H. G. WEBSTER.

CALL BELL.

APPLICATION FILED DEC. 30, 1912.

1,090,436.

Patented Mar. 17, 1914.

Fig. 1.

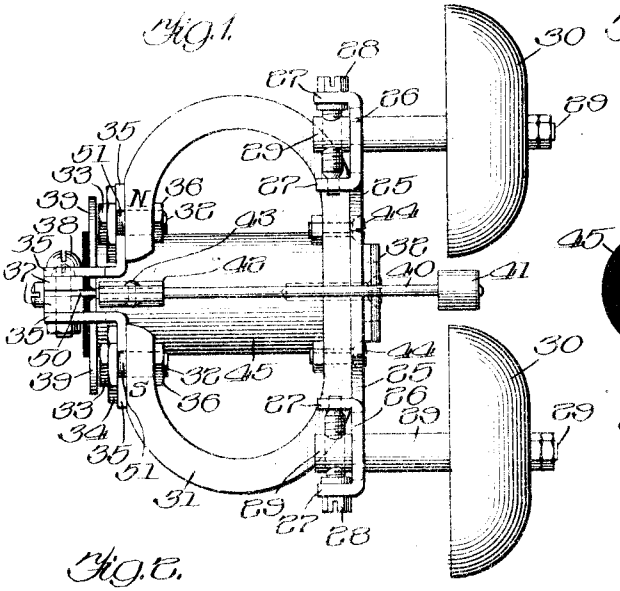


Fig. 3.

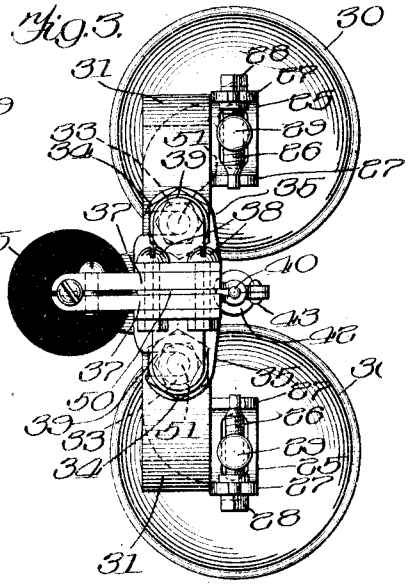


Fig. 6.

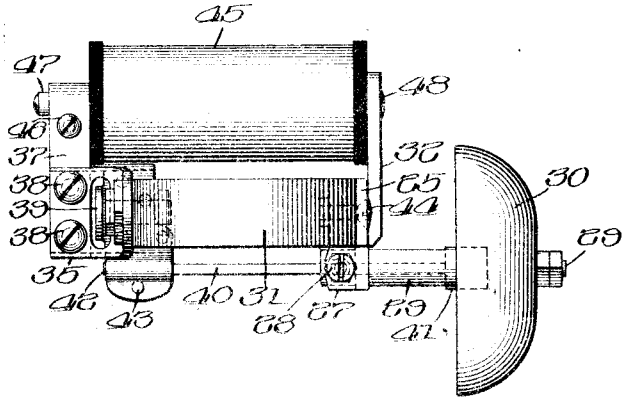


Fig. 5.

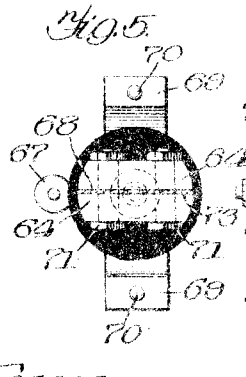
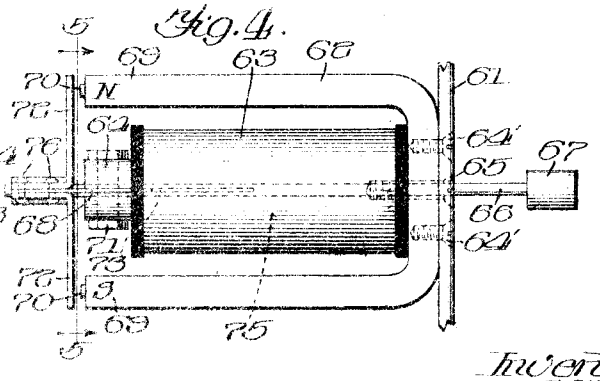


Fig. 4.



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UNITED STATES PATENT OFFICE.

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CALL-BELL.

1,090,436. Specification of Letters Patent. **Patented Mar. 17, 1914.**

Original application filed March 11, 1912, Serial No. 682,994. Divided and this application filed December 30, 1912. Serial No. 739,330.

To all whom it may concern:

Be it known that I, HARRY G. WEBSTER, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Call-Bells, of which the following is a specification.

My invention relates to call bells such as are used in telephone systems and more particularly to call bells used in so-called "harmonic" selective systems.

The object of the invention is to provide a novel bell which will insure greater accuracy and efficiency in operation than is now commonly obtained by bells of this class.

The present invention is particularly useful in systems of the character described and claimed in my prior application Serial No. 682,994, filed March 11, 1912, and the present application is a division of that application. As stated in that application, in bells of the prior art, such as illustrated in the patents to Dean, No. 779,533, issued Jan. 10, 1905, and to North, No. 1008232, issued Nov. 27, 1911, a polarized armature, forming part of the reed-member of each bell, vibrates before or between the poles of an electromagnet energized by each frequency of signaling current that is impressed upon the line. Now it is a well known fact that when current is impressed upon a polarized device of this character, the armature will be attracted toward that pole of the electromagnet to which it is nearest. The mechanical stresses do not correspond in direction to the impressed current. This appears to be due to the fact that both polar extremities of the electromagnet act directly on the reed armature. The result is in some instances a false response to currents of frequencies other than that for which the device is intended, and in other instances a failure to respond and attain full amplitude of vibration in response to the intended frequency. In contrast to this, I so organize the parts of my device that the magnetism set up by the impressed current impulses produces mechanical forces which correspond in direction and frequency with the impressed current impulses independently of the momentary positions of the reed-member. In my device there is correspondence between the mechanical stresses and the current impulses. This appears to be due to the fact that but one polar extremity of the electromagnet acts directly on the reed-member. This organization of parts, which results in changing the energy of the electric impulses into mechanical stresses agreeing with the impulses in direction and frequency, coöperates with the tuned reed-member, which has a characteristic rate of vibration, to bring about an improved action in devices of this class.

In the accompanying diagram, I have illustrated two embodiments of my invention, which obviously may take other forms as well. From these a fuller understanding of the invention will be obtainable, and the scope of the invention will be particularly pointed out in the appended claims.

In said diagram, Figures 1, 2 and 3, illustrate one embodiment, Fig. 1 being a plan view, Fig. 2, a side view, and Fig. 3, a view of the armature end of the device. Figs. 4 and 5 illustrate the second embodiment, Fig. 4 being a partial plan view and Fig. 5 a sectional end view, the section being taken on a plane indicated by the line 5—5 of Fig. 4.

Throughout these views like characters refer to like parts.

Referring now to the mechanical structure of the first form of my invention, 25 designates a mounting plate slotted at 26, 26, for the reception of the gong posts 29, 29, and having turned up ears 27, 27, 27, 27, in which turn the adjustment screws 28, 28. These screws are threaded in the posts 29, 29, and serve to hold and move the posts in the slots 26 and thus adjust the gongs 30 with respect to the tapper weight 41. The curved permanent magnet 31 is secured to the mounting plate by bolts 44, 44, and has its opposite poles N, S, perforated for the reception of the soft iron bolts 32, 32, whose heads 33, 33, constitute adjustable pole-pieces for the permanent magnet. The armature consists of the two angular pieces 39, 39, between which is clamped one end of the leaf-spring 56. These two pieces are formed of soft steel, or iron, with a channel at 42 for clamping the tapper rod, and are securely riveted together as at 43. The other

end of the leaf-spring is securely clamped between the soft iron blocks 37, 37, by means of the non-magnetic angle pieces 35, 35, and the bolts, or rivets, 38, 38. The pieces 35 are slotted at 51, 51, to receive the bolts 32, and when clamped against the ends of magnet 31, serve to rigidly support the armature 39, 39, at a fixed distance from the magnet ends. The non-magnetic nuts 34, 34, and iron nuts, 36, 36, serve to hold the pieces 35, 35, in place; and also provide means for adjusting the bolt heads 33, 33, with respect to the armature 39, 39, and so varying the air gap for the armature. Air gap spacers of non-magnetic metal may be fixed in the armature or bolts, or these parts may be plated with copper if desired. The electromagnet 45 consists of a single spool having its core secured at one end to the ends of the pieces 37, 37, by means of the screws 47 and 46, and at the other end by the screw 48 to the soft iron piece 32 carried on the mounting plate 25. The electromagnet may be provided with any suitable winding, one such being of approximately 12,000 turns of No. 33 single silk covered copper wire, having a resistance of approximately 500 ohms.

The structure is one having no break in the magnetic circuit of the permanent magnet or electromagnet, except at the operating air gap of the armature. When assembled as above, the entire device constitutes a rigid unitary structure in which the armature pieces 39, the leaf-spring 50, the rod 40 and tapperweight 41, constitute a reed-member or reed-striker having a characteristic rate of vibration. It is adjusted during assembly for currents of predetermined frequency by varying the operating air gap and the length and stiffness of the leaf-spring, and by varying the tapperweight with respect to its size and to its position on the tapper rod.

In the second form of my invention, illustrated in Figs. 4 and 5, the mounting plate 61 corresponds to plate 25 of Fig. 1 and is to be understood as adjustably supporting gong-posts and gongs in a similar manner. The permanent magnet 62 is secured to the plate 61 by bolts or screws 64', and between its two legs is mounted the electromagnet 63. The electromagnet core 75 is secured at one end to the plate 61 and magnet 62 by means of the screw 65, or in any other suitable manner; and the opposite end is provided with a slot 73, and enlarged portions 64, 64, for supporting the reed-member. This reed-member consists of the two soft iron armature pieces 72, 72, the tapper rod 66, the tapper weight 67, and the leaf-spring 68. One end of the tapper rod, and one end of the leaf-spring are rigidly clamped between the armature pieces 72, by means of rivets, as indicated at 76. The other end of the leaf-spring is rigidly supported in the slot 73, between the core portions 64, by means of rivets or bolts, as indicated at 71, 71. Non-magnetic stops may be provided, as indicated at 70, or in any suitable manner. The end portions 69, 69, of magnet 62, constitute opposite poles, and the electromagnet may have 8,000, or any other suitable number of turns in its winding. As so organized, the reed-member has a characteristic rate of vibration, the magnetic circuit is practically unbroken, except at the operating air gap which may be given a permanent adjustment, and the device as a whole is compact, rigid, efficient, and economical to manufacture.

With either embodiment of my invention, when alternating currents are impressed upon the electromagnet winding, the armature always receives an active magnetic polarity when current flows in one direction, and an active and opposite magnetic polarity when current flows in the other direction. Thus, regardless of the position of the armature, the reed-member always receives an active stress in one direction in response to current impulses of one polarity, and an active stress in the other direction in response to current impulses of the opposite polarity. As thus organized, the present device has many advantages over prior tuned reed bells, aside from those advantages already pointed out. One characteristic of prior reed bells of the polarized type is found in the more or less well known fact that when impressing relatively strong current impulses of that frequency for which the bell is adjusted, if the bell armature be at that instant slightly vibrating, as from a previous ring, it will frequently fail to respond and ring the bell, and instead will vibrate continuously at small amplitude as long as the ringing circuit remains closed. This faulty operation seems to be due to the reed motion getting into and remaining in a phase relation with respect to the impressed current, under which it is displaced practically one hundred and eighty degrees from that phase relation under which its greatest amplitude of vibration can be secured. Its frequent occurrence is just as objectionable in practice as if the reed-tongue remained motionless. In the device of the present application, the characteristic just described is wholly absent; and instead the reed-member invariably and quickly assumes its full amplitude of vibration under all operative conditions. The device has an efficiency and a positiveness of operation not found in any prior devices of this art, so far as I am aware.

All of the above statements, as to operation, I have fully verified by actual tests.

It will also be apparent that in practising my invention many alterations and modifications may be made in the embodiments dis-

closed herein without departing from the spirit of the invention. I, therefore, do not wish to be limited to the particular uses and embodiments herein disclosed but aim to cover all such uses and alterations and modifications by the terms of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:—

1. A call bell comprising a tuned reed-striker having a characteristic rate of vibration and means whereby magnetic stresses corresponding in direction and frequency to the impressed current impulses will be applied to said striker independently of its momentary positions.

2. A call bell comprising a tuned reed-striker having a characteristic rate of vibration and means whereby sinusoidal currents will apply to said striker approximately sinusoidal stresses corresponding to said currents in direction and frequency independently of the momentary positions of said striker.

3. A call bell comprising a reed-member having a characteristic rate of vibration, and means, including a permanent magnet and an electromagnet of which said reed-member is a polar extension, whereby magnetic stresses corresponding in direction and frequency to the impressed current impulses will be applied to said member independently of its momentary positions.

4. A call bell comprising a reed-member having a characteristic rate of vibration, and means, including a permanent magnet and an electromagnet having in their magnetic circuits operating air gaps between said member and the poles of said permanent magnet, whereby magnetic stresses corresponding in direction and frequency to the impressed current impulses will be applied to said member independently of its momentary positions.

5. A call bell comprising a permanent magnet, a reed-member adapted to be tuned to vibrate at one rate only, said member including an armature mounted intermediate of the poles of said magnet and operatively related to said poles, and magnetic circuit connections rigidly secured to an intermediate point of said permanent magnet and extending therefrom to said armature.

6. A call bell comprising a permanent magnet, a reed-member adapted to be tuned to vibrate at one rate only, said member including an armature mounted intermediate of the poles of said magnet and having its ends operatively related to said poles, and magnetic circuit connections rigidly secured to an intermediate point of said permanent magnet and extending therefrom to an intermediate point of said armature.

7. A call bell comprising a permanent magnet, an electromagnet rigidly related to said permanent magnet and having its core included in magnetic circuit with portions of said permanent magnet and a reed-member adapted to be tuned to vibrate at one rate only, said member including an armature operatively related to the poles of said magnets and providing in the magnetic circuits of the device operating air gaps at the poles of said permanent magnet.

8. A call bell comprising a permanent magnet, an electromagnet having its core rigidly related to said permanent magnet and magnetically connected with an intermediate point of said permanent magnet, and a reed-member adapted to be tuned to vibrate at one rate only, said member including an armature constituting a polar extension of said electromagnet.

9. A call bell comprising a permanent magnet, an electromagnet having its core rigidly related to said permanent magnet and magnetically connected with an intermediate point of said permanent magnet, and a reed-member adapted to be tuned to vibrate at one rate only, said member including an armature constituting a polar extension of one of said magnets and having its ends operatively related to the poles of the other of said magnets.

10. A call bell comprising a permanent magnet, an electromagnet having its core rigidly related to said permanent magnet, and a reed-member adapted to be tuned to vibrate at one rate only, said member including an armature constituting a polar extension of the core of said electromagnet and having its ends operatively related to the poles of said permanent magnet.

11. A call bell comprising a permanent magnet terminating in adjacent poles, an electromagnet having its core extended to an intermediate point of said permanent magnet and terminating in a pole positioned between said permanent magnet poles, and a reed-armature mounted upon said core and extending into operative relation with the poles of said permanent magnet.

12. A call bell comprising a permanent magnet terminating in adjacent poles, an electromagnet having one end extended to an intermediate portion of said permanent magnet and the other end terminating between said poles, an armature extending between and operatively related to said poles, and a supporting reed uniting an intermediate point of said armature to the adjacent end of said electromagnet.

13. A call bell comprising gongs, a suitable supporting member for said gongs, a permanent magnet secured at a central point to said member and having its ends extending therefrom and terminating in adjacent poles, an electromagnet having one end secured to said permanent magnet at said central point and the other end termi-

nating between said poles, an armature extending between and operatively related to said poles, a tapper rod secured to said armature and extending into operative relation to said gongs, and a supporting reed uniting the adjacent end of said electromagnet to a central portion of said armature.

In witness whereof, I hereunto subscribe my name this 28th day of Dec. A. D. 1912.

HARRY G. WEBSTER.

Witnesses:
T. H. FERGUSON,
I. E. LARSEN.