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C. E. SEDGWICK & W. H. ABBOTT.
ELECTRICALLY OPERATED APPARATUS.

APPLICATION FILED SEPT. 17, 1903.

NO MODEL.

FIG. 1.

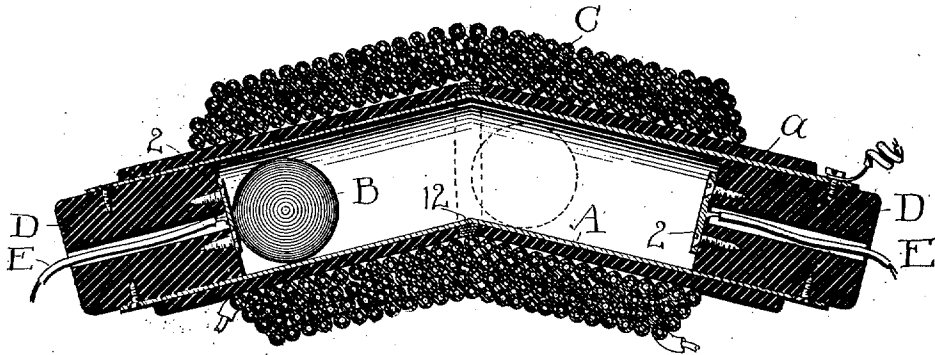


FIG. 2.

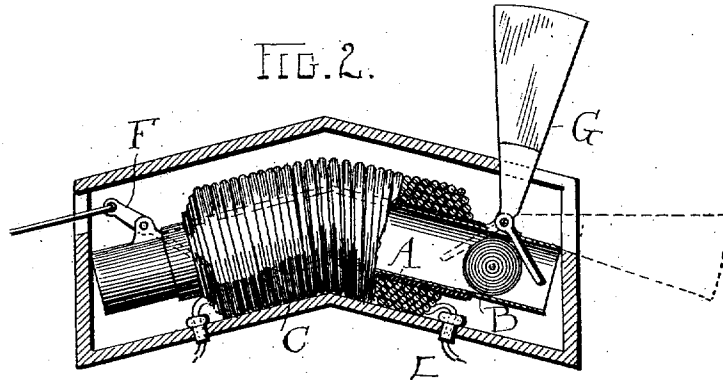
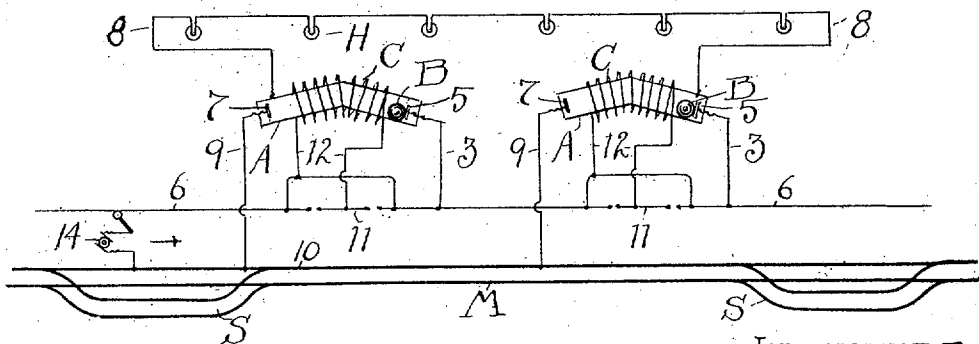


FIG. 3.



ATTEST.

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ELECTRICALLY-OPERATED APPARATUS.

SPECIFICATION forming part of Letters Patent No. 767,599, dated August 16, 1904.

Application filed September 17, 1903. Serial No. 173,551. (No model.)

To all whom it may concern:

Be it known that we, CHARLES E. SEDGWICK and WALTER H. ABBOTT, citizens of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Electrically-Operated Apparatus; and we do declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

Our invention relates to electrically-operated apparatus, the same adapted to be used in current-switching and other devices; in which a part is moved from one position to another by the power of the current; and the invention consists in a device constructed and operating substantially as shown and described, and particularly pointed out in the claims.

In the accompanying drawings the invention is disclosed in three several different views.

Figure 1 is a longitudinal sectional elevation of the invention in one of its simplest forms, showing a reversely-inclined tube wound with a suitable coil and having plugs in its ends with electrical contacts and an iron or steel ball or sphere therein adapted to be electrically shifted from one incline or side of said tube to the other, as hereinafter fully described. Fig. 2 is a longitudinal sectional view corresponding substantially to Fig. 1 in so far as the tube and ball are concerned, but having only mechanical contacts in the tube for the ball and the tube being inclosed by a suitable casing sectioned longitudinally. Fig. 3 is a diagrammatic illustration of the invention, showing the same as applied to a block-signaling system for electrically-operated cars.

Primarily the invention comprises an electrically-operated ball or sphere adapted to be moved electrically from one position to another to make or break a circuit, or both successively, and to operate a mechanism with which the ball is adapted to contact momentarily or for a longer period, as may be desired in any given case and according to the work to be done. To these ends we provide a de-

vice in which there is a reversely bent or inclined tube A—say of brass or other suitable metal which is a good electrical conductor—and the said tube or pipe may be constructed in a single piece bent at its center to the inclination substantially as shown or of two straight pieces of tubing soldered or brazed together and made one in this way. A suitable insulation *a* is placed about the said tube, and upon or around this we wind the coil C. The character of this winding or coil will depend much upon the use for which the device is to be employed, and the coil may be heavier or lighter, as a particular service may demand. In operation when a current is sent through said coil the position of the ball in the tube is changed, as hereinafter fully explained, and in any event the said ball B is wholly under the control of the current passing through the coil C whatever shift of position it may make and whether its work when shifted or *en route* be electrical or mechanical or whether the said ball travels from one to the other position in tube A or does its work in one inclination or side thereof alone. As to this latter operation see further description herein.

In Fig. 1 the ends of tube A are closed by means of plugs or blocks D of wood or other suitable non-conducting material, and said plugs are bored to enter the electrical conductors E into engagement with contact-plates 2, fixed upon the inside of said plugs.

In Fig. 2 the plugs D and contact-plates 2 are omitted, and instead thereof we show a switch-plate F, pivoted in or at one end of tube A and extending into the said tube in position to be engaged by ball B, while semaphore or sign G is pivoted in or upon the other end of the said tube in position to be mechanically engaged by the ball and raised thereby through gravity. In both ends the ball performs a strictly mechanical function, whereas in Fig. 1 the function is wholly electrical. The ball might be used to perform a mechanical function and also serve for electrical purposes in addition. In that event the members F and G should be insulated.

Now, referring to the operation of the apparatus, when a current is sent through the coil of wire C it has the effect of pulling or

rolling the ball up toward the center of the coil with such an impetus that it is carried past the center to the other side or incline, where it remains—say as in dotted lines, Fig. 1—even though the current is still passing through the coil. Upon interrupting the current the ball rolls down to the stop on that side and against plate 2, when it is in the opposite position from which it started. Upon applying current again through coil C the ball is drawn over the center as before, but from the opposite side, and when current is again interrupted it rolls down to the position from which it originally started. It is thus seen that with one impulse given to the ball by current applied to coil C and then interrupted, even though the current be on for a long time, the ball is transferred from one end or incline of the tube to the other, and upon repeating the operation the ball is transferred back again, and so on as often as may be desired. In other words, the same operation of the current repeated moves the ball alternately from one side to the other in the tube, and this without any auxiliary or other reversing device or medium but the current itself. A narrow iron ribbon or band 12 being wrapped around the center or middle and highest point of the tube increases very largely the limits of current between which the ball will act. Without it the range is from minimum to about double-minimum current. Higher currents pull the ball over the center twice—that is, the ball crosses the apex to the other side and is then drawn back again to the side it started on—so that when the current is interrupted the ball rolls down to the side from which it started. The introduction of the iron ribbon 12, as shown, increases the maximum current to at least six times the minimum current, and, indeed, it may considerably exceed this increase.

This device can be used wherever it is desired to do alternately first one thing and then another by means of an electric current, and the effect may be worked out electrically or mechanically, as a given case may require.

In Fig. 3 we show an electrical block-signaling system in diagram in which two or a pair of tubes A and balls B are used. These are arranged in sets, which may be a considerable distance apart—say a mile or more, according to the distances between side tracks or switches S of the main track M—and the plan of the invention as applied here contemplates signaling from one switch to the other along the main line or approximately thereto to disclose the presence of a car or train on the main track between the switches. Such notice in whatever form made, whether by electric lamps H, as shown, and extending at intervals between the switches or by other sufficient means and whether electrical or mechanical, utilizes the two electrically-connected tubes A and the balls therein for completing

the circuit through said lamps by means of the car itself as it proceeds along the main line and after leaving the switches. Thus in Fig. 3 a practical use of the invention is shown. The plan here is to connect a number of lamps H in series by a wire 8, which is strung parallel with the tracks between the switches S, and the terminals of wire 8 are connected with tube A. A third rail 6 is shown, which presumably carries the current for the road and is the equivalent of the usual overhead or trolley wire. One contact, 5, in each tube A is connected by wire 3 with said third rail or its equivalent and the other contact, 7, is connected by wire 9 with rail 10 of the car-track or with the ground. The motor or car is indicated by 14 and presumably is approaching the block. This being the case, the moment it comes within the block after passing the car-switch the trolley-wheel of the car rides over a section 11 of the trolley or third rail 6, which section is separated from the main trolley by suitable breaks or insulated connections and whereby no current from the main supply is obtainable unless otherwise provided for; but provision is made by a connecting-wire 12, which taps the supply-wire and section 11 and in which coil C is connected in circuit. Thus when the car is opposite section 11 current is still obtainable, but the power derived to drive the car is taken over a circuit in which coil C is a part, and thus must perforce energize the coil and throw the ball to one side or the other within tube A. When balls B in both tubes are in contact with both plates 5 or with both bolts 7, lamps 4 are cut off from all current; but when coil C is energized by the passing of a car over a section 11 and a ball is shifted from one end of the tube A to the other a working circuit is established over wires 9, 8, and 3 and lamps H glow and give warning of the presence of a car on the main track between switches S. Then as said car reaches the switch ahead and section 11 at that point the coil C in the circuit of that section is energized and its ball B shifted, whereby the current over wire 8 is cut off to darken lamps H, and thereby indicate that the main track is again open. If desired, a reverse arrangement of the plan for signaling can be used—that is, the lamps may be darkened when a car is on the main track and aglow when open.

Various means may be utilized to provide current for coil C; but the means shown is preferred, because the current which drives the car must pass through the coil as the car travels over the main track opposite section 11, and thereby always acts to shift ball B each time a car passes this point.

It will be seen that the coil C is energized by the current which drives the car, and if for any reason the motorman desires to prevent the energizing of the coil he can throw open his controlling-switch and permit the

car to pass beyond section 11 under its own momentum.

Another application of the invention is in connection with the operation of track-switches by the motorman without leaving the car. In this case the apparatus is made large enough and the ball heavy enough so that in rolling down the ball will throw the tongue or point of the switch one way or the other and hold it in position after it is thrown, the ball being operated as in case of the block-signaling device.

We have described part A as a tube, and such it is preferably; but any equivalent form of said part which will serve the same purpose is within the scope of the invention whether it be a shell of cast metal or other form not having the exact characteristic of a tube, but serving the same purpose. So, also, may the ball be substituted by any rotatable member which will run from one position to another under the influence of the current and by gravity continue its course in the direction of its initial movement, substantially as shown and described.

What we claim is—

1. An electrical device comprising a shell having a reversely-inclined bottom with its highest point at its center, an electrical winding about said shell extending across both sides of its center and a free rotatable member in said shell adapted to be electrically drawn from one side of the shell to the other across its center, substantially as described.

2. In an electrical apparatus, a shell and an electrical winding about said shell, and an independent member in said shell adapted to be moved part way within said shell when the winding upon the tube is energized, and means to shift said member to the opposite end of the tube from whence it started when the winding is deenergized, substantially as described.

3. An electrical appliance consisting of a tube having reversely-inclined portions, a wire coil about said tube, and a ball free to run in the tube, substantially as described.

4. A device substantially as described comprising a hollow reversely-inclined member and an electrical coil about the same, a contact-point in one end of said member and a ball therein adapted to run into and out of engagement with said contact-point, substantially as described.

5. In electrical devices, a tube having reversely-inclined portions with the highest point at its center and having a contact-point in each inclined portion, and a ball free to travel from one contact-point to the other, substantially as described.

6. In an electrical device, a tube having two oppositely-inclined portions and a metallic band wrapped about said tube, an electrical wrapping about said tube and an independent

rolling member within the tube adapted to be drawn across the center thereof from either side, substantially as described.

7. An electrical device comprising a hollow member with reversely-inclined end portions having a winding of metallic ribbon at its center and a contact-point in its end and a rotatable part in said member adapted to be electrically drawn over the center thereof, substantially as described.

8. In an electrically-operated apparatus, an electrical coil and a hollow core therefor, a free member within said core adapted to move part way therein when the coil is energized, and means to compel said member to continue its travel in a given course after each interruption of the current flowing through the coil in combination with means for switching current through the coil, substantially as described.

9. An electrically-operated apparatus comprising a tube and electrical coil wound centrally thereon, a free member within said tube adapted to travel from end to end therein, and means to alternately shift said member from opposite ends upon successive switching of current through said coil, substantially as described.

10. In an automatic signaling system for electric railways, the power-supply line for the car having insulated sections at intervals provided with feed connecting-wires tapping the main supply-line, in combination with an electrical apparatus comprising a shell and a coil thereon connected in circuit with said feed-wire and whereby current is supplied to energize said coil whenever electrical current is supplied to the car as it passes said section, a movable member within said shell adapted to shift alternately to opposite ends therein as said coil is successively energized by the movement of the car from section to section, and signaling means controlled by said member whereby the location of the car is determined, substantially as described.

11. In an electrical apparatus, a shell and a wire coil wound thereon, a metallic band about said shell centrally between the ends of the coil, and an independent member within said shell adapted to be moved therein when said coil is energized, substantially as described.

12. The tube and separate contacts therein, signaling means operatively connected with each of said contacts, an independent movable member within said tube, and means to shift said member back and forth to engage said contacts alternately, substantially as described.

Witness our hands to the foregoing specification this 9th day of September, 1903.

CHARLES E. SEDGWICK.
WALTER H. ABBOTT.

Witnesses:

R. B. MOSER.
R. ZBORNIK.