Dec. 15, 1925. 1,565,333

F. J. SEABOLT

ELECTRIC CLOCK

Filed Feb. 20, 1924

Fig. 1.

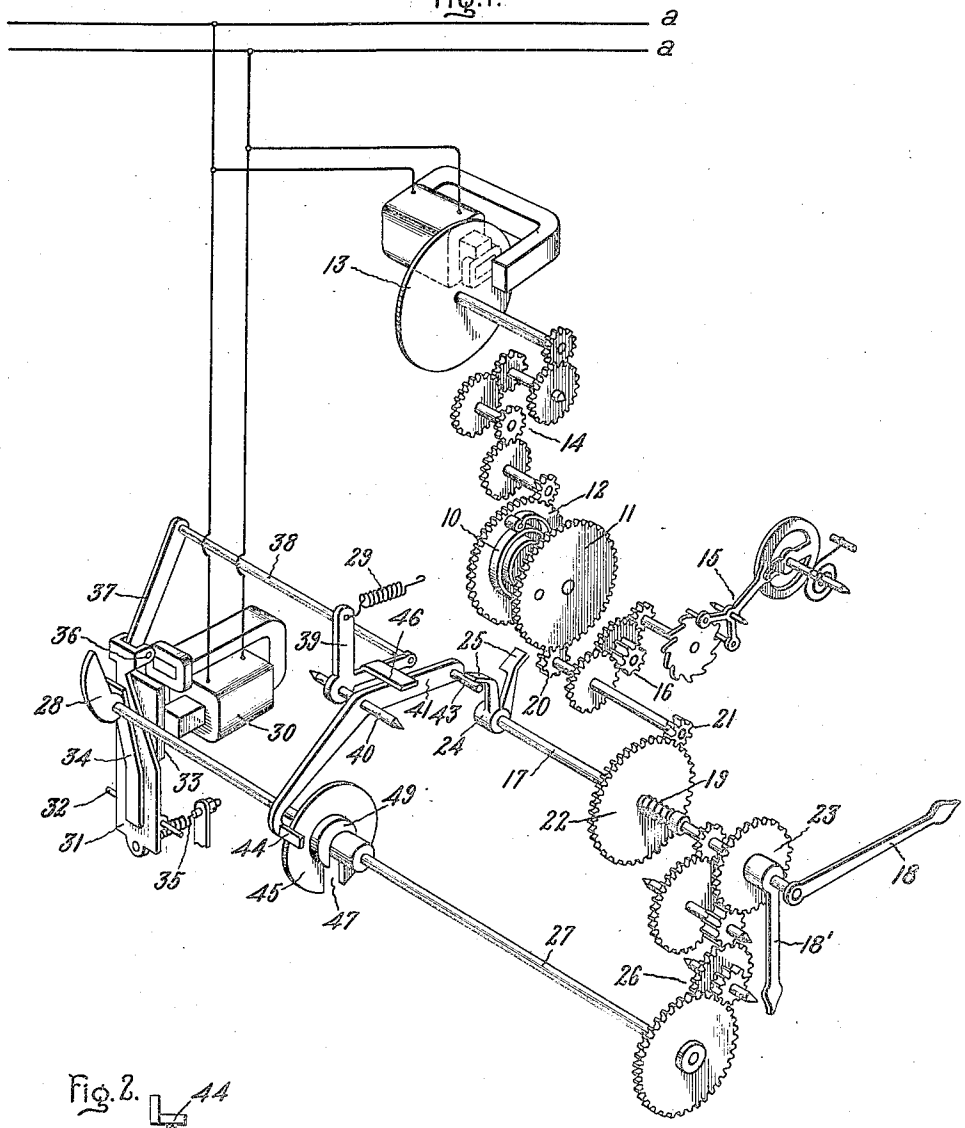



Fig. 2.

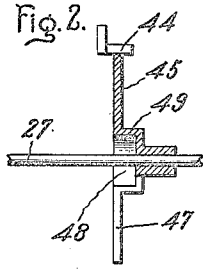
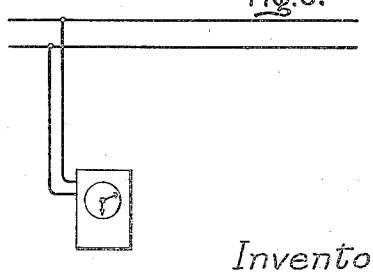



Fig. 3.



Inventor:

Frank J. Seabolt

Patented Dec. 15, 1925. 1,565,333

# UNITED STATES PATENT OFFICE.

FRANK J. SEABOLT, OF SCHENECTADY, NEW YORK, ASSIGNOR TO SERVICE CLOCK COMPANY, A CORPORATION OF NEW YORK.

## ELECTRIC CLOCK.

Application filed February 20, 1924. Serial No. 693,954.

*To all whom it may concern:*

Be it known that I, FRANK J. SEABOLT, a citizen of the United States, residing at Schenectady, State of New York, have invented certain new and useful Improvements in Electric Clocks, of which the following is a specification.

My invention relates to improvements in electric clocks intended more particularly for connection to an electric lighting or power circuit so as to operate entirely automatically.

It has heretofore been proposed to utilize the electric lighting circuit to furnish correct time to a community. This involves the idea of connecting a time keeping mechanism such, for instance, as the usual spring operated clock, which is preferably electrically wound, to the circuit and providing means whereby the manipulation of the electric circuit such as the instantaneous opening of the circuit or the dropping of the voltage will effect the setting of all the clocks connected to the circuit. In order to be a commercial success, a clock of this character must be such that it is practically free of the possibility of getting out of order or becoming deranged by the interruption of the circuit for periods of at least two or three hours as well as from the failure to manipulate the circuit at the proper time as contemplated. The clock must be a fairly good time piece, that is, it should not vary more than two or three minutes or possibly five minutes in 24 hours, particularly if the setting is to be made only once a day. It should be of the simplest possible construction with the various functioning parts so interlocked that by no possibility can they get out of synchronism due to manipulation of the hands.

In carrying out my invention I provide a clock of this character having a minimum of working parts of the simplest construction. The arrangement is such that the setting mechanism will function only when the circuit is manipulated at the time intended, and any failure to manipulate or any interruption at any other than the predetermined time will have no effect whatever upon the clock. In order to further simplify the clock I preferably employ a winding motor permanently connected to the circuit which maintains the spring at a constant tension, there being enough reserve in the spring to keep the clock mechanism running for several hours in case of failure of power, and also eliminate all electrical contacts.

In the accompanying drawing, in which I have illustrated one embodiment of my invention, Fig. 1 is a perspective view showing the construction. Fig. 2 shows a detail, and Fig. 3 shows the clock connected to the circuit.

Referring to the drawing, 10 represents the spring of the clock, one end of which is connected with the gear 11 which drives the clock hands, while the other end is connected with gear 12 driven by the electric motor 13, which winds the spring.

The electric motor may be of any well known type, but I have found a motor of the induction disc type, such as I have illustrated, is particularly well adapted for the purpose. This motor drives the gear 12 through reduction gearing 14, the torque of the motor and the gear ratio being such that the motor will be practically constantly running at a slow speed and maintain a substantially constant tension on the spring. In other words, the energy put into the spring will be substantially equal to the energy consumed in driving the mechanism, the spring being normally balanced against the motor.

I have shown for purposes of illustration, a lever escapement mechanism 15 connected with the gear 11 by gearing 16 for purposes well understood in the art. An arbor 17 carrying the minute hand 18, is driven in the usual manner by a friction drive 19 from the gear through gears 20, 21 and 22, the hour hand 18′ being driven therefrom by the gear 23 in the well known manner.

Secured to the end of the arbor 17 is a V shaped element 24, for the purpose of setting the hands. This simply consists of two converging surfaces 25, mounted on arms which form a V, the adjacent ends of the surfaces being separated as shown. Driven from the arbor 17 through gearing 26 is a shaft 27. As shown, the gearing is such that the shaft will make one revolution in 24 hours, this being the period between settings of the hands. Obviously this period may be changed as desired. Secured to the end of shaft 27 is a cam 28 which gradually moves the hand setting mechanism against the bias provided by the spring 29 until it

is held by the magnet 30. The cam acts upon an armature member 31 pivoted at 32 and provided with an armature 33 which cooperates with the magnet 30. A spring strip 34 is secured to the member and the cam bears upon this strip to move the member 31 on its pivot. A spring 35 acting upon the member below the pivot biases the armature member away from the magnet. Pivoted at 36 is an arm 37 which forms a toggle with the armature member. The free end of arm 37 is connected by a link 38 with one end of a bell crank lever 39 pivoted at 40, the other end of the lever being connected to spring 29. As the shaft 27 turns in a counter-clockwise direction (looking at the clock dial), the cam 28 moves the armature member toward the magnet, thereby straightening out the toggle formed by the member with arm 37 and pulling on the link 38 to turn the bell crank lever 39 on its pivot against the tension of the spring 29. The toggle mechanism is, therefore being straightened out against the tension of the spring 29. As the armature member approaches the magnet, the tendency to move away from the magnet decreases, due to the straightening of the toggle. Obviously if the pivots 32 and 36 should form a straight line with the pivotal point of arm 37 with link 38, the toggle would become "set" and there would be no tendency for the armature member to move away from the magnet and, if moved a little further it would be "over set". The magnet is so located, however, that the armature engages it just before the "set" condition is reached and while there is a slight tendency for the armature member to move away from the magnet. It requires therefore but a slight pull of the magnet to hold the armature member and since the pull of the member away from the magnet is slight, there will be no chattering due to the alternating current which energizes the magnet. It will be understood that as the cam continues to revolve, its face ceases to engage the member which is now held by the magnet, and the member is free to move back when released by the magnet.

While the setting mechanism above described is moving slowly the setting member 41 remains stationary. This member is pivoted concentrically with bell crank lever 39 and is provided with a pin 43 which cooperates with the V shaped element 24. The portion of the setting member which is on the opposite side of the pivot from the pin 43 terminates in a bent portion 44 which rests against a disc 45 secured to shaft 27. The weight of the setting member is so distributed about its pivot that the pin 43 has a tendency to move upward away from the centre of the V shaped member, and this tendency is normally resisted by the disc 45. It will be observed that there is a lug 46 on the bell crank lever which projects over the setting member and the latter member, if unrestrained by the disc would follow the bell crank lever and remain in engagement with the lug. A slot 47 is provided in the disc however, into which the bent portion 44 may enter when the disc reaches the proper point in its revolution. At this point, which will be after the bell crank lever has been moved to its extreme position, the setting member will quickly turn on its pivot until it engages the lug 46 and the setting pin 43 will be in position to perform its setting operation when moved by the lug 46 upon the release of the armature member by the magnet. If, however, this release does not occur promptly after the setting member moves to setting position by reason of the entrance of the bent portion 44 into the slot 47, the setting member will be locked in the setting position and will in turn lock the toggle mechanism against movement when released by the magnet. This is to prevent the setting mechanism from operating at some time other than that determined upon and is brought about by the entrance of the bent portion 44 into the recess or pocket 48 formed by the hub 49 (Fig. 2). When the bent portion 44 enters the slot, it goes into the central recess 48 and can return so long as the disc does not move enough so that the sides of the slot will be engaged, that is it can return so long as the slot is in a position to form an exit from the recess 48 for the bent portion. After an interval, however, the bent portion becomes confined in the recess 48 and will not be released until the disc 49 makes nearly a complete revolution. The exact width of the slot 47 is not important so long as the setting member 41 is locked against movement within an hour after the V shaped member reaches the position to be engaged by the pin 43 in case the magnet 30 does not release the setting mechanism when this position is reached. This insures that in case the circuit is not manipulated so as to cause the magnet 30 to release the setting mechanism at the proper time—say 12 o'clock midnight—it will not be released if for some reason the magnet should release the setting mechanism at about 1 o'clock—one hour later. If it were free to operate at that time it would probably set the hands erroneously. Nor will it be released for about 23 hours, so that any accidental failure of voltage during that time will have no effect upon the clock. Just before 12 o'clock midnight of the next night—something less than one hour before—it will be released from the recess so that upon the magnet releasing the setting mechanism, the setting operation will take place.

It will be noted that all of the parts are mechanically tied together so that they can-

not get out of synchronism. For a certain position of the hands, the disc 47 and the cam 28 will always be in the same position. The toggle mechanism is moved very slowly, taking more than 12 hours to make a complete movement, thereby applying very little load to the hands, while the setting member 41 is moved quickly so as not to interfere with the V shaped element in its movement.

The operation of my device will now be clear. Upon connecting it to the lighting circuit, which in this case is an alternating current circuit because of the nature of the motor 13, the motor will operate rapidly for a while since there will be no tension on the spring. As the tension approaches normal the motor slows down and, with the escapement mechanism started, will run slowly—just fast enough to restore energy to the spring as fast as it is consumed. The disc of the motor does not necessarily rotate continuously without a stop but it has a substantially continuous movement. Slight irregularities in the spring, variation of friction, etc., cause the speed of the motor to vary somewhat and, of course, it may stop for a brief interval, but, in general the balance between the tension of the spring and the torque of the motor is maintained. Assuming that 12 o'clock midnight is the time at which the setting is to take place, as the hands move the cam will gradually move the armature member 31 toward the magnet, the toggle mechanism gradually approaching the "set" condition. After a long interval, say for instance, about 20 or 22 hours, the toggle mechanism, in a slightly "underset" condition, will be held by the magnet and the projection 46 will be fully raised against the tension of spring 29. After this condition is reached, say for instance, about 11:30, the slot 47 in disc 45 comes under the bent portion 44, thereby allowing the setting member 41 to turn on its pivot until it engages the projection 46.

The pin 43 is now in a raised position. At 12 o'clock the V shaped member will be under the pin 43, and upon the release of the setting mechanism by the magnet, the projection 46 will be moved downward by spring 29 and carry with it the setting member 41. If the hands are slightly off, say for instance, 2 or 3 minutes or even 5 minutes, they will be corrected by the engagement of pin 43, with either of the surfaces 25, depending upon whether the clock is "fast" or "slow." The pin passes through the gap between the surfaces into a position where it does not interfere with the member. It may be stopped by engaging the hub of the V shaped element. The magnet may be caused to release the setting mechanism by a slight drop in the voltage of the lighting circuit *a*—*a*. A drop of 10% for a fraction of a second will cause the setting operation to take place with certainty. It will be seen that I have provided an electric clock which is automatically wound and set by a very simple mechanism and without any circuit controlling contacts. A constant tension is kept on the spring, thereby increasing the accuracy of the clock. Upon failure of voltage the clock will continue to run for several hours by reason of the power stored in the spring. The motor and magnet consume very little power since the work required of them is very slight.

While I have described my invention as embodied in concrete form and as operating in a simple manner in accordance with the prosisions of the patent statutes, it should be understood that I do not limit my invention thereto, since various modifications thereof will suggest themselves to those skilled in the art without departing from the spirit of my invention, the scope of which is set forth in the annexed claims.

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

1. The combination with a clock mechanism, of means for setting the hands thereof comprising a member gradually moved with the hands against a bias to a predetermined position, an electromagnet for holding it in said position and means whereby upon the release of the member the hands are set.

2. The combination with a clock mechanism, of means for setting the hands thereof comprising a member gradually moved mechanically against a bias by the movement of the hands to a predetermined position, an electromagnet for holding it in said position and means whereby upon the release of the member by the magnet and its return in response to its bias the hands are set.

3. The combination with a clock mechanism of means for setting the hands thereof comprising a cam driven with the clock hands, a member gradually moved with the cam against a bias to a predetermined position an electromagnet for holding the member in said position, and means whereby upon the release of the member by the magnet and its return in response to its bias the hands are set.

4. The combination with a clock mechanism of means for setting the hands thereof comprising an electromagnet, a setting mechanism moved so as to be held by said magnet and automatically movable to set the clock hands when released by the magnet while the hands occupy a predetermined position, and means for holding the mechanism against movement if released by the magnet while the hands occupy another position.

5. The combination with a clock mechanism of means for setting the hands thereof comprising a member gradually moved with the hands against a bias to a predetermined position, an electromagnet for holding it in

said position, a V shaped element on the minute hand arbor, and a pin moved by said member into engagement with the V shaped element to set the hands when the member is released and returns in response to its bias.

6. The combination with a clock mechanism, of means for setting the hands thereof, comprising a setting member on the minute hand arbor, an electro-magnet, a setting element having two positions and cooperating with the setting member to set the hands when moved to one of the positions, and an actuating element gradually moved into holding engagement with the magnet and arranged to move the setting element to set the hands when released by the magnet.

7. The combination with a clock mechanism, of means for setting the hands thereof comprising a V shaped member on the minute hand arbor, an electromagnet and a two part setting mechanism cooperating with the V shaped member one of which parts is moved gradually with the hands against a bias into a position of holding engagement with the magnet and the other part moved quickly to said position under the control of the hands, said first part when released carrying the second part with it into engagement with the V shaped member to set the hands.

8. The combination with a clock mechanism of means for setting the hands thereof comprising a V shaped element on the minute hand arbor, an electromagnet, a two part setting mechanism one part of which parts is gradually moved with the hand against a bias into holding engagement with the magnet, the other part following said first part quickly when the hands reach a predetermined position, means whereby the second part holds the first part against movement when the latter is released by the magnet unless the hands are in a certain position, said first part in moving in response to its bias carrying the second part with it into engagement with the V shaped element to set the hands.

9. The combination with a clock mechanism, of means for setting the hands thereof, comprising a setting member on the minute hand arbor, an electromagnet, a setting element having two positions and cooperating with the setting member to set the hands when moved in one of said positions, a slotted disk driven with the hands for controlling the movement of the member to its other position, and an actuating member gradually moved into holding engagement with the magnet and arranged to move the setting element to set the hands when released by the magnet.

10. The combination with a clock mechanism of means for setting the hands thereof comprising a toggle gradually moved by the hands toward locked position, a magnet for holding the same just before it reaches said position, a member moved with said toggle against a bias and means whereby upon the release of said toggle it returns and the member is moved thereby to set the clock hands.

11. The combination with a clock mechanism of means for setting the hands thereof comprising a cam driven with the clock hands, a toggle gradually moved by the cam toward locked position, a magnet for holding the same just before it reaches said position, a member moved with said toggle against a bias and means whereby upon the release of the toggle it returns and the member is moved thereby to set the hands.

12. The combination with a spring operated clock mechanism of a source of power to maintain the spring at a substantially constant tension, a member gradually moved with the clock hands against a bias to a predetermined position, an electromagnet continuously energized from the same source for holding the member in said position and means whereby upon the interruption of the normal condition of said circuit and the release of said member the hands of the clock are set.

13. The combination with a clock mechanism, of means for setting the clock thereof, comprising a setting member on the minute hand arbor, an electromagnet, a setting element having two positions and cooperating with the setting member to set the hands when moved to one of the said positions, a slotted disk driven with the hands for controlling the movement of the member to its other position and provided with a pocket for retaining the member against movement to said other position when the hands occupy certain positions, and an actuating element gradually moved into holding engagement with the magnet and arranged to move the setting element to set the hands when released by the magnet.

In witness whereof, I have hereunto set my hand this 19th day of February, 1924.

FRANK J. SEABOLT.