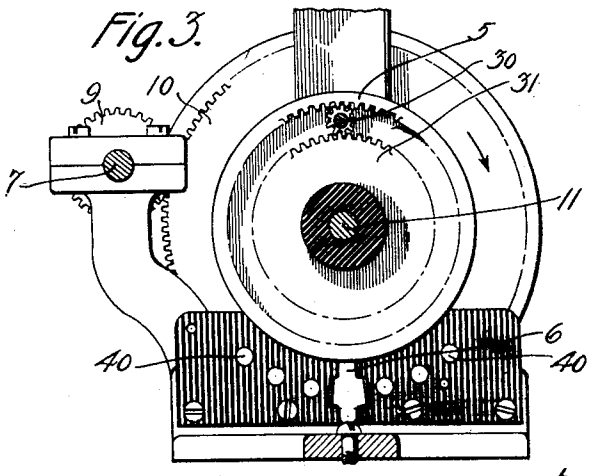


Fig. 2.

Fig. 3.



Inventor:
Louis M. Potts
by Joel A. Palmer Att'y.

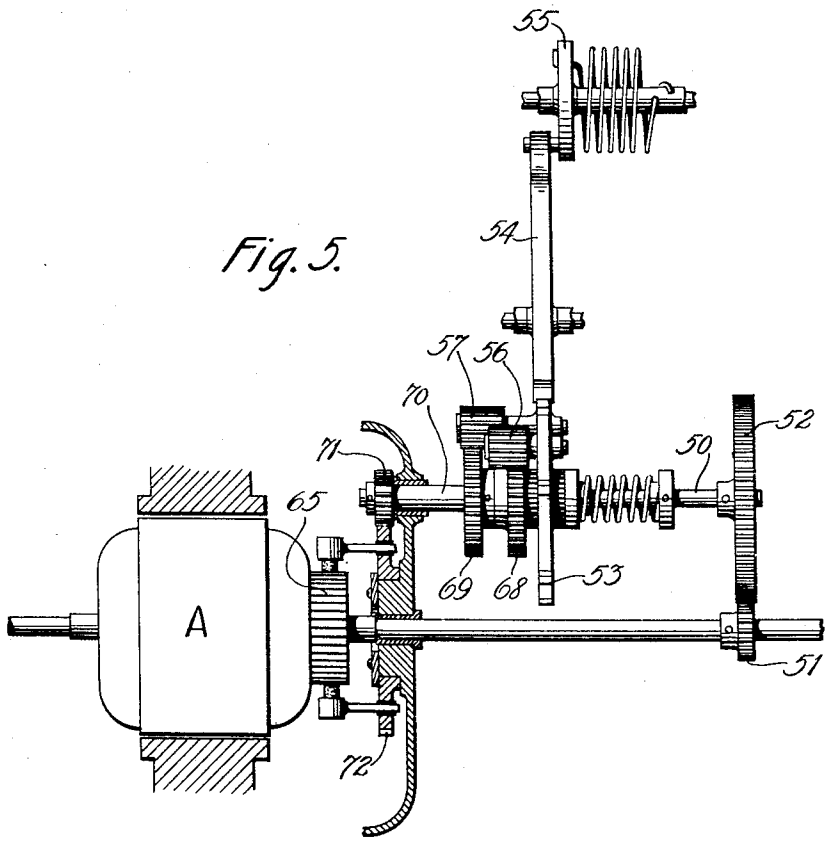
Nov. 10, 1925. 1,560,724

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Filed Oct. 26, 1922 2 Sheets-Sheet 2

Fig. 5.



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UNITED STATES PATENT OFFICE.

LOUIS M. POTTS, OF HIGHWOOD, NEW JERSEY, ASSIGNOR TO WESTERN ELECTRIC COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

REGULATING SYSTEM.

Application filed October 26, 1922. Serial No. 596,941.

To all whom it may concern:

Be it known that I, LOUIS M. POTTS, a citizen of the United States of America, residing at Highwood, in the county of Bergen, State of New Jersey, have invented certain new and useful Improvements in Regulating Systems, of which the following is a full, clear, concise, and exact description.

This invention relates to regulating systems and particularly to devices for governing the speed of electric motors.

Its object is a regulating device suitable for use in connection with the driving motors of printing telegraph and like apparatus.

The invention in its preferred form provides a device having a definite natural period of operation such as a balance and escapement mechanism driven by power from the motor to be regulated and means under the joint control of the motor and the balance and escapement mechanism for increasing or decreasing the current supplied to the motor whenever the motor starts to fall below or passes beyond the desired normal speed.

Referring to the drawings, Fig. 1 shows one embodiment of this invention; Fig. 2 is a view of the mechanism taken along the line 2—2 of Fig. 1; Fig. 3 is a sectional view taken along the broken line 3—3 of Fig. 1; Fig. 4 is a detail view showing the arrangement of the resistance with the motor circuit. Fig. 5 illustrates a modification of the arrangement shown in Fig. 1.

In the drawing is shown an electric motor A, whose speed it is desired to keep constant, but which normally varies, and a balance and escapement mechanism B having normally a constant rate. A rotary member 5 and an arm 6 adapted to be actuated by the member 5 are provided for regulating a variable resistance in the motor circuit. With any given gear arrangement there is some value of the ratio between the speed of the motor and the rate of the balance for which rotary member 5 will remain stationary except for a slight oscillation about a fixed position due to the starting and stopping action of the balance and escapement. Variations of the motor speed, from the value which gives the ratio above referred to, will move regulating arm 6, which in turn increases or decreases the value of the regulating resistance. By the selection of a suitable rate for the balance, and a proper gear arrangement, the motor A may be made to run at any chosen speed.

In Fig. 1 a motor A is coupled with a shaft 7 by a flexible coupling 8, such as is commonly employed in printing telegraph apparatus. The shaft 7, which is supported in suitable bearings, has secured thereto a pinion 9, which is meshed with the teeth of a gear wheel 10 secured to a shaft 11. This shaft 11 is journaled in the uprights 15 and 16, and has secured thereto a brush arm 12 of the distributor D. The distributor D comprises a segmented ring 13 and a continuous ring (not shown), over which the brush or brushes carried by the brush arm 12 are arranged to sweep.

The shaft 11 has loosely mounted thereon the internally geared drum 5, and also drives through a suitable friction clutch an escapement wheel 20, which forms a part of the balance and escapement mechanism B. The balance and escapement mechanism B, in addition to the escapement wheel 20 comprises an anchor 21 rotatably mounted on a shaft 22; an impulse pin 23 secured to a balance wheel 24, which is mounted on a shaft 25 supported by uprights 26 and 27, and adapted to move in a manner whereby the pin 23 engages the fork of the anchor 21; and a helical spring 28 which has one end fastened to the balance wheel 24, while the other end is secured to the shaft 25. The escapement wheel 20 is provided with six teeth so that a suitable relation exists between the speed of the balance and escapement mechanism and that of the element which is driven by the motor.

Power is communicated to the escapement wheel 20 through a suitable friction clutch, and rotates it until it is stopped by the action of the radial faces of the escapement wheel 20 with one pallet of the anchor 21. The balance 24, due to its inertia, continues its swing, and on its return, the impulse pin 23 engages the fork of the anchor 21, releasing the escapement wheel 20 and allowing the mechanism controlled thereby to rotate. The engagement of the radial faces of the escapement wheel 20 with the pallets of the anchor 21 gives an impulse to the balance wheel 24, which in this manner maintains its motion. As the balance swings, the escapement wheel 20 moves step by step with

intervals of rest, the length of which are determined by the relation of the rate of the balance to the speed of the motor.

Also secured to the shaft 11 is a gear wheel 31, which has its teeth meshed with those of a pinion 30, which in turn is carried by a projection mounted on the escapement wheel 20. As shown in Fig. 3, the pinion 30 is arranged to mesh with both the teeth of the gear wheel 31 and those formed on the inner surface of the drum 5. When the speed of the motor A and a corresponding rate of the balance and escapement mechanism have a predetermined ratio, the pinion 30 will merely roll around on the teeth of the gear wheel 31, thereby producing no relative movement of the drum 5. The rate of the balance should be so chosen that the corresponding speed of the motor for a given condition is the speed desired. The drum 5 has secured thereto, a pair of pins 3 and 4 which are arranged on opposite sides of regulating arm 6. Pin 4 is arranged to operate a pair of contacts 41 and 42 which are carried by the arm 6. Regulating arm 6 is frictionally mounted on shaft 11 and arranged to be moved over a series of contacts 40 by the pins 3 and 4. The contacts 40 are arranged in a semi-circle below drum 5 and have connected thereto the sections of a resistance 39. This resistance 39 is connected in the operating circuit of the motor A and serves to control the current passing therethrough. A fly-wheel 35 is provided for dampening out slight fluctuations in the speed of the driving shaft.

Due to the fact that the escapement wheel 20 and pinion 30 are alternately rotating and stopping due to the periodic action of the balance and escapement and shaft 11 is moved with a uniform motion, drum 5 will oscillate, and consequently pin 4 closes and opens contacts 41 and 42 for each oscillation of the balance without disturbing the position of the regulating arm 6. These contacts serve to increase and decrease the resistance in the motor circuit whereby slight fluctuations in the speed of the motor are compensated for, thus causing the shaft 11 to be driven at a constant speed.

As previously stated, when the desired speed relation exists between the motor A and the balance and escapement mechanism B, the pinion 30 which is secured to the escapement wheel 20 merely rolls around on the teeth of the gear wheel 31, and produces only the slight angular displacement or oscillation of the drum 5 referred to above. However, should the speed of the motor A increase to a point where the normal relation between the speed of the motor and that of the balance and escapement mechanism B no longer exists, the pinion 30, which, owing to the control of the balance and escapement mechanism, makes the same number of revolutions each minute, rotates drum 5 in the direction of the arrow. The rotation of the drum 5 in this direction causes a corresponding movement of the regulator arm 6 through the movement of pin 3 whereby the amount of resistance in circuit with the motor A is increased due to the passage of one end of the regulator arm 6 over the contact points 40. In this way the current through the motor A is decreased, whereby the increase in speed is automatically compensated for and the distributor D will continue to be driven at the predetermined constant speed. The reverse condition exists when the speed of the motor A decreases to a value below normal. In this case, the combined effect of the gear wheel 31 and the pinion 30 causes the drum 5 to be rotated in a direction opposite to the arrow, whereby the arm 6, which is now engaged by pin 4, is caused to move in the reverse direction. With the movement of the arm 6 in the reverse direction, the amount of resistance 39 connected in the motor circuit is decreased, whereby an increase in current to the motor A results so that the speed of the motor is compensated for, which results in the distributor D being driven at the predetermined constant speed.

In the modification shown in Fig. 5, in place of controlling the motor circuit, mechanism is shown for changing the position of the brushes with respect to the commutator 65 of the motor, thus causing the same effect as in the case where a change in the field circuit was produced. In this modification, the shaft of the motor A has secured thereto a pinion 51, which drives a gear wheel 52, in turn mounted on a shaft 50. The shaft 50 also has secured thereto a gear wheel 68. Arranged to be driven through a suitable friction clutch by power communicated from the shaft 50, is an escapement wheel 53, which as in the arrangement shown in Fig. 1, is arranged to be controlled by an anchor 54, the movement of which is controlled by a balance wheel 55. The escapement wheel 53 has rigidly secured thereto a pair of projections, which have rotatably mounted thereon a corresponding number of pinions 56 and 57. These pinions are meshed with each other. The former pinion engages the teeth of the gear wheel 68 while the latter pinion engages the teeth of a gear wheel 69, which is mounted on a sleeve 70. A pinion 71 is also mounted on sleeve 70 and engages teeth on the brush rack 72. For any given rate of the balance there will be a speed of the motor A for which the pinions 56 and 57 merely roll around on the teeth of the gear wheels 68 and 69, and gear wheel 69 remains stationary. However, when the speed of the motor A varies from this, a result is produced whereby the pinion 71 is rotated for causing

the corresponding rotation of the brush rack 72, upon which the brushes engaging the commutator 65 are secured. The operation of the mechanism is similar to that described in connection with Fig. 1 and a further description of the mechanism shown in Fig. 5 is therefore considered unnecessary.

It is apparent from the previous description that the invention provides an arrangement whereby the speed of the motor A may be controlled through the action of a balance and escapement mechanism B, which has a constant and uniform motion.

Although the invention has been shown as applied to a particular type of apparatus, it is of course obvious that other variations may be made without departing from the spirit and scope of the present invention.

What is claimed is:

1. In combination, a single source of motive power, means having a natural period of oscillation operated by power derived from said source of motive power, an element driven mechanically by power communicated thereto from said source of motive power, and means controlled jointly by said source of motive power and said first recited means for controlling the speed of the driven element.

2. In combination, a single source of motive power, means having a natural period of oscillation operated by power derived from said source of motive power, an element driven mechanically by power communicated thereto from said source of motive power, and means common to said source of motive power and said first-mentioned means and controlled thereby for causing said element to be driven within predetermined speed limits.

3. A device for controlling the speed of a member driven mechanically by a motor, the speed of which is variable, including means acting to vary the current delivered to said motor for effecting changes in the speed thereof, means having a natural period of motion and operating at a constant rate by power derived from said motor, and means controlled conjointly by said motor and said second recited means for rendering said first mentioned means effective for changes in speed of said motor to maintain the speed of said member constant.

4. In combination, a motor, a driven element directly and mechanically connected to said motor, means for regulating the speed of said motor whereby said element is driven at a constant and uniform speed comprising a speed control means operative directly on said motor, a balance and escapement mechanism operated by power derived from the said motor, and means common to said motor and said balance and escapment mechanism and controlled by variations in the speed of said motor from the rate of said balance and escapement mechanism for operating said speed control means.

5. In combination, a motor, an adjustable resistance operatively associated therewith, a balance and escapement mechanism having a constant and uniform rate, means for increasing and decreasing the amount of resistance operatively associated with said motor, and means substantially stationary when the speed of said motor and balance and escapement mechanism bear a predetermined relation to take care of slight changes in speed of said motor for operating said first recited means periodically.

6. Means for regulating the speed of a motor by the action of a balance and escapement mechanism comprising a resistance for the motor, means for increasing and decreasing the amount of resistance connected with said motor, and means controlled jointly by said motor and balance and escapement mechanism for periodically rendering a portion of said resistance effective to take care of slight variations in the speed of said motor.

7. In combination, a motor, a driven element directly and mechanically connected to said motor, means for regulating the speed of said motor whereby said element is driven at a constant and uniform speed comprising a body capable of harmonic motion operated by power derived from said motor, means common to said motor and said body and rotated due to variations in the speed thereof from the rate of said body for operating said speed control means.

In witness whereof, I hereunto subscribe my name this 24th day of October, A. D., 1922.

LOUIS M. POTTS.