No. 667,016. Patented Jan. 29, 1901.

C. O. JANNEY.

AUTOMATIC CORRECTOR FOR STEP BY STEP MECHANISM.

(No Model.) (Application filed Dec. 26, 1899.)

2 Sheets—Sheet 1.

Fig. 1.

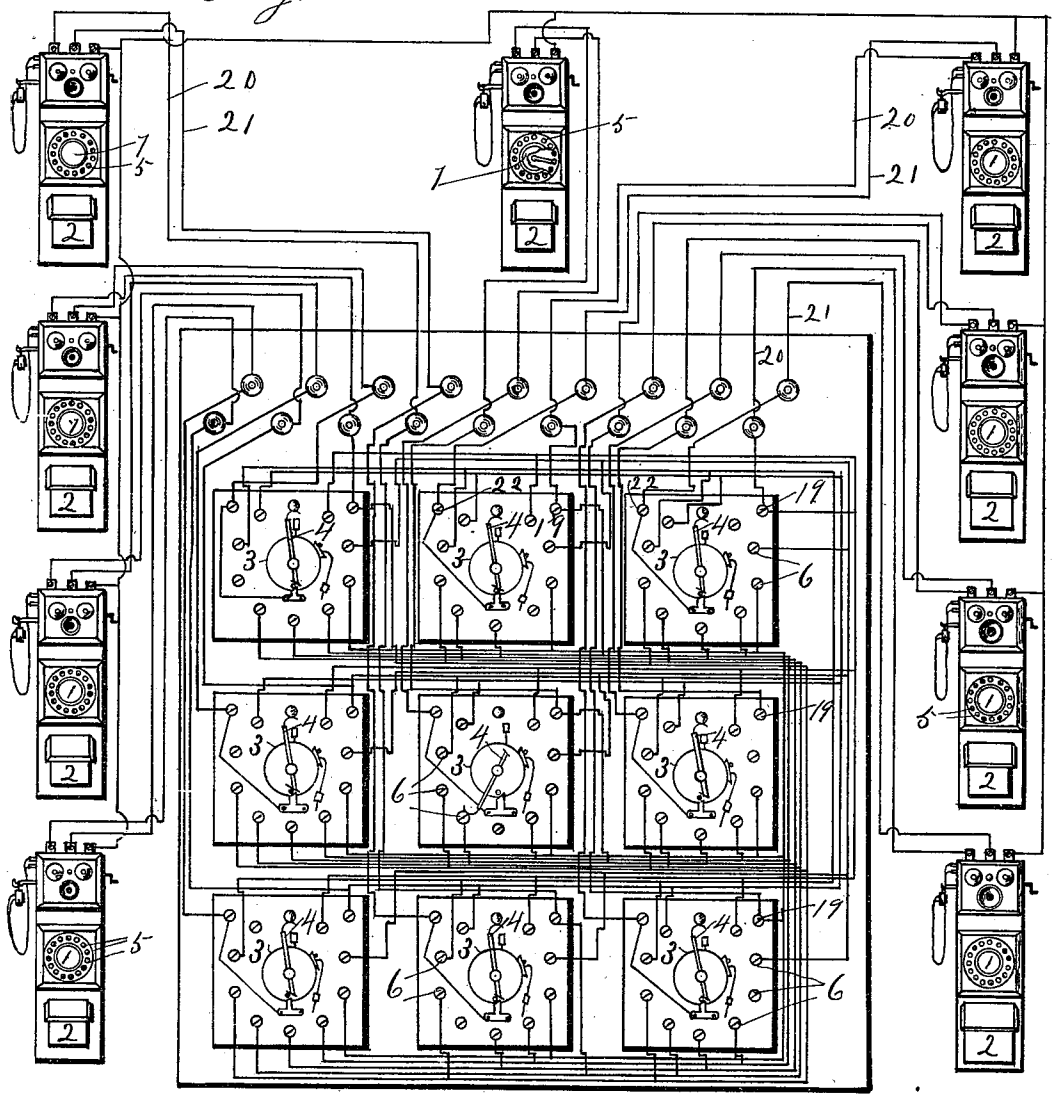

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Fig. II.

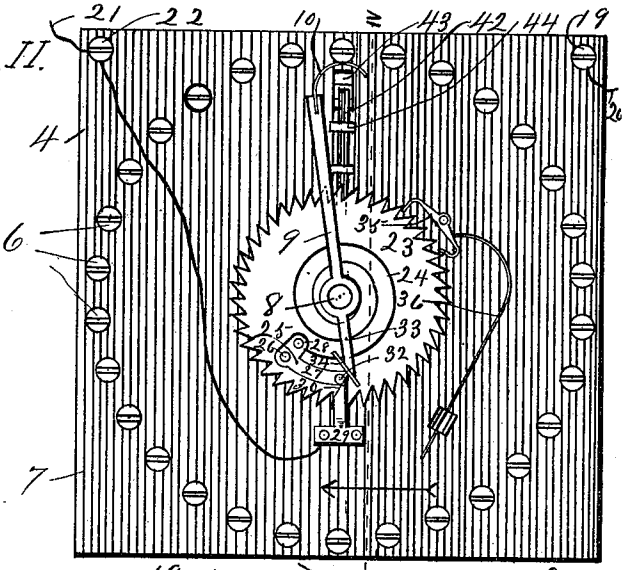


Fig. IV.

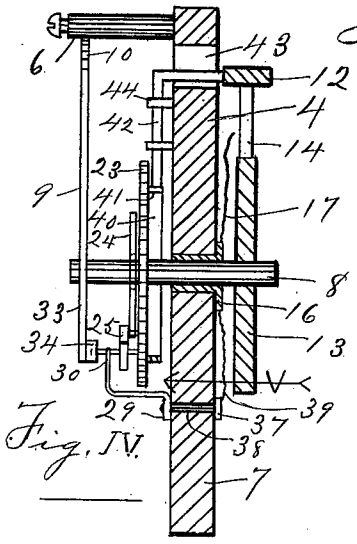


Fig. III.

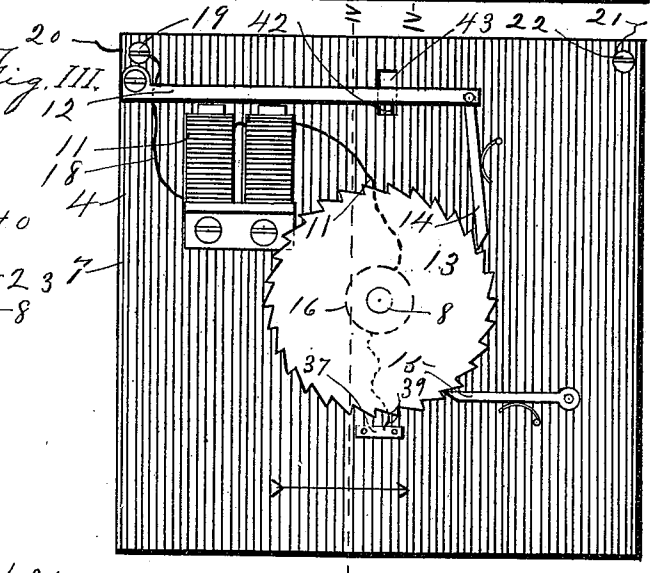


Fig. V.

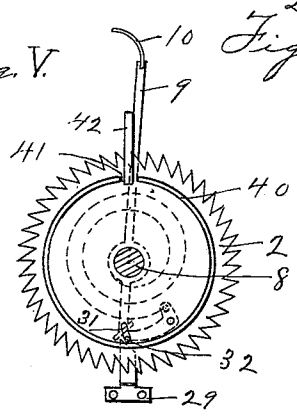
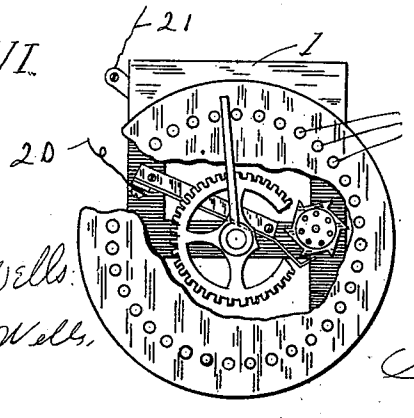


Fig. VI.



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UNITED STATES PATENT OFFICE.

CHARLES O. JANNEY, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO ADOLPH WISSLER, OF SAME PLACE.

AUTOMATIC CORRECTOR FOR STEP-BY-STEP MECHANISM.

SPECIFICATION forming part of Letters Patent No. 667,016, dated January 29, 1901.

Application filed December 26, 1899. Serial No. 741,509. (No model.)

To all whom it may concern:

Be it known that I, CHARLES O. JANNEY, a citizen of the United States, residing at St. Louis, Missouri, have invented a new and useful Automatic Corrector for Step-by-Step Mechanism Driven or Controlled by Electrical Impulses, of which the following is a specification.

My object is to provide means for automatically correcting the errors or discrepancies arising between step-by-step mechanism driven or controlled by electrical impulses and the mechanism sending or producing the impulses. In other words, I add to ordinary step-by-step mechanism means of keeping the driven mechanism in step with the driving mechanism.

My invention consists of a rotary switching member having a normal zero position and located at central, an automatic circuit-breaker located at an outlying station and having limiting-stops, said circuit-breaker also having a normal zero position and more points of contact than the switching member, an electrical connection between the switch and the circuit-breaker, electrically-controlled mechanism interposed in the circuit, so that the operation of the circuit-breaker operates the switch, and means of holding the switch at zero at the completion of its circuit until the circuit-breaker returns to zero, so that the circuit-breaker and switch will start upon new circuits simultaneously from their respective zero-points. For example, in an automatic telephone system each telephone has a central-station switch, an electromagnet for driving the switch or releasing spring-actuated mechanism which drives the switch, and a circuit-breaker at the telephone. The switch is very apt to get out of step with the circuit-breaker. The switch and circuit-breaker have corresponding dials or indicators, but it frequently happens that the switch is not at the number indicated by the number indicated by the circuit-breaker.

The object of my invention is to correct these errors, and I accomplish this object by operating the circuit-breaker enough so that the switch will be sure to get around to zero, then holding the switch at zero until the circuit-breaker gets around to zero. Then the switch and circuit-breaker will start from zero simultaneously.

Figure I is a diagrammatic view of an automatic telephone system with my invention incorporated. Fig. II is an enlarged detail view, in front elevation, of one of the central-station switches. Fig. III is a rear elevation of the switch shown in Fig. II. Fig. IV is a sectional detail substantially on the lines IV IV of Figs. II and III. Fig. V is a rear elevation of the escapement mechanism as seen looking in the direction indicated by the arrow V in Fig. IV. Fig. VI is a detail of the circuit-breaker.

Referring to the drawings in detail, a circuit-breaker 1 is attached to each outlying telephone 2, and an escapement mechanism 3 is attached to each central-station switch mechanism 4. In Fig. I there are fifteen contacts 5 on the circuit-breaker 1 and ten contacts 6 on the central-station switch mechanism 4. The circuit-breaker shown in Fig. VI has thirty-five contacts 5, and the corresponding central-station switch shown in Fig. II has thirty contacts 6.

The operation of the circuit-breaker 1 makes more impulses than are required to operate the switch to zero from any point, and after the switch reaches zero the escapement mechanism holds the switch at zero until the circuit-breaker returns to zero.

Referring to Figs. II, III, IV, and V, the block 7 is of non-conducting material—such as pulp, hard rubber, or wood fiber—and the binding-posts or contacts 6 project forwardly from the block and are arranged in a circle equal distances apart. The shaft 8 passes through the block 7 at the center of the circle described by the binding-posts 6. The rotary switch-arm 9 is mounted upon the shaft 8 and has a flexible outer end 10 to engage the binding-posts. The electromagnet 11 is mounted upon the back side of the block 7. The armature 12 is pivoted to the block 7 in position to be operated by the magnet, and the free end of the armature extends some distance beyond the magnet. The pawl-wheel 13 is fixed upon the shaft 8, and the pawl 14, connected to the free end of the ar-

mature, drives the pawl-wheel 13 when the armature vibrates. The pawl 15 engages the pawl-wheel to hold it from back action.

The bushing 16 is placed around the shaft 8, and the conductor 17 connects the bushing to the electromagnet 11, and the conductor 18 leads from the magnet to the binding-post 19. The conductor 20 leads from the binding-post 19 through the telephone to the circuit-breaker, and the conductor 21 leads from the circuit-breaker through the telephone binding-post 22 of the switch mechanism.

The toothed wheel 23 is mounted loosely upon the shaft 8. The spring 24 is connected at its inner end to the shaft 8. The pawl 25 is pivotally connected against the front face of the wheel 23 by means of the pin 26. The arm 27 of the pawl extends in a concentric position, and the arm 28 extends radially toward the shaft. The outer end of the spring 24 is connected to the inner end of the arm 28. The stop 29 is secured rigidly to the block 7 and has a beveled inner face 30. The slot 31 is formed through the wheel 23 concentric to the pin 26, and the pin 32 is fixed in the free end of the pawl-arm 27, said pin extending both forwardly and backwardly from said pawl, and the rear end of said pin operates in the slot 31, while the forward end extends forwardly into position to engage the beveled face 30 of the stop 29. The tension of the spring 24 operates to throw the free end of the pawl, carrying the pin 32 outwardly into position to engage the stop. The arm 33 is an extension of the switch-arm 9 upon the opposite side of the shaft 8, and the cam-face 34 extends backwardly from the outer end of the arm 33 in position to engage the pin 32 and draw the pin inwardly until it passes the end of the stop.

The wheel 23 has teeth on its periphery to engage the pivoted bar 35, carrying the arm 36, and the weight on the outer end of the arm to form an escapement. A plate 37 is placed upon the opposite side of the block 7 and is connected to the stop 29 by the rivets 38, and the conductor 39 connects the plate 37 to the bushing 16. The ring 40 is placed upon the back of the wheel 23 in a concentric position, and a slot 41 is cut in the ring. The plunger 42 is attached to the armature-bar 12 and extends through the opening 43 in the block 7, and its free end is in position to operate in the slot 41 when the wheel 23 is at rest and the armature is vibrating. The bearings 44 guide the plunger.

When in step and at rest, the indicator of the circuit-breaker is at zero and the central-station switch is on the zero-contact, which has no electrical connection. If you go to the middle one of the upper telephones in Fig. I and operate the circuit-breaker until the indicator moves to contact No. 4, then the corresponding switch at the central station moves from the zero-contact to contact No. 4, as shown in the central switch in the diagram. Then the calling-telephone is connected with the called telephone and the talking-circuit established in the usual way; but if the switch is out of step then the calling-telephone will get the wrong connection and there is trouble. It is the purpose of my invention to overcome this trouble.

If it is desired to avoid the trouble, the best procedure is to allow the circuit-breaker to make a complete revolution before setting the stop-pin for the desired connection.

Suppose that by some disturbance the central switch is on contact 29 when the circuit-breaker is started. The first impulse action of the circuit-breaker operates the magnet, vibrates the armature 12, drives the wheel 13, and moves the switch from contact No. 29 to zero. The cam-face 34 will engage the pin 32 and draw it inwardly until it passes the inner end of the stop 29. Then the tension of the spring 24 will operate the wheel 23 to make a complete revolution. While the wheel 23 is at rest, the plunger 42 operates to pass into the slot 41 and out again at each vibration of the armature; but as soon as the wheel 23 is started the plunger is elevated by the upward motion of the armature and comes down on the outer face of the ring 40, thus holding the armature from vibrating, and so the switch is held at rest at zero while the wheel 23 is making its circuit, and during this time the circuit-breaker completes its circuit and comes to rest at zero. Then the stop-pin is set for the desired connection, and now the circuit-breaker and switch move from zero simultaneously, make the desired connection, and establish the talking-circuit. Thus it will be seen that the circuit-breaker creates enough impulse-sending actions to operate the switch to zero from any point before the circuit-breaker comes to rest at zero, and then the escapement holds the switch at zero until the circuit-breaker gets around to zero. During the operation described the circuit is not open to kill the surplus impulse actions, but the armature is held from vibrating and driving the switch. The circuit passes through the conductor 39.

If desired, the plunger 42 and conductor 39 may be omitted, and the circuit passes through the stop 29 and the pin 32 and wheel 23. Then the circuit is open, while the wheel 23 is rotating. The result is the same as before.

The time required for the wheel 23 to make a revolution should exceed the time required for the circuit-breaker to make a revolution. It is not necessary that there should be a surplus of contacts on the circuit-breaker if the circuit-breaker is to make a revolution before the pin is set for the connection; but it is desirable to have a surplus of impulse-sending actions to make up for ineffective actions due to imperfect contact or other causes.

The wheel 23 makes a complete revolution while the switch is standing at zero, and by this means the pin 32 is again brought into contact with the stop 29, and this operation

unwinds the spring 24 to some extent, but the spring is again wound when the shaft 8 is again rotated. Thus the operative relations are restored. It is immaterial whether the surplus actions are made by surplus contacts of the circuit-breaker or by an extra revolution of the circuit-breaker.

I claim—

1. In a device of the class described, a rotary switching member located at a central station and having a normal zero position, an automatic circuit-breaker located at an outlying station and having a normal zero position and limiting-stops, an electric circuit connecting the circuit-breaker to the switch, mechanism interposed in the circuit whereby the operation of the circuit-breaker operates the switch, and means of holding the switch in its zero position for a time after the completion of its rotation or operation thus allowing the circuit-breaker to come to its zero position, so that the circuit-breaker and switch may start simultaneously upon new circuits, substantially as specified.

2. In a device of the class described, a rotary switching member located at a central station and having a normal zero position, an automatic circuit-breaker located at an outlying station and having a normal zero position and limiting-stops, an electric circuit connecting the circuit-breaker to the switch, mechanism interposed in the circuit whereby the operation of the circuit-breaker operates the switch, said circuit-breaker having more contacting-points than the switch, and means of holding the switch in its zero position for a time after the completion of its rotation or operation thus allowing the circuit-breaker to come to its zero position, so that the circuit-breaker and switch may start simultaneously upon new circuits, substantially as specified.

3. In a device of the class described, a rotary switching member located at a central station and having a normal zero position, an automatic circuit-breaker located at an outlying station and having a normal zero position and limiting-stops, an electric circuit connecting the circuit-breaker to the switch, mechanism interposed in the circuit whereby the operation of the circuit-breaker operates the switch, and an escapement mechanism adapted to be set in motion by the passing of the switch into its zero position at the completion of a rotation or operation, the operation of said escapement mechanism being limited in time and serving to hold the switch temporarily at its zero position, regardless of the action of the circuit-breaker, substantially as specified.

4. In a device of the class described, a rotary switching member located at a central station and having a normal zero position, an automatic circuit-breaker located at an outlying station and having a normal zero position and limiting-stops, an electric circuit connecting the circuit-breaker to the switch, mechanism interposed in the circuit whereby the operation of the circuit-breaker operates the switch, and an escapement mechanism adapted to be set in motion by the passing of the switch into its zero position at the completion of a rotation or operation, and the operation of the said escapement mechanism serving to break the electric circuit, thus temporarily holding the switch at its zero position regardless of the action of the circuit-breaker, substantially as specified.

5. In a device of the class described, a rotary switching member located at a central station and having a normal zero position, an automatic circuit-breaker located at an outlying station and having a normal zero position and limiting-stops, an electric circuit connecting the circuit-breaker to the switch, mechanism interposed in the circuit whereby the operation of the circuit-breaker operates the switch, and an escapement mechanism adapted to be set in motion by the passing of the switch into its zero position at the completion of a rotation or operation, and the operation of said escapement mechanism serving to lock the switch-operating mechanism as required to render the action of the circuit-breaker temporarily ineffective to move the switch from its zero position, substantially as specified.

6. In a device of the class described, a rotary switching member located at a central station and having a normal zero position, an automatic circuit-breaker located at an outlying station and having a normal zero position and limiting-stops, an electric circuit connecting the circuit-breaker to the switch, mechanism interposed in the circuit whereby the operation of the circuit-breaker operates the switch, and means of holding the switch in its zero position for a time after the completion of its rotation or operation thus allowing the circuit-breaker to come to its zero position, so that the circuit-breaker and switch may start simultaneously upon new circuits, said means consisting of an escapement-wheel mounted loosely on the shaft of the switch, a clock-spring connecting the wheel to the shaft, an escapement-lever engaging the wheel, a pawl carried by said wheel, a stop in position to engage the pawl and hold the wheel against rotation, and a cam carried by the switch to release the pawl from the stop; a concentric ring carried by said escapement-wheel, and having an opening, a plunger carried by a vibrating portion of the switch-operating mechanism in position to operate in said opening when the escapement is at rest, and to beat against said ring when the escapement is operating, substantially as specified.

7. In a device of the class described, a rotary switching member located at a central station and having a normal zero position, an automatic circuit-breaker located at an outlying station and having a normal zero position and limiting-stops, an electric cir-

cuit connecting the circuit-breaker to the switch, mechanism interposed in the circuit whereby the operation of the circuit-breaker operates the switch, said circuit-breaker having more contacting points than the switch, and means of holding the switch in its zero position for a time after the completion of its rotation or operation thus allowing the circuit-breaker to come to its zero position, so that the circuit-breaker and switch may start simultaneously upon new circuits; said means consisting of an escapement-wheel mounted loosely on the shaft of the switch, a clock-spring connecting the wheel to the shaft, an escapement-lever engaging the wheel, a pawl carried by said wheel, a stop in position to engage the pawl and hold the wheel against rotation, and a cam carried by the switch to release the pawl from the stop; substantially as specified.

8. In a device of the class described, a rotary switching member located at a central station and having a normal zero position, an automatic circuit-breaker located at an outlying station and having a normal zero position and limiting-stops, an electric circuit connecting the circuit-breaker to the switch, mechanism interposed in the circuit whereby the operation of the circuit-breaker operates the switch, and escapment mechanism adapted to be set in motion by the passing of the switch into its zero position at the completion of its rotation or operation, the operation of said escapement mechanism being limited in time and serving to hold the switch temporarily at its zero position, regardless of the action of the circuit-breaker; said escapement mechanism consisting of an escapement-wheel mounted loosely on the shaft of the switch, a clock-spring connecting the wheel to the shaft, an escapement-lever engaging the wheel, a pawl carried by said wheel, a stop in position to engage the pawl and hold the wheel against rotation, and a cam carried by the switch to release the pawl from the stop; substantially as specified.

9. In a device of the class described, a rotary switching member located at a central station and having a normal zero position, an automatic circuit-breaker located at an outlying station and having a normal zero position and limiting-stops, an electric circuit connecting the circuit-breaker to the switch, mechanism interposed in the circuit whereby the operation of the circuit-breaker operates the switch, and an escapement mechanism adapted to be set in motion by the passing of the switch into its zero position at the completion of its rotation or operation, and the operation of the said escapement mechanism serving to break the electric circuit, thus temporarily holding the switch at its zero position regardless of the action of the circuit-breaker; said electric circuit passing through the stop and pawl so that the releasing of the pawl breaks the circuit; substantially as specified.

10. In a device of the class described, a rotatory switching member located at a central station and having a normal zero position, an automatic circuit-breaker located at an outlying station and having a normal zero position and limiting-stops, an electric circuit connecting the circuit-breaker to the switch, mechanism interposed in the circuit whereby the operation of the circuit-breaker operates the switch, and means of holding the switch in its zero position for a time after the completion of its rotation or operation thus allowing the circuit-breaker to come to its zero position, so that the circuit-breaker and switch may start simultaneously upon new circuits; said means consisting of an escapement-wheel mounted loosely on the shaft of the switch, a clock-spring connecting the wheel to the shaft, an escapement-lever engaging the wheel, a pawl carried by said wheel, a stop in position to engage the pawl and hold the wheel against rotation, and a cam carried by the switch to release the pawl from the stop; substantially as specified.

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Witnesses:
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JACOB WISSLER.