W. W. DEAN.

ELECTROMAGNETIC DEVICE.

APPLICATION FILED JUNE 15, 1903.

1,088,771. Patented Mar. 3, 1914.

Fig. 1.

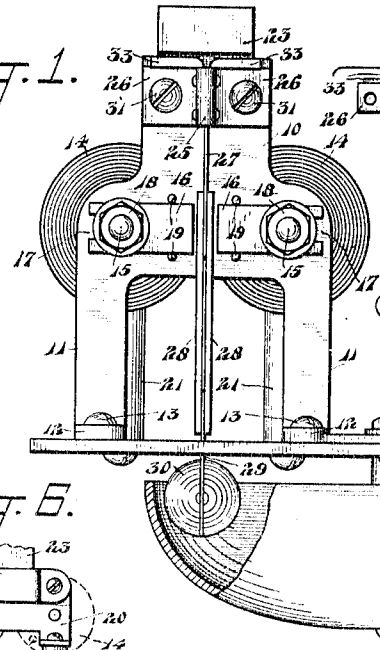


Fig. 5.

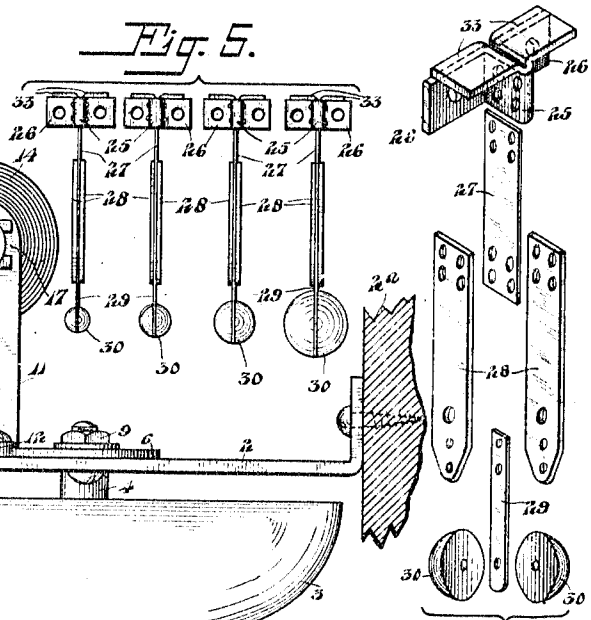


Fig. 6.

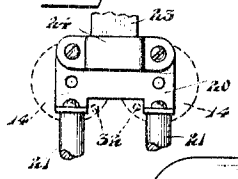


Fig. 4.

Fig. 3.

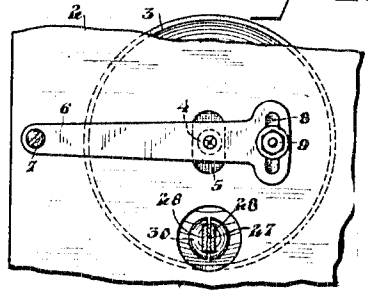
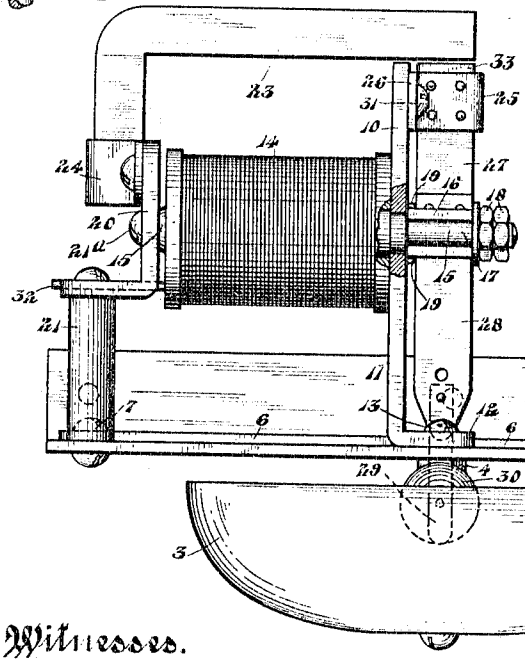


Fig. 2.



Witnesses.

R. H. Burfine

Kempster B. Miller.

Inventor:-

William W. Dean,

by Robert Lecio Amos,

Attorney.

UNITED STATES PATENT OFFICE.

WILLIAM W. DEAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD & SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

ELECTROMAGNETIC DEVICE.

1,088,771. Specification of Letters Patent. **Patented Mar. 3, 1914.**

Application filed June 15, 1903. Serial No. 161,528.

To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States of America, and residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Electromagnetic Devices, of which the following is a specification.

My invention relates particularly to electro-magnetic bells of the tuned reed type, although many of its features are of more general application. By tuned reed I mean a reed or a bell adapted to respond to one distinct predetermined rate or frequency only, and unresponsive to all other rates of vibration or frequencies of current.

In carrying out my invention, which has been worked out for commercial purposes, I provide a suitable framework upon which is mounted a pair of magnet spools and a tuned reed placed between the poles of the magnet coils and carrying the armature by means of which the said reed is vibrated and the bell hammer which strikes the gong of the bell in the vibration of the reed. This reed is preferably made readily removable and replaceable so that it may be handily changed for another reed having a different characteristic vibration. The rates of vibration of the reeds are most readily adjusted by varying the sizes of the balls or hammers carried by the reeds, whereby no adjustment in the device itself is necessary, but only that a reed carrying the proper sized hammer or ball be employed. The difficulties of manufacture are thus largely reduced and no skilled labor is necessary for adjusting the parts.

In my invention I prefer also to use a single gong which in itself reduces the cost of the device and greatly simplifies it, although two gongs may be used if desired, without departing from my invention.

I have discovered also that the rate of vibration or operation of the bell to cause it to correspond to a definite rate of alternation or pulsation of the operating current must be the characteristic rate of vibration of the reed as modified by the action of the gong in being struck, assuming such modification to take place. In other words, the natural vibration of the reed in that event, is accelerated by the vibration of the gong or its elasticity or both, so that it is insufficient to merely select reeds having the proper characteristic vibration but it is also necessary to take into account the resultant action of the reed and gong. Heretofore in some tuned reed electro-magnetic devices the armature was not required to do additional work aside from making and breaking electric contacts which did not increase or decrease to any appreciable extent the vibration of the reed. In my apparatus the reed is required to do work which in this instance consists in ringing the bell so that a different problem is involved from that of said prior devices, and which is solved in the manner indicated. I also polarize the bell, whereby it is particularly adapted for operation by alternating currents of the proper frequency.

Other features of novelty will appear from the detailed description and claims.

The accompanying drawing illustrates one form of the invention, the same reference characters being used throughout the several views, in which—

Figure 1 indicates a side elevation thereof; Fig. 2 is a side elevation at right angles to that of Fig. 1. Fig. 3 is a plan view of the gong mounting. Fig. 4 is a segregated view in perspective of the parts of one of the reeds shown in Fig. 5. Fig. 5 is a view showing reeds for four different characteristic vibrations of the bell, and Fig. 6 shows the rear supporting plate of the magnet.

Upon a supporting shelf 2 which may be of sheet iron or other desired material and secured laterally to the face of a support 2^a a gong 3 is mounted upon a central stem 4 passing through a slot 5 in said shelf and carried by the arm 6 pivoted at one end 7 to the upper-side of said shelf and having at its opposite end a slot 8 through which passes a suitable bolt 9 by means of which the said arm and the gong carried thereby may be adjusted in position with reference to the shelf 2. To the upper side of said supporting shelf 2 the framework of the actuating part of the bell is secured, said framework

comprising a front plate 10 preferably of brass having the legs 11 provided with the feet 12 secured by suitable screws, bolts or rivets 13 to the said shelf 2. The magnet coils 14 are mounted upon suitable cores 15 having reduced ends passing through apertures in said plate 10 and carrying the pole pieces 16 which are adjustable toward each other by means of the slots 17 through which the said ends of the cores 15 pass, locknuts 18 being threaded upon the said ends of the cores to clamp said pole pieces, the front plate 10 and the cores 15 together. Suitable steady pins 19 are provided in the front face of said plate 10 to maintain the pole pieces 16 in alinement. The rear ends of the cores 15 are secured to the rear supporting plate 20 of magnetic material as by the screws 21ª, said rear plate being supported by the shelf 2 by means of the posts 21 on said shelf and secured thereto and to the plate 20 in any desired manner. A permanent magnet 23 is secured at its rear end to the plate 20 by a suitable clamping strap 24 and extends parallel with the magnet coils 14 to the front ends thereof. The terminals 32 of the coils 14 are brought out in the rear as shown in Figs. 2 and 6.

The construction of the reed of the bell which consists of a tuned reed is best shown in Fig. 4. A securing plate or clip 25 provided with the laterally extending lugs 26 is riveted to one end of the leaf spring 27. The armature pieces 28, 28 stamped from sheet metal are secured preferably by riveting to the lower end of spring 27 and a spring strip 29 is secured in a similar manner between the lower ends of the armature pieces 28, 28. At the free end of the strip 29, the ball or hammer 30 consisting of two halves is riveted thereto. The assembled reed which forms a unit is then secured to the upper end of the front plate 10 of the bell by means of screws 31 passing through suitable apertures in the laterally extending lugs 26 and threading into the said plate 10. The mounting clip 25 preferably consists of a punching and the wings 33 serve to concentrate the lines of force from the permanent magnet.

In order to vary the rate of vibration of the reed, I find it convenient to use different sized balls or hammers 30, this being indicated in Fig. 5. The reeds are thus constructed in units and the rate of operation of the bell may therefore be varied by simply using one reed or another according to the desired rate of vibration of the armature.

As stated at the beginning of this specification, the characteristic vibration of the reeds does not correspond to the rate of vibration of the device as a whole. The natural action of the reed is modified by the ball 30 in the first instance and by the striking of the gong which serves to accelerate the vibration of the reed in the second. It is therefore necessary in order to adapt the device to an operating current of a particular alternation or pulsation to experimentally select a reed such that this resultant rate of vibration will correspond to that of the operating current.

The permanent magnet serves its usual function in polarizing the armature to permit the device to work satisfactorily with alternating currents. That is, by combining the polarized armature with tuned reeds provided with tappers that will partake of the same vibrations as the reed, I am enabled to entirely overcome the difficulties which have hitherto prevented the successful operation of tuned reeds. These difficulties I attribute to the fact that the tapper, while given an impulse toward the bell, was allowed to return according to its own free rate as influenced by the impact of the hammer against the bell, thus if the reed was made sufficiently rigid as to require several electrical impulses before the tapper came in contact with the bell, the frequency was so disturbed by the impact with the bell that an irregular or otherwise unsatisfactory vibration occurred after the tapper came in contact with the bell. The permanent magnet by polarizing the armature renders it sensitive to impulses in both directions which serves to maintain the vibrations of the parts at a rate which will respond to the particular alternations or pulsations of current in a regular and harmonious manner even after the bell has been struck. I believe that I am the first to provide such a device with a permanent magnet for governing or regulating the movement of the armature at all times, and thus rendering the armature sensitive to current impulses in two directions. I have not deemed it necessary to show an operating circuit since this matter is well understood by those skilled in the art. The rear edge of the supporting shelf 2 is shown turned up to permit the shelf 2 to be readily secured to any vertical supporting surface. The armature plates 28 extend for some distance below the pole pieces 16 to stiffen the reed and prevent it from vibrating in nodes or beats as is liable to occur particularly with the heavy balls 30 if the reed is flexible throughout its length. The flexible strip 29 at the free end of the armature is also important since it permits a slight flexibility of movement of the hammer, but at the same time provides a sufficiently rigid connection to permit or compel the hammer to vibrate at the same rate as the reed, which is essential to the proper operation of the device. All tendency therefore of the hammer to vibrate at a different rate from the reed is obviated. The hammer vibrates accurately with the reed and there is no tendency for the reed to vibrate and the

hammer to stand still, or for the hammer to vibrate at a different rate from the reed. Also from a manufacturer's and user's point of view it is preferable to make the armature strips 28 as described since it is much cheaper to make the two pieces and rivet them in place than to use but a single piece with slits sawed in the ends. Again by riveting all parts together there is nothing to come loose and nothing to adjust. The balls similarly are easily manufactured owing to being cut in half. The mounting of all operating parts upon the single front supporting shelf is of advantage, since the errors of manufacture are not multiplied and all parts go together practically without adjustment or excessive fineness in manufacture. Neither the armature nor any of the other parts are carried by the permanent magnet as is common in this form of electrical devices. The permanent magnet is secured in place by means of the clamping strap which saves drilling the hard steel bar for screw holes. The shelf 2 supports all parts which is important with devices made in several parts which must work together, like the bell and gong.

I claim:—

1. In a device of the class described, the combination with a diamagnetic front plate, of magnet coils secured to said front plate, a supporting member to which said plate is secured to support the front ends of the magnets with reference to the said member, and a vibrating reed adapted to be operated by said magnets and fixed at one end to said front plate, substantially as described.

2. In a device of the class described, the combination with an operating magnet, of a tuned-reed adapted to be vibrated thereby, said tuned-reed comprising a leaf spring fixed at one end, a pair of rigid magnetic strips riveted to the opposite sides of the free end of said spring, a flexible member riveted between the other ends of said strips and a ball carried by the latter member, said strips forming the armature of the magnet, substantially as described.

3. In a device of the class described, the combination with an operating magnet, of a tuned reed adapted to be vibrated thereby, said tuned reed comprising a leaf spring fixed at one end, a pair of magnetic pieces riveted to the opposite sides of the free end of said spring, an extending member secured between another portion of said magnetic pieces, and a hammer carried by the latter member, said magnetic pieces forming the armature for the magnet, substantially as described.

4. In a magnetic device of the class described, the combination with a single pair of magnet coils, of a two-piece polarized armature for said coils, a thin spring plate fixed at one end and secured between said armature pieces at the other end, and adapted to form a portion of the magnetic circuit of said device, and a hammer carrier also secured between said armature pieces, substantially as described.

5. In a signaling device, the combination with a pair of electro-magnets, of a tuned reed adapted to be vibrated by alternating current passed through the coils of said electro-magnets in series, said tuned reed comprising a spring, a pair of armature pieces, a hammer and a supporting strip passing between said armature pieces and supporting the said hammer, substantially as described.

6. In a device of the class described, the combination with a bell structure, including an operating magnet, a single tuned reed rigidly supported at one end and having its central portion adapted to act as the armature of said magnet, said tuned reed also including a hammer or ball, a gong adapted to be struck by the hammer or ball of said tuned reed, the characteristic rate of the actuation of the bell being varied by the size of the hammer or ball carried by the tuned reed, and means for readily substituting a tuned reed having a hammer or ball of the desired size, substantially as described.

7. In a device of the class described the combination of a supporting shelf having an aperture and constructed and adapted to be secured horizontally to a wall or the like, a single bell gong adjustably secured to the under side of said shelf, a vertical plate secured to the upper side of said shelf, a pair of electro-magnets secured to said plate on one side thereof, an armature for said magnets, pole-pieces for said magnets adjustably secured to the other side of said plate, and a tuned reed secured to said plate, carrying said armatures and passing between said pole-pieces and through the aperture in said shelf and including a ball or hammer carried in position to strike said gong.

8. In a signaling device, the combination with a pair of magnet spools, of a magnetic support connecting said spools at one end, a non-magnetic member secured to the other ends of said spools, a tuned reed supported by said member, including an armature and bell tapper, a permanent magnet secured at one end to said magnetic support and having its other end in proximity with said armature, whereby the armature is polarized, said armature and bell-tapper being adapted to be vibrated by the current in said magnet spools, substantially as described.

9. In a signaling device, the combination with a pair of magnet spools, of a magnetic support connecting said spools at one end, a non-magnetic member secured to the other ends of said spools, a tuned reed supported by said member, comprising a short stiff spring, an armature, a bell tapper, and a resilient mounting carried by the armature for

said tapper, a permanent magnet secured at one end to said magnetic support and having its other end in proximity with said armature, whereby the armature is polarized, said armature and bell-tapper being adapted to be vibrated by the current in said magnet spools, substantially as described.

Signed by me at Chicago, county of Cook, State of Illinois, this 12th day of June, 1903.

WILLIAM W. DEAN.

Witnesses:
EVA A. GARLOCK,
ROBERT LEWIS AMES.