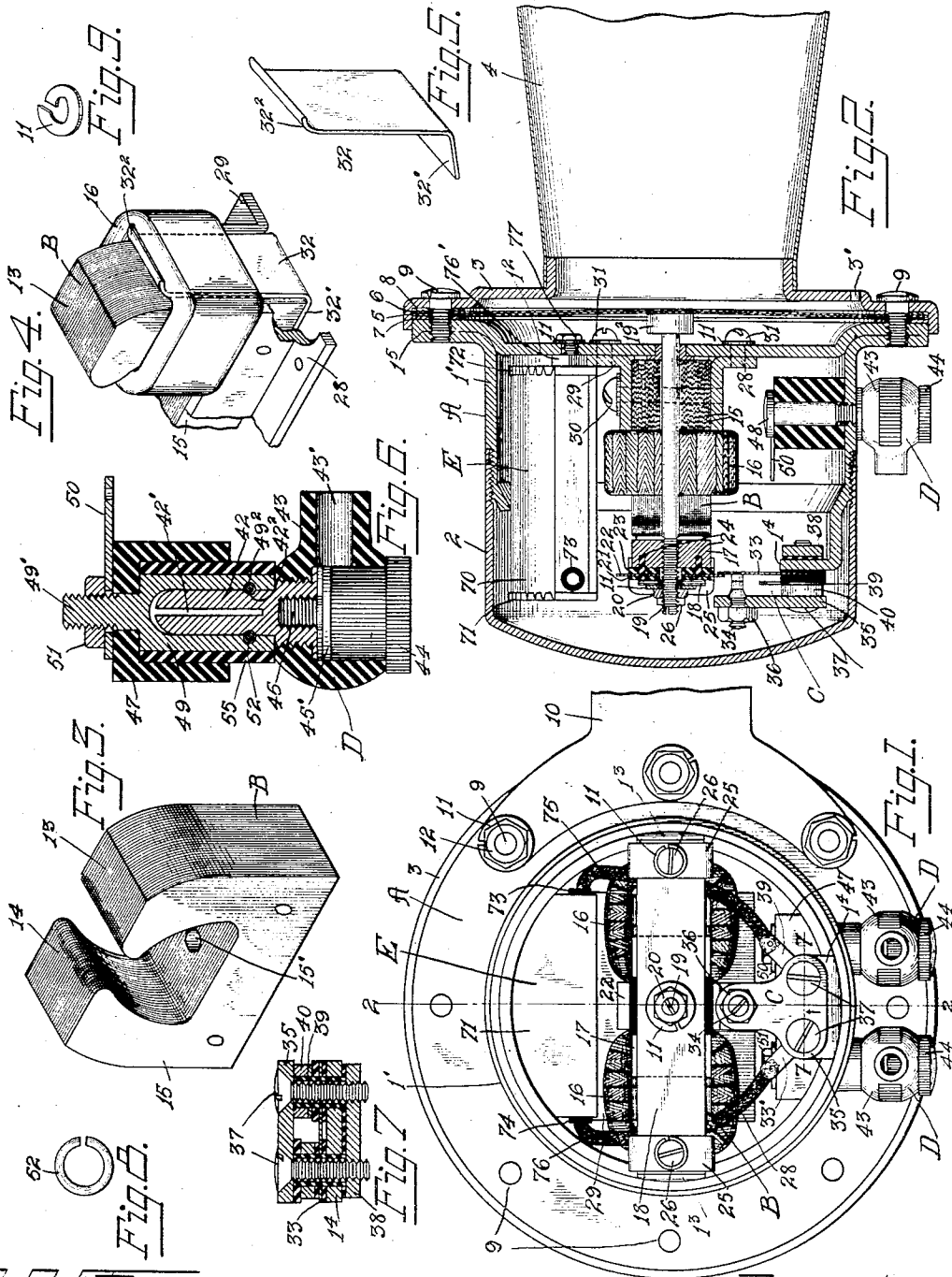


W. W. DEAN.
ELECTRICAL SIGNALING HORN.
APPLICATION FILED OCT. 28, 1912.

1,233,651.

Patented July 17, 1917.

2 SHEETS—SHEET 1.



Witnesses:

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2 SHEETS—SHEET 2.

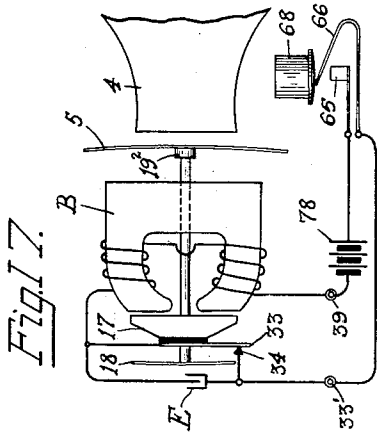


Fig. 17.

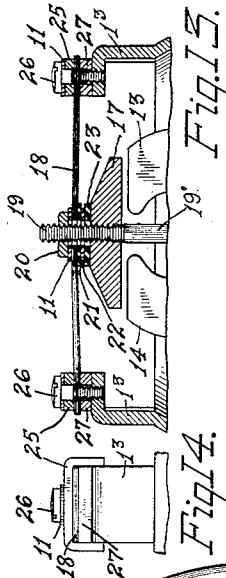


Fig. 15.

Fig. 14.

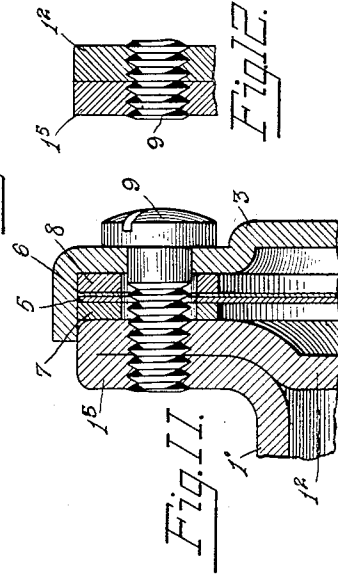


Fig. 11.

Fig. 12.

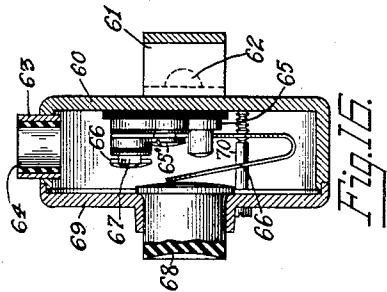


Fig. 16.

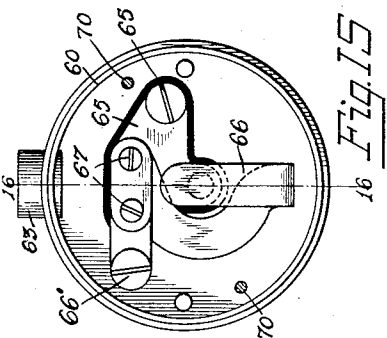


Fig. 15.

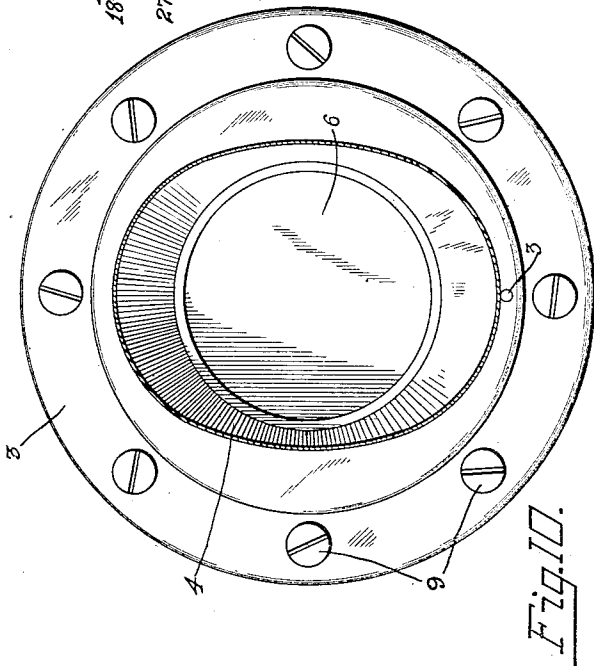


Fig. 10.

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UNITED STATES PATENT OFFICE.

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ELECTRICAL SIGNALING-HORN.

1,233,651.

Specification of Letters Patent.

Patented July 17, 1917.

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To all whom it may concern:

Be it known that I, WILLIAM W. DEAN, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented new and useful Improvements in Electrical Signaling-Horns, of which the following is a specification.

My invention relates to signaling horns such as are usually employed on automobiles or motor boats for warning signals, my invention being more particularly directed to electrical signaling horns in which a vibratile member, such as a diaphragm is operated by an electromagnetic device, an object of my invention being to provide a signal horn of the class described which is more simple of construction, efficient in operation, compact and readily adjustable, certain features thereof being more particularly pointed out in the ensuing specification including the appended claims.

In signaling horns it is desirable to provide a device which will give the most effective sound and therefore it is desirable to secure a loud and penetrating sound and at the same time make the device compact and to operate in a most efficient manner by the least current consumption.

I have found that by providing a diaphragm and a retractile spring, and supporting a hammer member between said diaphragm and spring in such a manner that said diaphragm and spring are flexed, by reciprocating the hammer member at a rate equal to the natural rate of vibration of the diaphragm, most efficient results are obtained.

For a more complete understanding of my invention reference is to be had to the accompanying drawings in which;

Figure 1 is a rear elevation of a signaling horn embodying my invention, shown with the rear cap removed;

Fig. 2 is a cross section along the line 2, 2 of Fig. 1;

Fig. 3 is a perspective view of the laminated core of the electromagnet;

Fig. 4 illustrates the manner in which the coil is held upon the pole of the core;

Fig. 5, is a detail view of the spring clamping plate used for holding the coil on the core;

Fig. 6 is a section through the center of one of the removable terminal binding posts;

Fig. 7, is a sectional view along the line 7, 7 of Fig. 1 illustrating the manner in which the interrupter contact springs are insulatingly mounted;

Fig. 8, shows a spring ring used for holding the removable portion of the terminal in place;

Fig. 9 illustrates in perspective a split washer such as is used under screw heads and nuts of the device to prevent their becoming loose;

Fig. 10, is a face view of Fig. 2 showing a portion only of the bell extending from the front of the device;

Fig. 11, is an enlarged sectional view showing the preferred manner of clamping the diaphragm;

Fig. 12 shows a modified method of manufacturing the main frame or casing;

Fig. 13 is a partial view of the device showing the manner in which the retractile spring is supported and attached to the armature;

Fig. 14 is a left end view of Fig. 13;

Fig. 15 is a face view of an actuating switch with the front cap removed;

Fig. 16 is a cross section along the line 16, 16 of Fig. 15 but with the cap and button in place, and

Fig. 17 illustrates diagrammatically a manner of connecting the device in circuit for operation.

Referring now more in detail, the device illustrated comprises a main casing A having a tubular body portion 1¹ and a face plate 1² preferably formed integral therewith. A pair of ears 1³ are formed integral with the casing A being bent inwardly as indicated in Fig. 13. A contact spring supporting ear 1⁴ is also preferably formed integral with the body portion 1¹ being bent inwardly as indicated in Fig. 2. The rear end of the portion 1¹ is threaded and adapted to receive a cap 2. A front cap 3 is also provided having a central opening formed outwardly and adapted to be secured to a bell 4 in a suitable manner. The front cap 3 is preferably formed of sheet metal and has its outer edge turned over to fit snugly over the rim 1⁵ of the casing A.

A diaphragm 5 preferably constructed of thin sheet steel and having an oiled-silk protecting member 6, is held between a pair of flexible rings 7, 8 and then clamping screws 9 are passed through front cap 3

and threaded into the rim 1⁵ to securely hold the diaphragm. A fastening bracket 10 of any suitable construction is provided and the clamping screws 9 are equidistantly spaced so that the bracket member 10 may be moved in any one of a plurality of positions. The screws 9 which are used for holding the bracket 10 are made long enough to pass through the bracket, a split washer 11 and nut 12.

A vent 3¹ is provided in front cap 3, to allow the excursion of water which may blow into the bell. Due to the spacing of screws 9 the front cap may be always clamped in such a position that the vent 3¹ is at its lowest point.

In Fig. 12, I have illustrated another method of constructing the casing A in which the cylindrical portion 1¹ and face plate 1² may be separate parts and held together in any suitable manner, preferably by rivets, not shown.

The electromagnet I preferably construct with a core B, of U shape, having converging poles 13, 14, said core being built up of thin sheets 15 as is indicated more clearly in Fig. 3. By bringing the poles 13, 14 together I am enabled to use a shorter armature and still allow sufficient room for holding a coil 16 of greater number of turns.

It will be apparent that with a given transverse section of the armature, the shorter the armature the lighter its weight thus less power is needed to drive it at a definite speed. With the two cores of magnet B converging a comparatively short armature can be used.

An armature 17 is suitably held in operative position with respect to the poles 13, 14 of the electromagnet, said armature being preferably suspended from a retractile spring 18 comprising a plurality of thin spring members. To suspend said armature from the said retractile spring I preferably provide a screw stud 19 which threads through the armature 17 and has a clamping nut 20 threaded thereon. A split locking washer 11 rests between the nut 20 and spring 18. A layer of insulation 21 lies next to the spring 18, then a contact spring actuating plate 22 and then another layer of insulation 23. These members 21, 22, 23 are then held in position by dowel pins 24, shown in Fig. 2, and clamped between the spring 18 and armature 17. The spring actuating plate 22 is thus insulated from the rest of the device.

The spring 18 is suspended between the ears 1³, being secured thereto by means of saddle clamps 25 and clamping screws 26. A shim 27 is placed between the spring 18 and ear 1³ to bring the spring 18 and armature 17 in proper relation to the poles of the electromagnet B. It is well known that in the ordinary process of manufacture of the

various parts of a device like applicant's, inaccuracies or slight differences in size of the parts frequently occur and in order to bring the armature 17 and spring 18 in proper relation to the poles of magnet B should such inaccuracies occur, shims 27 of different thicknesses are provided and used accordingly.

In vibrating a flat spring of substantial thickness, which is rigidly held at its opposite ends, it will be apparent that with any substantial vibration there will be a tendency to rupture the metal due to a surface tensile strain and to materially overcome this I provide a plurality of thin flat springs to form the member 18 and then secure such member at its opposite ends to ears 1³. These ears are also capable of vibration to allow a variation of the distances between the two points of fastening when the spring 18 is vibrated. By using a plurality of comparatively thin flat springs, this surface tensile strain is materially lessened with a given amplitude of vibration. Another advantage in using a plurality of springs in making up the retractile spring 18, is that the number used may be varied whereby the rate of operation of the electromagnet may be varied to conform more nearly to the natural rate of the diaphragm 5, which of course may vary due to difference in quality and other factors in the manufacture of the diaphragm.

The stud 19 also carries an extension 19¹ at the free end of which the hammer 19² is carried preferably integral with the stud and extension, said hammer being of a larger face area than the stud whereby the blow delivered to the diaphragm upon each vibration of the armature, acts upon the larger surface and it has been found that this has an advantage over a smaller faced hammer in that less wear results. The stud 19 is so adjusted, in assembling the device, that the retractile spring 18 and diaphragm 3 are outwardly flexed as shown in Figs. 2 and 13.

Independently wound coils 16 are preferably provided for the magnet core B, said coils being slipped over their respective pole pieces. A pair of brackets 28, 29 are provided for supporting core B said brackets being adapted to clamp the sheets of core B together by the use of clamping screws 30 as shown in Fig. 2. Brackets 28, 29 are then attached by means of screws 31 to the face plate 1².

To hold the coils 16 in their proper position upon the core B, I preferably employ a spring clamp 32 (Fig. 5) having a portion 32¹ bent at an obtuse angle. Before the brackets 28, 29 are fastened to the face plate 1², plate 32 is inserted between a coil 16 and its pole piece 13 or 14, as indicated in Fig. 4, whereby when the brackets 28, 29 are drawn against the face plate 1², the portion

32¹ of the spring plate 32 is drawn against the bottom of the core B whereby the part 32² presses against an inner surface of coil 16 and tends to hold it in position. It will be apparent that by the use of a spring plate as 32, coils 16 will be securely held in position although they may vary slightly in dimensions. A hole 15¹ is drilled through the yoke of magnet B, to allow the extension 19¹, which connects the hammer 19² and armature 17, to pass through as shown in Fig. 2.

In order to use a source of direct current to operate the magnet, I provide an interrupter C comprising a vibratile contact spring 33 and an adjustable stationary contact 34 threaded into a supporting piece 35 and locked in adjustment by a lock nut 36. Pieces 35 and 33 are attached to the ear 1⁴, being insulatingly mounted thereon and held by clamping screws 37. Fig. 7 is a sectional view through the centers of screws 37 and illustrates the manner in which the contact pieces are insulated from each other and from the casing. A tapped plate 38 is provided for receiving the clamping screws 37 as shown in Fig. 7. A terminal piece 39 and washer 40 are secured in electrical contact with the stationary contact carrying piece 35, and vibratile contact spring 33 carries a terminal 33¹ as shown in Fig. 2.

When current is passed through the windings of the electromagnet, armature 17 is attracted and the contact actuating piece 22 carried thereby moves contact 33 away from contact 34 to interrupt the circuit of the electromagnet in a well known manner.

A pair of terminal binding posts D are provided preferably of a snap type, each one comprising a central stud 42 embedded in a body portion 43 composed of some insulation material as rubber, said stud being slotted at 42¹ to form a spring tip. A thumb screw is used comprising a handle portion 44, preferably composed of an insulation material, and a screw portion 45, said screw portion being adapted to thread into a tapped end of stud 42. An opening 43¹ is provided whereby the conductor may be inserted and clamped between the flange 45¹ and stud 42. An insulating block 47 is attached to the inner surface of casing A by means of a screw 48 as shown in Fig. 2, said screw passing through the block 47 and threading into the wall of casing A. Binding post D is a so-called snap type binding post, that is, the portion which carries the external wires or conductors may be readily pulled out of connection with the stationary part of the terminal. The stationary part which is supported by the block 47 comprises a metallic sleeve 49 having a threaded stud end 49¹ which passes through block 47. A terminal clip 50 is placed beneath the nut 51, said nut 51 acting to securely hold the sleeve 49. An insulating sleeve 55 incloses

the sleeve 49, said parts 49, 55 being set in a counter bore in block 47. To prevent the removable part of the binding post from jarring out, corresponding annular grooves 49² and 42² are cut in terminal sleeve 49 and spring tip 42 respectively and a spring wire ring 52, (shown in Fig. 8) is forced into the annular groove 49² and said ring is so proportioned that it will open to allow the tip 42 to be inserted into sleeve 49 until grooves 49², 42² register when said ring springs into the groove 42² thus holding the removable part of the terminal.

To withdraw the removable part of the binding post, the part 43 is grasped between the fingers and pulled outwardly. The ring 52 is thus spread by the action of groove 42² allowing the withdrawal of tip 42.

In Figs. 15, 16, I have illustrated a controlling switch which comprises a cup or main casing 60 having a saddle clamp 61 attached to the rear thereof by means of screws 62 whereby the switch may be attached to the starting wheel. Of course any other suitable fastening device may be used. A ring 63 is inserted into the periphery of casing 60, and an insulation bushing 64 is forced into ring 63. A stationary contact carrying piece 65 and a spring contact terminal 66 are insulatingly fastened to casing 60 by means of screws 67, a terminal screw 65¹ being provided for terminal piece 65 and a terminal screw 66¹ being provided for contact spring 66. A button 68 preferably of some insulation material is supported by the cap 69, said cap being held against casing 60 by means of screws 70 which pass through the cap 69 and thread into the casing 60. Contact spring 66 presses against the bottom of button 68 so that when said button is depressed spring 66 and contact 65 are moved into engagement and when the pressure upon button 68 is released contact spring 66 restores also disengaging itself from the contact piece 65.

In order to eliminate the sparking of the interrupter contacts, a condenser E is employed, said condenser comprising an outer casing 70 having caps 71, 72. A pair of bushings 73, 74 are inserted into the sides of the casing 70 through which conductors 75, 76 pass in extending from the terminals of the condenser to the terminals of the interrupter contacts. A lug 76¹ (Fig. 2) is fastened to the bottom cap 72 of the condenser and a stud extended therefrom through an opening in the face plate 1² whereby a nut 77 may be threaded on to said stud to hold the condenser in position within the casing.

In Fig. 17 I have illustrated diagrammatically the signaling horn connected in an operating circuit, said operating circuit including a battery 78 connected between the push button switch and the operating

mechanism of the signaling horn. When the button 68 is depressed, contacts 65, 66 are closed and a circuit is closed through the winding of the electromagnet causing an attraction of the armature 17. This movement of the armature causes a further flexure of the diaphragm 5, the attracting movement of the armature being assisted by the action of the spring 18. The attraction of the armature causes the interruption of contacts 33, 34 and the circuit of the electromagnet is broken.

Upon deenergization of the electromagnet, armature 17 is free to retract, and therefore retractile spring 18 assisted by diaphragm 5, which is pressed against the hammer 19, starts the return movement of the armature and hammer. Due to the momentum of the armature and hammer gained by the retracting movement, hammer 19² draws away from the diaphragm 5 and at this time contacts 33, 34 being again closed the electromagnet is energized attracting the armature and thus causing the hammer 19 to strike the diaphragm another blow, the continued attracting movement of the armature holding the hammer against the diaphragm and thus causing an extreme outward flexure thereof. This vibratory operation is of course continued as long as the circuit of the magnet is held closed. In order to secure the most effective and penetrating sound of the device, I adjust the armature, contact springs, retractile spring, and hammer, so that the rate of vibration of the electromagnet armature corresponds to the rate of vibration of the diaphragm.

Although I have illustrated and described my invention in a particular embodiment, it will be apparent that many details of construction may be changed and modifications made and therefore I do not desire to be limited to the exact structure as illustrated and described but aim to cover all that which comes within the spirit and scope of the appended claims.

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

1. A signaling horn comprising a face plate, a diaphragm peripherally secured to the front thereof, a U-shaped electromagnet having its yoke end secured adjacent the rear of said face plate intra-peripherally to said diaphragm and having the open ends of the pole pieces converging and extending rearwardly, a hammer member for said diaphragm, an elongated flat retractile spring suitably supported at its opposite ends, an armature attached to said spring at the center thereof and operatively related to the free ends of the pole pieces, and a connecting member between said armature and hammer.

2. A signaling horn including a front

supporting plate, a diaphragm peripherally secured to the front thereof, a U-shaped electromagnet having its yoke end secured adjacent the rear of said supporting plate intra-peripherally to said diaphragm and having the open ends of the pole pieces converging and extending rearwardly, a retractile spring suitably supported at its opposite ends, a hammer supported between said spring and diaphragm under normal tension thereof and adjustably fastened to the said spring, and an armature for said electromagnet operatively associated with said hammer, said armature being adapted to be vibrated by said electromagnet to vibrate said hammer and diaphragm.

3. A signaling horn including a cylindrical casing having a face plate, rearwardly extending ears for said casing, a diaphragm secured at the front of said face plate, a U-shaped electromagnet having its yoke end secured adjacent to the rear of said face plate intra-peripherally to said diaphragm and having the open ends of the pole pieces converging and extending rearwardly, a flat retractile spring attached at its opposite ends to said ears, an armature for said electromagnet attached to said spring and mounted opposite the free ends of the pole pieces, and a hammer for said diaphragm adapted to be operated by said armature.

4. A signaling horn including a cylindrical casing outwardly flanged at its forward end and having a rearwardly extending open cup, a diaphragm, a front cap and clamping screws for peripherally clamping said diaphragm to the front face of the flange, a U-shaped electromagnet having its yoke end secured intra-peripherally adjacent to said diaphragm and having the open ends of the pole pieces converging and extending rearwardly, a retractile spring having its opposite ends secured to the rearwardly open cup portion of said cylindrical casing, an armature carried by said retractile spring, a hammer, a member connecting said hammer to said armature, and a removable rear cap for incasing said mechanism threaded upon the rear of said cup.

5. A signaling horn including a suitable face plate, a diaphragm peripherally secured to the front thereof, a U-shaped electromagnet having its yoke end secured adjacent to the rear of said face plate intra-peripherally to said diaphragm and having the open ends of the pole pieces converging and extending rearwardly, an armature operatively related to the free ends of the pole pieces, and a hammer rod adjustably secured to said armature so as to partake of the same motion as the armature and resting adjacent to said diaphragm so as to produce a normal opposing flexure of said spring and diaphragm, said electromagnet operat-

ing to directly cause the hammer rod to strike said diaphragm upon energizations thereof.

6. A signaling horn including a face plate, 5 a diaphragm peripherally secured to the front of said face plate, a U-shaped electromagnet having its yoke end secured adjacent to the rear of said face plate and having the open ends of the pole pieces converging 10 and extending rearwardly, a retractile spring suitably secured at its opposite ends, an armature for said electromagnet carried by said spring, a hammer rod adjustably supported by said spring and diaphragm so 15 as to produce a normal opposing flexure of said spring and diaphragm, said armature being suitably supported in operative relation to said electromagnet whereby energizations thereof directly cause the hammer 20 rod to vibrate said diaphragm at a frequency equal to the frequency of the operation of said armature, and means for adjustably fastening said hammer rod at one end to said retractile spring so that it will 25 partake of the same relative frequency as said armature and diaphragm.

7. A signaling horn including a support, rearwardly extending members fastened at their forward ends to said support, a diaphragm secured at the front of said support, a flat retractile spring attached at its 30 opposite ends to the rear ends of said members, a U-shaped electromagnet having its yoke end secured adjacent to the rear of said face plate intra-peripherally to said diaphragm and having the open ends of the pole pieces converging and extending rearwardly, an armature for said electromagnet 35 attached to said spring, the rear ends of said extended members being adapted to be moved laterally so as to permit a greater amplitude of vibrations of said spring and armature, and means operatively connecting 40 said armature and diaphragm.

8. A signaling horn including a face plate, 45 a diaphragm peripherally secured to the front thereof, a U-shaped electromagnet having its yoke end secured adjacent to the rear of said face plate intra-peripherally to said diaphragm and having the open ends of the 50 pole pieces converging and extending rearwardly, an armature for said electromagnet, a retractile spring for said armature, a hammer rod operatively related to said diaphragm armature and spring so as to produce 55 a normal opposing flexure of said diaphragm and spring, and means for fastening said hammer rod at one end to said spring and armature, said electromagnet being in operative relation to said armature whereby 60 energizations thereof attract said armature to directly cause the hammer rod to vibrate said diaphragm.

9. A signaling device including a mounting plate, a diaphragm peripherally secured 65 to the front thereof, a U-shaped electromagnet having its yoke end secured adjacent the rear of said mounting plate intra-peripheral to said diaphragm and having the open ends of the pole pieces extending rearwardly, a retractile spring suitably supported 70 at its opposite ends, an armature for said electromagnet attached to said spring, an actuating member provided with an enlarged end portion for contact with said 75 diaphragm, fastening means for securing said actuating member to said armature whereby said actuating member operates to vibrate said diaphragm in response to intermittent energizations of said electro- 80 magnet.

Signed by me at Chicago, in the county of Cook and State of Illinois, in the presence of two witnesses.

WILLIAM W. DEAN.

Witnesses:

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BESSIE O'BRIEN.