(No Model.) 2 Sheets—Sheet 1.

H. C. NICHOLSON.

AUTOMATIC ELECTRIC SIGNAL.

No. 347,634. Patented Aug. 17, 1886.

Fig. 1.

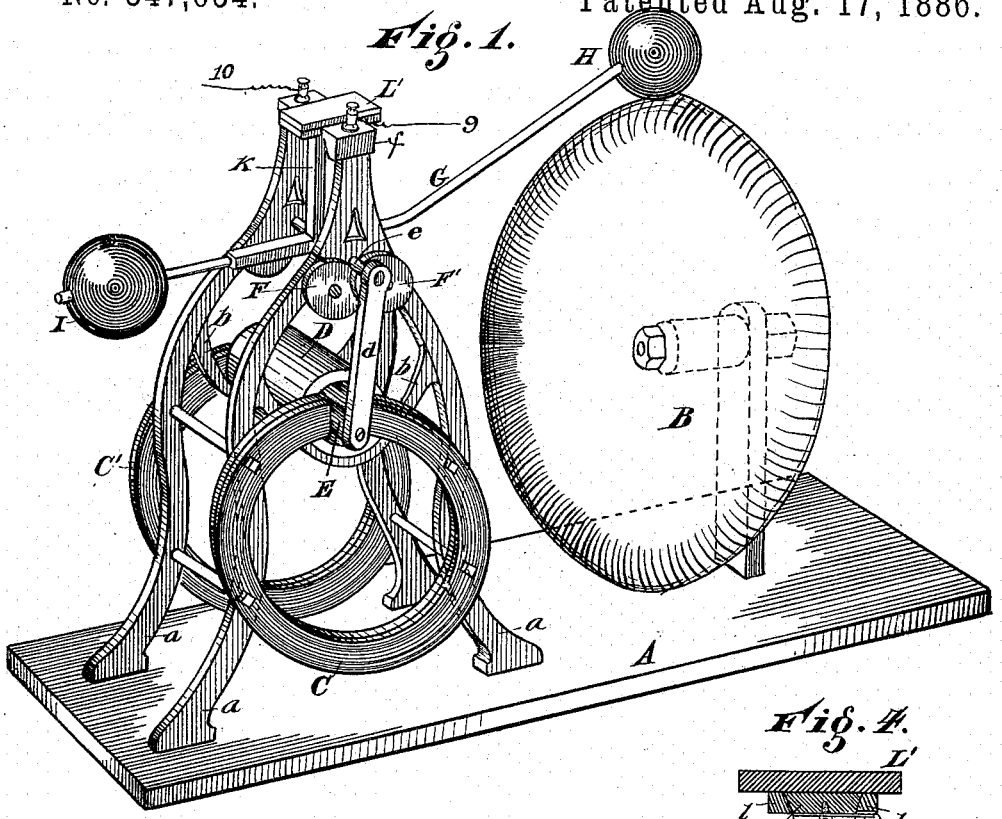


Fig. 4.

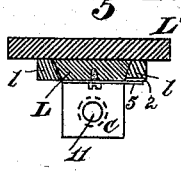


Fig. 2.

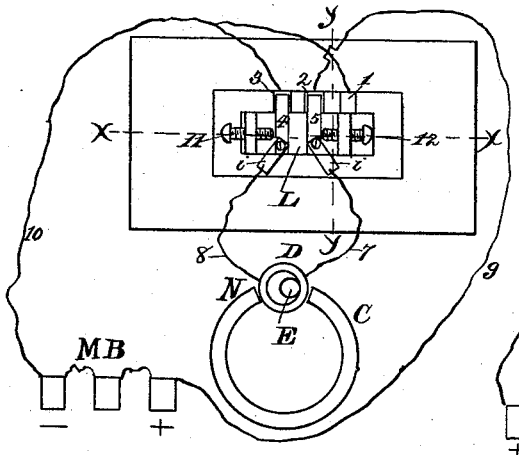


Fig. 3.

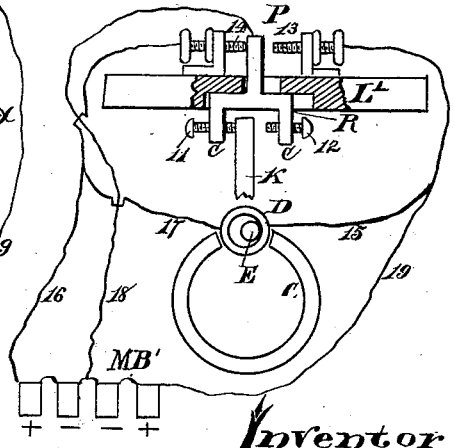
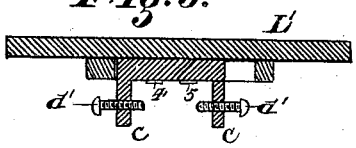


Fig. 5.



Attest

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(No Model.) 2 Sheets—Sheet 2.

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AUTOMATIC ELECTRIC SIGNAL.

No. 347,634. Patented Aug. 17, 1886.

Fig. 6.

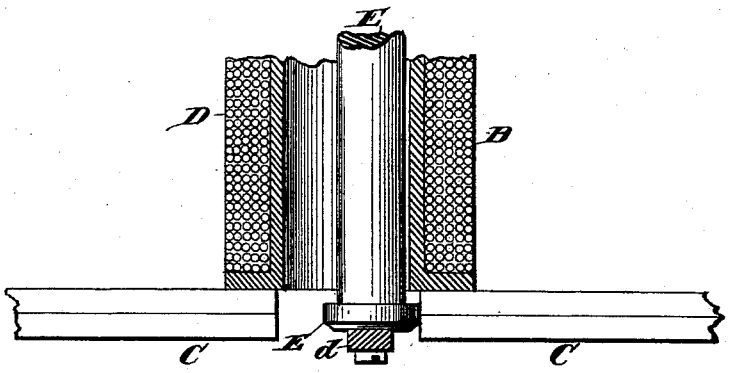
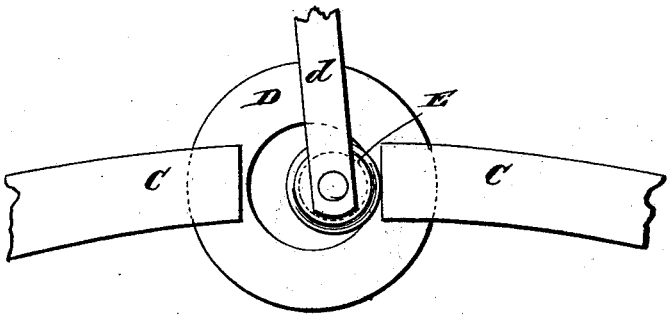


Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY C. NICHOLSON, OF MOUNT WASHINGTON, OHIO.

AUTOMATIC ELECTRIC SIGNAL.

SPECIFICATION forming part of Letters Patent No. 347,634, dated August 17, 1886.

Application filed December 4, 1885. Serial No. 184,718. (No model.)

To all whom it may concern:

Be it known that I, HENRY C. NICHOLSON, a resident of Mount Washington, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Automatic Electric Signals, of which the following is a specification.

My invention relates to a mechanical device operated by electro-magnetic force especially designed for the ringing of a gong or bell.

One of the objects of my invention is to operate the hammer by alternate electrical currents. One current—say the positive—will cause the hammer to move forward, and the other—say, the negative or reverse current—will retract the hammer for the second blow, thereby operating the hammer by a reversal of currents. By this means I obtain a much better sound and heavier blow and avoid the vibratory motion of the hammer on the bell and obtain an intermitting full stroke of the hammer, dispensing with springs usually employed in electrical annunciators or bells. By this means I am enabled to obtain any desired sweep of the hammer, and the necessary interval between the strokes to obtain a full sound of the gong or bell struck by the hammer.

Another object of my invention is to produce a cheap and reliable mechanism for ringing the gong or bell.

Another object of my invention is to obtain a reversal of the current by the oscillation of a lever or arm actuated by the armature, whereby the reversals of the current are automatically effected by the device and its electrical connections.

My invention is adapted to various other uses where an alternating impulse is required to actuate by reciprocating movements of mechanical devices, all of which will be fully set forth in the description of the accompanying drawings, making a part of this specification, in which—

Figure 1 is a perspective view of my invention adapted to ring a gong. Fig. 2 is a diagram of the reversing mechanism; Fig. 3, a diagram representing a modified form of connecting the parts for automatically reversing he currents. Fig. 4 is a section on line *y y*, Fig. 2. Fig. 5 is a section on line *x x*, Fig. 2. Fig. 6 is a horizontal section taken through the center of the magnet and core. Fig. 7 is an enlarged view of the armature E, arms *d*, coil D, and poles C of the permanent magnet.

A represents a base-board, on which is mounted a gong or bell, B.

a a represent posts of a frame on which the actuating mechanism is mounted. This frame may be of any desired form of construction, and is preferably made of brass or other diamagnetic material. The parts of this frame are connected by cross-arms *b*, and are united at the top to form a rigid frame.

C C′ represent permanent magnets secured to the frame.

D represents the electro-magnetic coil or helix, which is preferably wound of copper wire in the usual manner. It is secured in its position to the frame, preferably by resting on the arms *b*, to which it is tied by strings or wire, but without metallic connection to the permanent magnets C C′.

I have not shown the spool of the helix D, as it may be of any well known form of construction.

E represents an oscillating soft-iron core. It is affixed to arms *d*, which journal on a shaft, *e*, that passes through the upper portion of the frame, as shown in Fig. 1. The apertures through the frame are preferably made larger than the shaft *e*, and to avoid friction I journal this shaft upon anti-friction rolls F F′ upon each side of the frame.

G represents an oscillating arm rigidly secured to shaft *e*.

H represents a hammer mounted on one end of the arm G, and I represents a counterbalanced weight upon the opposite end of the arm.

K represents a lever or arm rigidly secured to rock-shaft *e*, and projecting upward between screws *d′*, which engage in ears or lugs *c c*, that depend from slide L.

L′ represents the cap, which is rigidly secured to yoke *f*, affixed to the top of frame *a*. This cap is shown as slotted in Fig. 3, and upon it is affixed one form of my reverser. Fig. 2 also illustrates by diagram the electrical circuit and connection of the parts.

l represents ways or guides, which hold the slide L in position. To one of these ways *l*, I affix three metallic electrical contact-points, 1 2 3. These contact-points are stationary,

and may be termed the "battery terminals." To the guide L, I affix two metallic electrical contact-points, 4 5, which may be termed the "coil terminals," and which are preferably made of spring-arms attached to the slide L. The distance between the contacts 4 and 5 and between the contacts 1 and 2 and 2 and 3 is about the size of the width of the metallic contacts, so as to prevent the entire breaking of the circuit, which is reversed by the movements of the contacts 4 and 5, to change their position with relation to the contacts 2 and 3, by means of which the circuit is established and reversed by the movement of the armature-core, the preferred form of which is by means of an oscillating arm projecting up from the axis of the armature. The preferred form is shown in Figs. 1 and 2, in which the top of the arm K is shown in contact with the stop 11, and the slide L has moved to its farthest limit, and the contact 4 is opposite and in contact with 3, and the contact 5 is in metallic connection with the contact 2, thereby forming a circuit with the battery M B.

7 represents one of the terminal wires of the magnet-coil D, and 8 the other terminal wire, which are metallically connected to the contacts 4 and 5 by plates *i*, which form a part of a metallic circuit of the coil with the battery. The circuit, when slide L is in this position, is as follows: From the plus pole of the battery by wire 9, contacts 2 and 5, wire 7, helix D, wire 8, contacts 4 and 3, wire 10, to the minus pole of the battery. This action of the slide L, moving to bring the contacts 4 with 3 and 5 with 2, reverses the direction of the current through the coil D, causing the armature to move in the opposite direction by the reversal of polarity, causing it to move, say, toward pole N of the permanent magnet C. The lever K is thereby moved in the opposite direction and strikes the opposite stop, 12, which causes the slide to move in the reverse direction, which again reverses the current and causes the slide to move again in the opposite direction.

11 and 12 represent regulating-screws forming the stops to adjust the movement of the arm K and the contact-points 1 2 3 4 5. Thus by the alternating impulse of the armature E and the lever K the contact-points are automatically changed, and the terminals of coil D are reversed, causing a reversal of the current in the coil, and simultaneously therewith the hammer lever or arm G oscillates to and fro with the armature movement.

In the mode shown of establishing and reversing currents in Figs. 2 and 4 the terminals of the coil are reversed automatically by the armature-arm K.

I have shown in Fig. 3 a diagram of another mode of reversing the currents. K represents the armature-arm projecting up between stops 11 and 12, which are attached to ears *c*, depending from the slide R, which carries a supplemental arm, P, moving between the metallic points 13 and 14. Slide R moves in ways in the cap-piece L similar to the ways *l*, (shown in Fig. 4,) and is moved by the oscillation of the arm K, so that the arm P may be brought into contact with the points 11 and 12 as the slide R is moved to and fro. This movement substitutes one-half of a divided battery for the other, and with such substitution reverses the current, which substitution and reversal are effected as follows: 15 represents a line-wire in metallic contact with stop 13. 17 represents one of the terminals of the coil D connected to stop 14. 19 represents a line-wire connecting the plus pole of other poles of the battery with stop 13. 15 represents the other terminal of the helices D connected to wire 19. 18 represents a wire connected to two of the minus poles of a divided battery and running thence to the arm P. When the arm P is in metallic contact with the stop 14, a circuit is established by wire 16 to stop 14, arm P, wire 18, to battery M B', and by wire 17 through coil D, wire 15, wire 19, to battery M B'. This attracts the armature E from the side opposite pole N, breaking the contact of arm P with stop 14 and bringing it into contact with point 13, which establishes a reverse current through wire 19, stop 13, arm P, wire 18, battery M B', and through the coil D by wires 15 17 16 to battery M B'. This method (shown in Fig. 3) simply reverses the current by substituting one battery for the other; but the reversing of the polarity by the substitution of part of a battery is an equivalent means of obtaining the same result, except that in the latter plan one-half of the battery will be sufficient to accomplish the same amount of work, which is the preferred form, and is illustrated in Fig. 2.

It is obvious that various modifications may be made in the mechanical devices operated by the armature to reverse the currents; and I do not wish to limit myself to the particular means, except where they are thus specified. Fig. 2 illustrates the preferred form of accomplishing this result.

It is obvious that any electrical motor may be substituted for the battery. So, also, the hammer-arm G might be attached to the frame or arms or the rocking axis, instead of being mounted directly upon the axis, without affecting the principles of my invention.

I claim—

1. An electric signal consisting of a battery, an electro-magnetic coil in circuit therewith, an oscillating core, E, suspended in the coil and between the poles of fixed magnets, and a reversing-arm which moves a slide between opposite polar contacts, thereby automatically reversing the terminal connections of the coil, the whole being combined, substantially as described.

2. In an electric signal, the combination, with the axes of an armature, E, which moves between the poles of fixed magnets, and within an electro-magnetic coil, of the arm G, mounted upon the axis operated by the armature E, and means, substantially as described, for effecting the successive reversal of the current

in the coil terminals, substantially as described.

3. In combination with the permanent magnets and the electro-magnet located between the poles of the fixed magnet and energized by electricity, the oscillating armature-core E, suspended upon arms journaled on an axis, on which is mounted the automatic reversing-arm K and hammer-arm G, to intermittently strike the gong B when the current is reversed, substantially as herein specified.

4. A current-reverser, in combination with a battery, and an electro and permanent magnet consisting, essentially, of the stationary contact or terminal points 1 2 3, and the intermittent contact or terminal points 4 and 5, mounted upon slide L and operated by the oscillations of the armature-core, substantially as specified.

5. The combination, with the oscillating axial armature E, of the hammer-arm G, the hammer H, the gong B, the coil D, the magnets C and C', the contacts 1 2 3, the alternate contacts 4 and 5, connected to the coil terminals, and the reciprocating slide L, substantially as described.

6. In combination with the oscillating axial armature E, the hammer-arm G, hammer H, and counterbalanced weight I, automatically operated by the reversal of currents through the coil D, surrounding the armature, substantially as herein specified.

7. The combination, with a fixed electro-magnet having its terminals connected in circuit, of fixed permanent magnets having their poles arranged at the ends of the electro-magnet, an oscillating armature within the electro-magnet and between the poles of the permanent magnets, and a signaling-arm, G, oscillated by said armature, substantially as described.

In testimony whereof I have hereunto set my hand.

HENRY C. NICHOLSON.

Witnesses:
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M. E. MILLIKAN.