W. S. BURNETT.

ELECTROMAGNETIC DEVICE.

APPLICATION FILED APR. 12, 1909.

970,180. Patented Sept. 13, 1910.

3 SHEETS—SHEET 1.

Fig. 1.

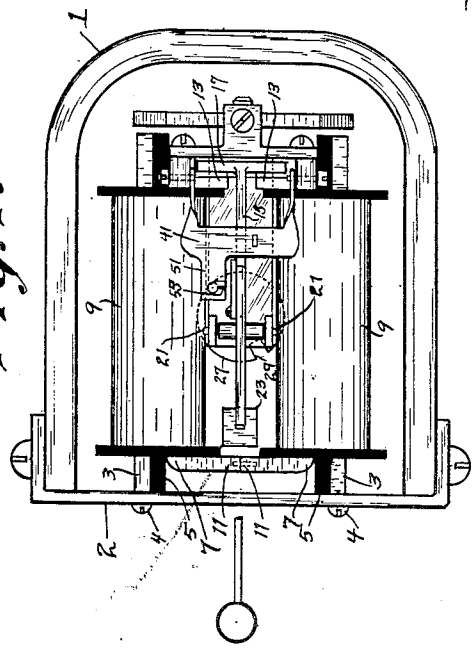


Fig. 2.

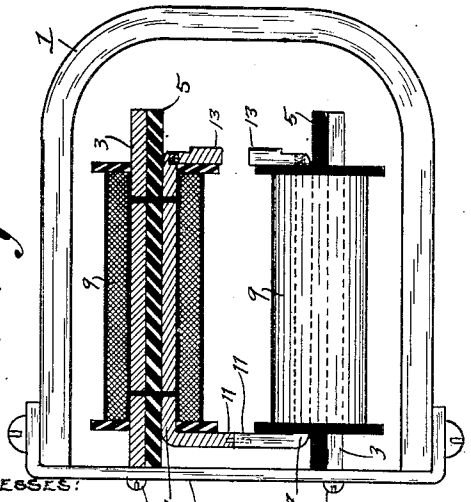


Fig. 3.

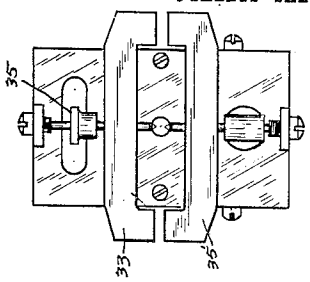


Fig. 4.

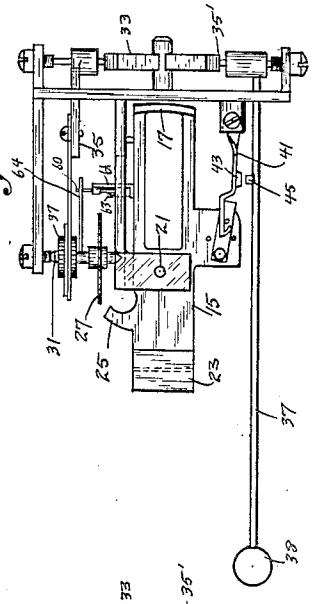
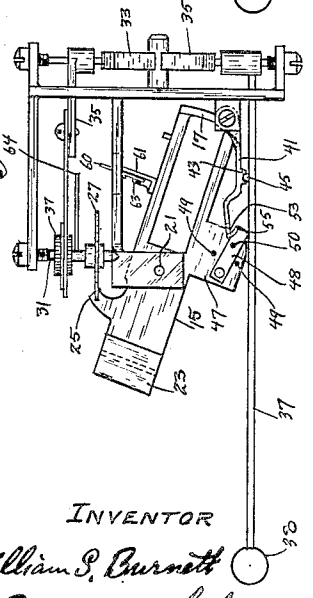


Fig. 5.



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3 SHEETS—SHEET 2.

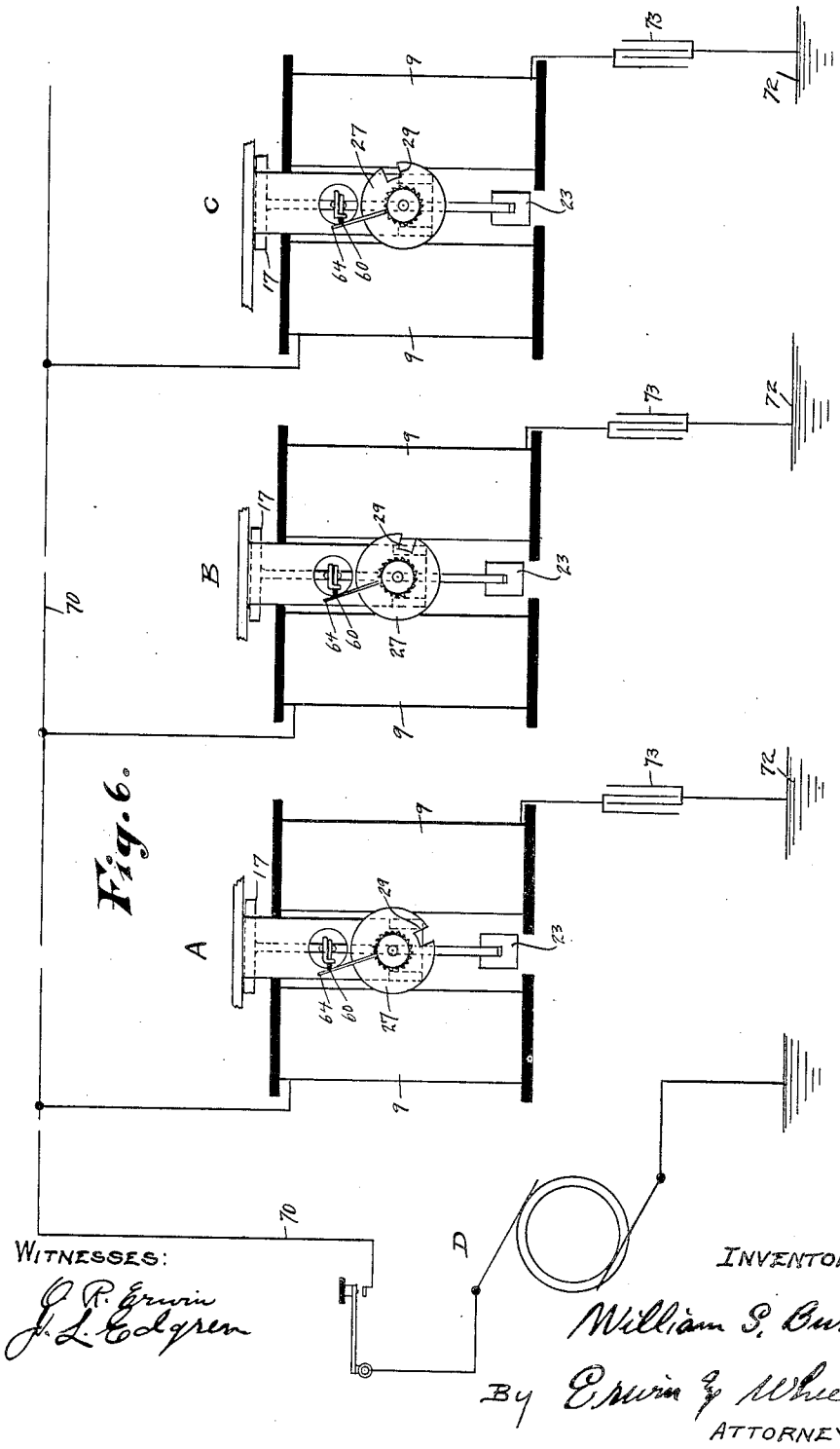

Fig. 6.

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3 SHEETS—SHEET 3.

Fig. 7.

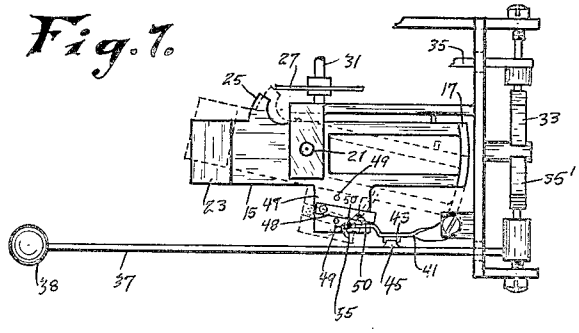


Fig. 8.

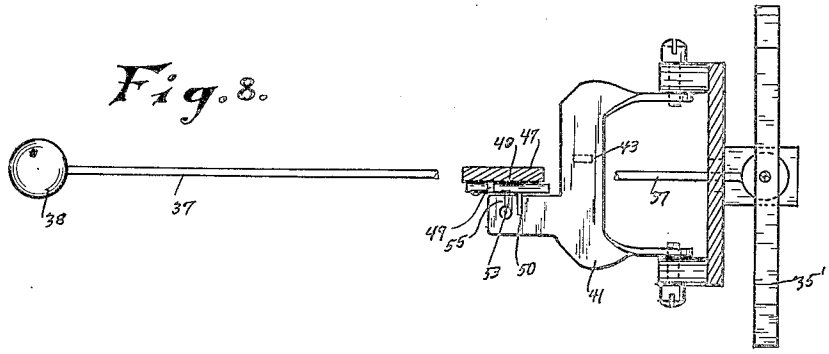
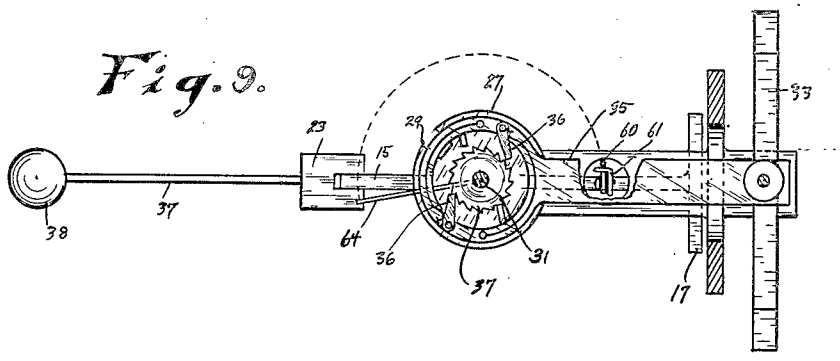


Fig. 9.



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UNITED STATES PATENT OFFICE.

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ELECTROMAGNETIC DEVICE.

970,180. Specification of Letters Patent. **Patented Sept. 13, 1910.**

Application filed April 12, 1909. Serial No. 489,319.

To all whom it may concern:

Be it known that I, WILLIAM S. BURNETT, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented new and useful Improvements in Electromagnetic Devices, of which the following is a specification.

My invention relates to improvements in electro-magnetic devices.

Heretofore, devices and apparatus operating electro-magnetically have in some cases been constructed in which a plurality of results at a given station, or at any one of a series of stations, is secured by means of a plurality of magnetic coils and magnetically controlled switches at each station for diverting the current from one set of coils to another at the same station. In other cases, a plurality of results has been secured by means of a single magnetic coil at each station, used in connection with currents of different character, such for example, as alternating currents differing in frequency, or a continuous current acting interchangeably with an alternate or undulating current. In any of these methods of operation, a certain degree of complexity results, either in the operation of the switches for diverting the current from one coil to another at a local or sub-station, or on the other hand, in the operation of switches at a central station controlling the character of the current.

The object of my invention is to provide means whereby a current of uniform character may be directed through a single electro-magnetic device to accomplish a plurality of results differing in character, or through a series of such devices at various stations along a conductor to produce like results in each and to selectively produce additional results in any one sub-station in the series.

The construction and operation of my improved electro-magnetic device will probably be most readily understood in connection with electrically controlled signaling apparatus, and I have, therefore, illustrated my invention as it is applied to such apparatus, without intending thereby, however, to limit the application of my improved device to such systems.

In the following description, reference is had to the accompanying drawings, in which—

Figure 1 is a detail plan view of an electro-magnetic device embodying my invention, one of the coils being shown in central horizontal section. Fig. 2 is a similar view of the magnet and its coils with the armatures, armature actuated mechanism and frame pieces removed. Fig. 3 is an end view of the frame plate which supports the armatures of the ratchet actuator and bell. Fig. 4 is a side view of the actuated mechanism and its supporting frame, showing the position of the parts when the bell is released. Fig. 5 is a similar view, showing the position of the parts when the bell is locked. Fig. 6 is a diagrammatic view illustrating one of application of my invention to an electrical signaling system for one central and a plurality of sub-stations. Fig. 7 is a view, similar to Fig. 4, showing the normal position of the weighted armature lever. Fig. 8 is a detail plan view of the gravity latch and its connections. Fig. 9 is a detail plan view of the ratchet actuator.

Like parts are identified by the same reference characters throughout the several views.

The frame 1 of my improved device is of the horse shoe type and is composed of material which is either naturally magnetic or of material which has been permanently magnetized. The ends of this bar 1 are connected by a cross bar 2, from which the core pieces 3 of a pair of electro-magnetic coils are supported, preferably by means of screws 4. A body of non-magnetizable or insulating material 5 is mounted upon one side of each of these core pieces 3 and interposed between such core pieces and an auxiliary core piece 7. The core pieces 3 and 7 are formed of soft iron or other suitable magnetizable material and the electrical conducting coil 9 is wound around each set

of bars or pieces 3, 5 and 7. The bars 7 of the respective coils each have one end 11 turned inwardly and abutting or connected with the like end portion of the bar 7 pertaining to the other coil. At their other ends 13, the bars 7 are turned inwardly and these inturned portions are shorter, leaving an air gap through which a lever 15 extends, which carries an armature 17 in a position to be attracted and lifted by the inturned ends 13 of the auxiliary core piece 7, these inturned ends 13 serving as magnetic pole pieces when an electrical current is traversing the coils. The lever 15 is pivoted to the frame at 21 and is provided with a counterbalance weight 23, which nearly counteracts the weight of the armature 17, but permits said armature to drop by gravity when the pole pieces 13 are demagnetized. The end of the lever 15, which carries the weight 23, is provided with an upwardly extending projection 25, which abuts the surface of a rotary disk shaped member hereinafter termed a permission wheel 27 of ordinary type and is adapted to enter a notch 29 in the periphery of such wheel, when such notch is in registry with the projection 25. The permission wheel is supported from the frame by a vertically disposed shaft 31 and is actuated from an oscillating armature 33 through the swinging arm 35, spring actuated pawls 36, ratchet wheel 37 and shaft 31, the ratchet wheel 37 being fast on said shaft and the armature 33 being actuated by the alternating magnetic pull of the core pieces 3, when an alternating current is passed through the respective coils 9. A similarly arranged armature 35 is connected with a clapper arm 37, having a bell clapper 38, whereby an alternating current in the coils tends to operate the bell clapper. The operation of the bell is, however, also controlled by the permission wheel, operating through lever 15 and a gravity latch 41, provided with a downwardly extending projection 43 adapted to engage an upwardly extending projection 45 on the clapper arm 37 to lock such arm against vibrating movement. The lever 15 is provided with a lip 47, having a pivoted member 48, operating between stops 49 and carrying a laterally projecting pin 50. The gravity latch 41 is provided with a lip 51, slitted at 53, and the extremity beyond the slit occupies a diagonal plane with reference to the main portion of the lip, and extends across the plane of the main portion of the lip in front of the slit, thus forming a guide shoe 55. The lip 47 is comparatively close to the fulcrum pivot of the lever 15 and the pin 50 normally has a downwardly and forwardly swinging movement above the gravity latch, when armature 17 drops. But when the notch 29 in the permission wheel registers with the projection 25 on lever 15, if the current is then cut off, the lever is permitted to swing through a greater arc, sufficient movement being allowed to carry the pin 50 over the outer margin of the shoe 55 to a point below it. The pin strikes the upper surface of the shoe during this movement, but the member 48 lifts and allows the pin to slide without material resistance over the shoe margin, after which, the member 48 drops into contact with the lower stop 49. The pin is then in a position to engage the under surface of the shoe 55, when the lever 15 swings in the opposite direction, the pole pieces 13 being again energized and lifting the armature 17. During this lever movement, the pin 50 moves along the under surface of the shoe 55 and lifts the shoe and the gravity latch 41 with which it is connected, thus releasing the clapper arm 37. The pin 50, however, moves past the shoe to a point underneath the body of the latch 41, as shown in Fig. 4, and when the armature 17 is again permitted to drop, this pin passes through the slit to its normal position and allows the gravity latch to drop to locking position.

The lever 15 is provided with a zero point stop for the permission wheel. This stop comprises two elements,—a gravity finger 60, and a fixed arm 61 connected with the lever 15. The finger 60 is pivoted to the arm 61 and offset from the pivot point so that it tends to swing outwardly and downwardly by gravity into contact with the frame member 63 or any other suitable support. Its upward and inner movement is limited by the arm 61, in contact with which the finger is substantially in an upright position. The shaft 31 carries a finger 64, which contacts with finger 60, when the armature 17 and finger 64 are in a raised position. It is therefore evident that when the permission wheel is rotated, the actuating ratchet will step around until the finger 64 engages finger 60, when its motion will be arrested until a cessation of the current permits the armature 17 to drop, carrying with it the lever 15 and finger 60 and releasing the finger 64. If the current is then reëstablished, the finger 60 will have swung outwardly by gravity and it will come up behind the finger 64, thus permitting another complete revolution of the ratchet, and permission wheels until the finger 64 again engages finger 60. With this construction, a series of like devices at different stations on a single line of electrical conduction may be invariably set in rotation from the same zero point, or normal position of rest.

In Fig. 6, I have illustrated a series of sub-stations A, B, and C, with which a central station D is connected by a conducting

wire 70 leading through the electro-magnetic coils 9 at each station, and having a ground connection 72 at each station, with an interposed condenser 73 to prevent short circuiting. In such a system, the operation will be as follows, the permission notches 29 of each permission wheel being differently located at each station, with reference to the common zero point. Electrical impulses at the central station, preferably alternating in polarity, are utilized to actuate the permission wheel, step by step, from the vibratory armature 33, until the notch 29 of the desired station reaches a position for registry with the projection 25 on lever 15, the armature 17 having in the meantime been lifted by the attractive energy of the polar extremities 13 of the core pieces 7. The impulses will of course, be of such frequency that armature 17 will not be permitted to drop while the current is on. When the desired position of the permission wheels is attained, a cessation of current permits these armatures 17 to drop at the several stations, but at the station to be called, the notch 29 permits a sufficient drop to carry pin 50 below the shoe 55. A resumption of the current will then lift the shoe and gravity latch 41, when the bell will be sounded by the vibrations of armature 35. The armatures 33 and 35 are caused to vibrate by the attractive energy of the core bars 3, which, with an alternating current, will change polarity with the changes in the direction of the current, and sufficient residual magnetism will remain in these core bars to hold the armatures in contact with one bar or the other. The core bars 7, however, being insulated from the bars 3 by non-magnetizable material, will deënergize instantly when the current is cut off, and thus release the armature 17 from the pole pieces 13. During the ringing interval, the armature 17 will be raised, and projection 25 being out of the notch in the permission wheel, the latter will have again stepped around to the zero point. When the current is again cut off, the bell not only stops ringing, but the armature 17 drops and tilts the lever 15, the pin 50 passing through the slit 53 to its normal position above the gravity latch 41. The angular position of the shoe 55 is such as to engage the pin 50 and guide it through the slit 53 during this movement. When the pin 50 passes through the slit 53, the gravity latch drops to normal bell locking position, and the permission wheel will be at zero point, all the parts being thus restored to normal position. Should the conducing wire be then employed for signaling or for any other purpose, the permission wheels at all stations would merely step around to locking position at zero point and remain there while the current is on. The structure and arrangement of parts illustrated, however, in so far as they relate to electrical signaling, are not claimed in this application, these features being the subject of a separate application filed August 23, 1909, Serial No. 514,131. My improved electro-magnetic device may not only be employed in connection with such signaling apparatus, but may be used in any relation where it is desirable to use a single coil, or set of coils, to perform a plurality of electrically controlled operations.

The terms and expressions herein used are used as terms of description and not of limitation, and I have no intention in the use of such terms and expressions to exclude any mechanical equivalent for the features shown and described, but recognize that various structural modifications are possible within the scope of the invention claimed.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a device of the described class, an electro-magnetic coil provided with a plurality of magnetizable core pieces magnetically separated from each other and a plurality of devices each separately controlled by one of the core pieces.

2. In a device of the described class, an electro-magnetic coil provided with a plurality of magnetizable core pieces, mechanically connected with, and magnetically separated from, each other by a body of material having less magnetic permeability in combination with a set of movable armatures, one in operative relation to one of said core pieces and the other in operative relation to another of said core pieces.

3. In a device of the described class, the combination with a permanent magnet, of a conducting coil, a magnetizable core piece connected with the permanent magnet and extending through said coil, another magnetizable core piece mechanically supported from the first mentioned core piece and separated therefrom by a body of non-magnetizable material, and a movable armature in operative relation to each core piece.

4. In a device of the described class, the combination with a permanent magnet, of a set of magnetizable core pieces supported therefrom, another set of auxiliary magnetizable core pieces mechanically supported from the first mentioned core pieces and magnetically separated therefrom by a body of non-magnetizable material, electrical conducting coils, each encircling one of said first mentioned pole pieces and the auxiliary pole pieces supported therefrom, said auxiliary core pieces having their ends extending through the coils and turned in the direction of the like core pieces of an adjacent coil to form a nearly closed magnetic

circuit, and movable armatures, each arranged in operative relation to like core pieces of such adjacent coils.

5. In a device of the described class, an electro-magnetic coil provided with a plurality of magnetizable core pieces, separated from each other by material having less magnetic permeability, and a plurality of devices, each separately controlled by one of the core pieces.

In testimony whereof I affix my signature in the presence of two witnesses.

WILLIAM S. BURNETT.

Witnesses:
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LEVERETT C. WHEELER.