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W. N. & F. W. NICHOLLS.

VIBRATOR.

APPLICATION FILED APR. 17, 1907.

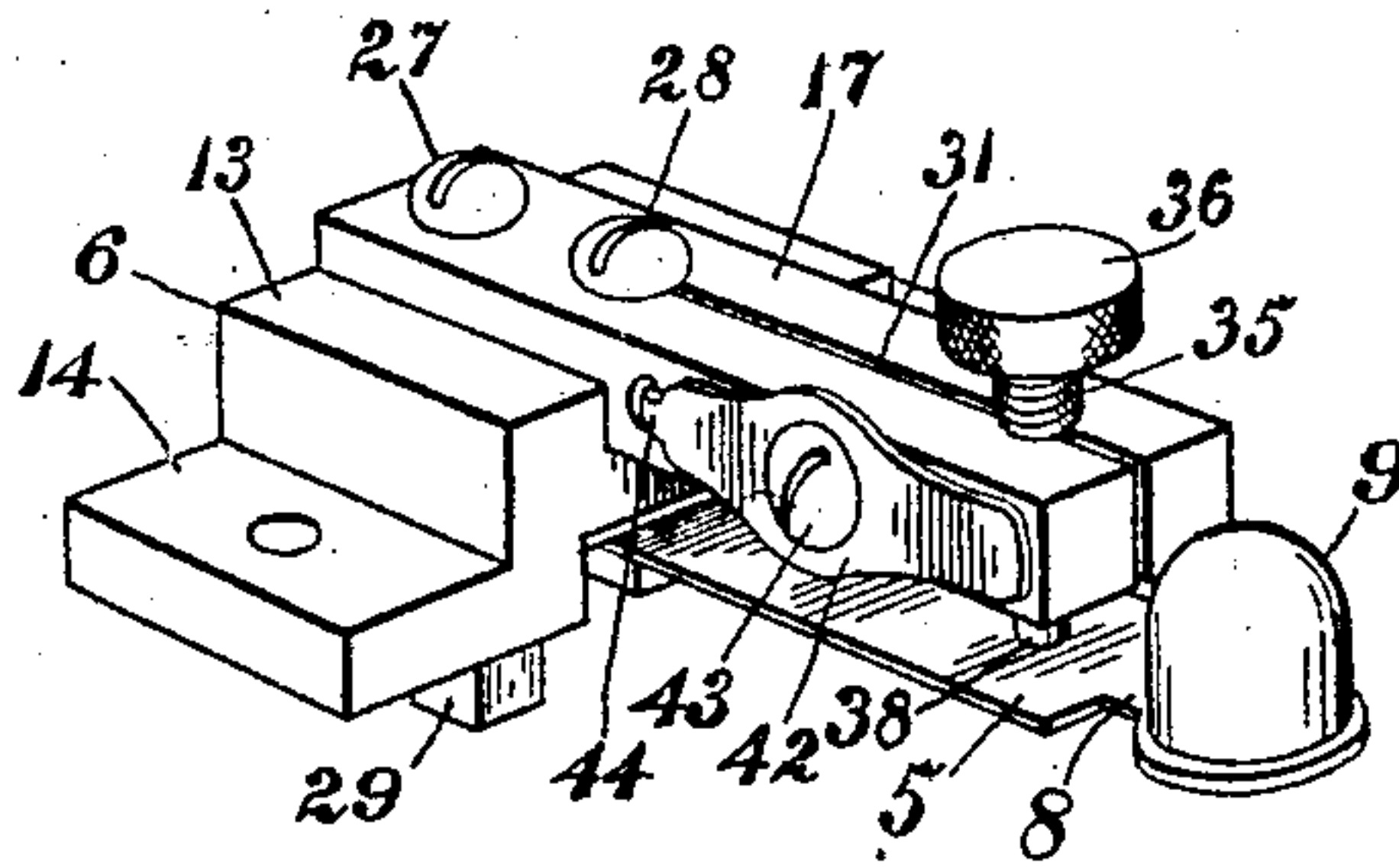


Fig. 1.

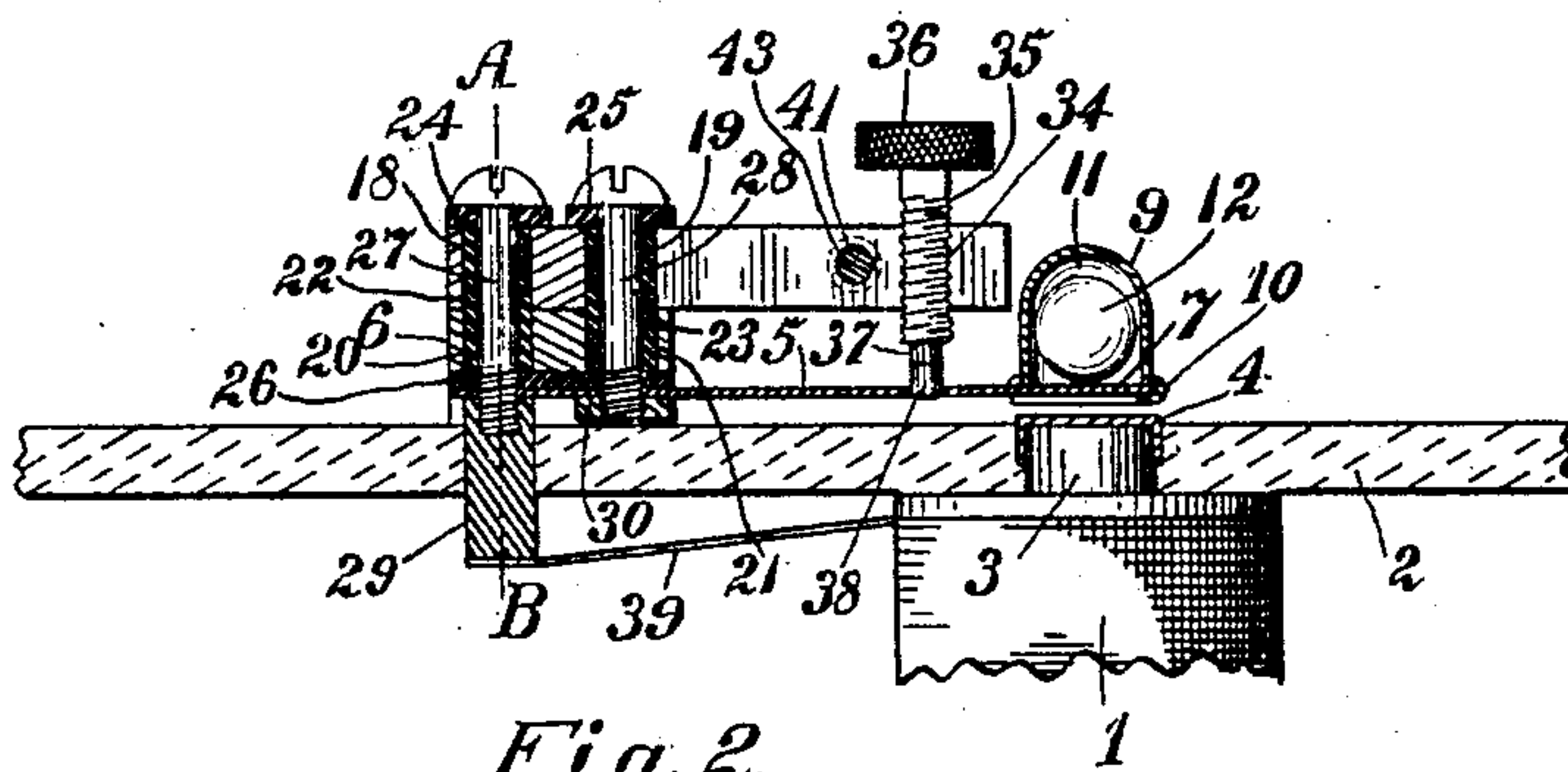


Fig. 2.

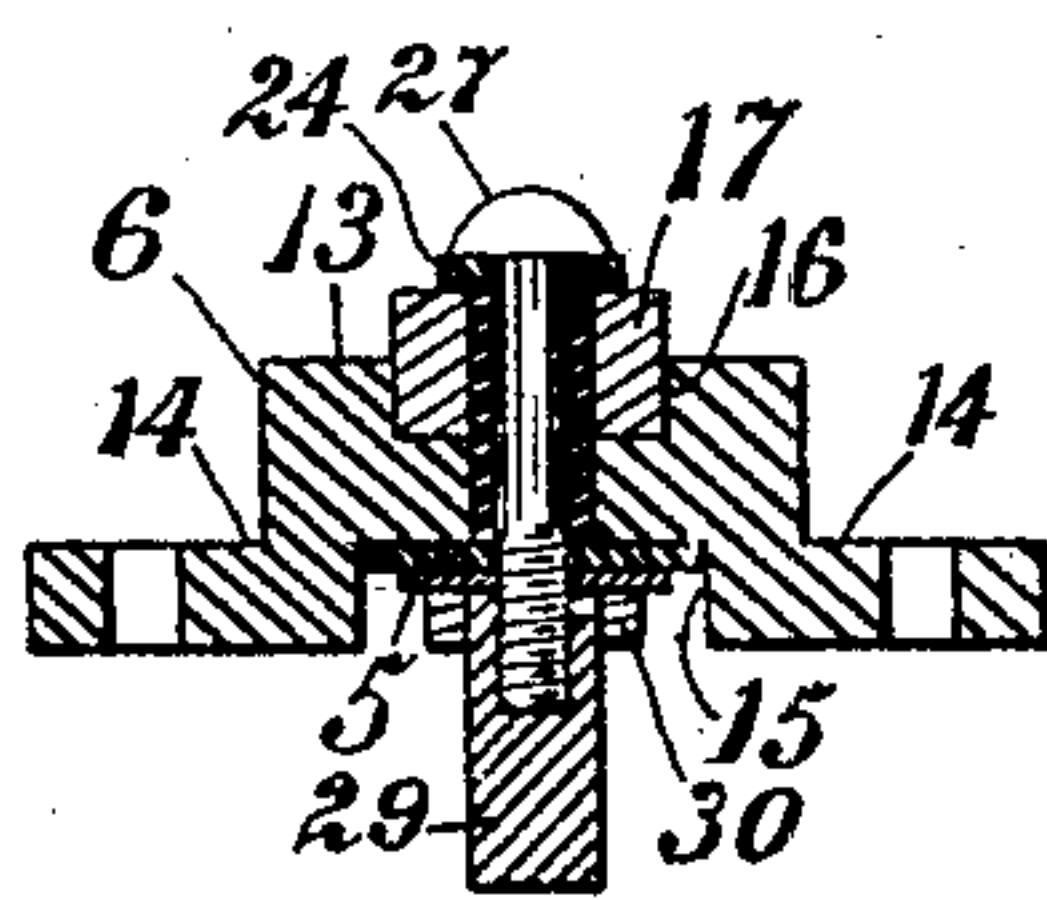


Fig. 3.

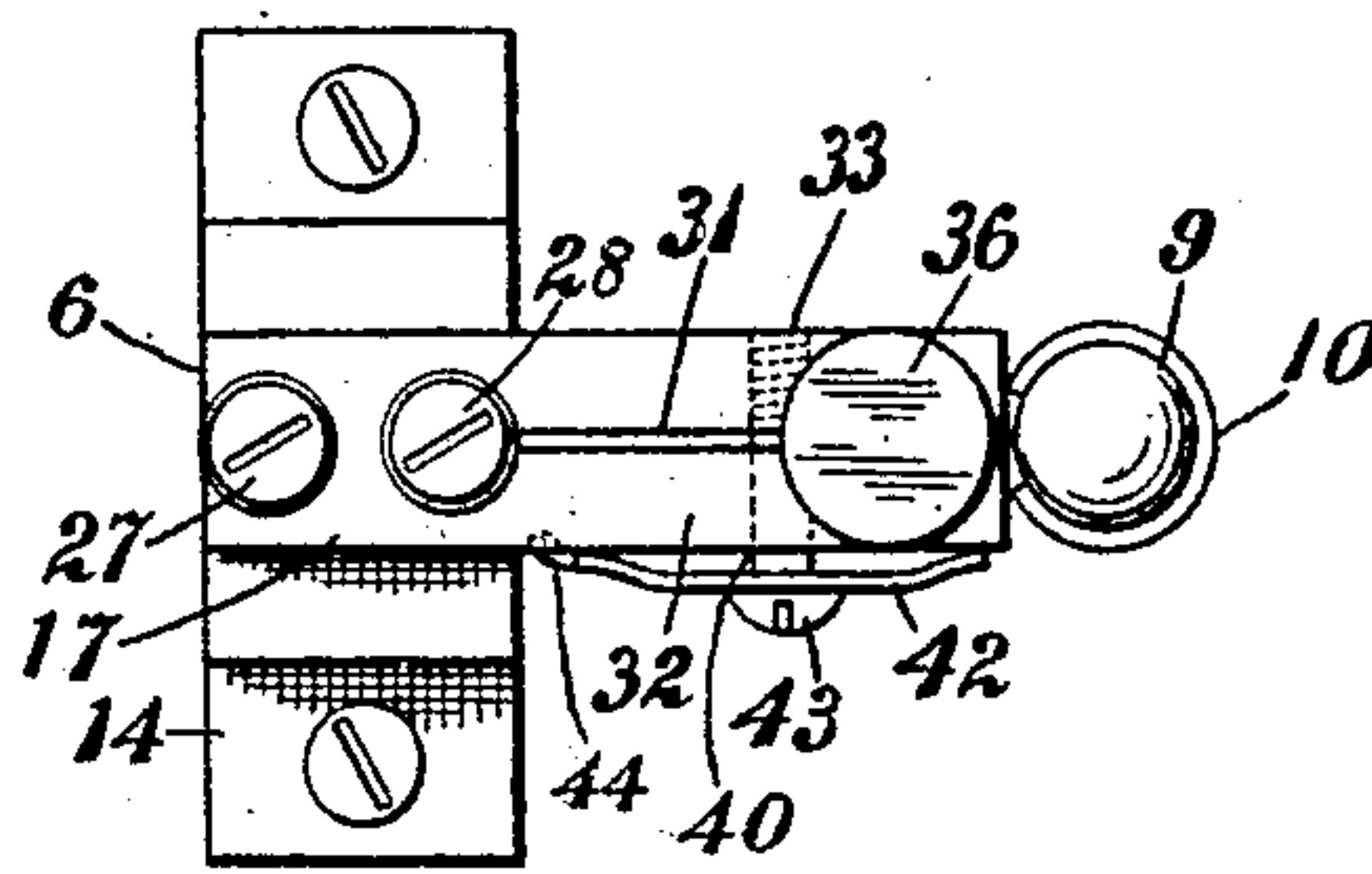


Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

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VIBRATOR.

No. 878,033.

Specification of Letters Patent.

Patented Feb. 4, 1908.

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To all whom it may concern:

Be it known that we, WALTER NELSON NICHOLLS and FREDERIC WILLIAM NICHOLLS, both subjects of the King of Great Britain, and residents of the city of Toronto, in the county of York, Province of Ontario, in the Dominion of Canada, have invented certain new and useful Improvements in Vibrators, of which the following is a specification.

The invention relates to improvements in vibrators as described in the present specification and illustrated in the accompanying drawings that form part of the same.

The invention consists essentially in the novel construction and arrangement of parts whereby the independent member in conjunction with the movement of the vibrator reed imparts impulse to the latter in addition to the electro-motive force of the magnet of the vibrator.

The objects of the invention are to obtain rapidity in vibration, to overcome the sticking of the vibrator, to hold the contact screw from turning, and to reduce the number of parts to a minimum.

Referring to the drawings; Figure 1 is a perspective view of the vibrator detached from the coil. Fig. 2 is a longitudinal vertical section through the vibrator showing it mounted on a base, and a portion of the magnet coil. Fig. 3 is a vertical cross section through A—B Fig. 2. Fig. 4 is a plan view of the vibrator.

Like numerals of reference indicate corresponding parts in each figure.

Referring to the drawings 1 is the electro-magnet suitably secured to the base 2 and having its core 3 projecting therethrough and 4 is the usual brass cap incasing the upper end of the said core 3 protecting it from atmospheric conditions.

5 is the spring reed of the vibrator fixedly secured at one end to the bracket 6 mounted on the base 2 and rigid therewith and having the outer end 7 thereof formed preferably circular in shape and superposed above the core 3 of the magnet 2. The circular shaped end 7 of the reed 5 is connected to the main portion of the said reed by a narrow neck portion 8.

9 is an inverted cup shaped cap having the edge 10 thereof flared outwardly and resting upon the upper surface of the circular end 7 of the reed 5 and inclosing a hollow chamber

11. The outwardly flaring edge 10 of the cap 9 is turned over and under the edge of the said circular portion 7 thereby fixedly securing the said cap to the spring reed in such a manner that it cannot become loosened or separated therefrom.

12 is a metal ball ensconced within the chamber 11 and fitting loosely within the walls thereof formed by the cap 9 and free to move vertically therein, the vertical movement being limited by the top of said cap and the circular portion 7 of the said reed 5.

The bracket 6 is formed with an upwardly projecting central portion 13 and the laterally extending portions 14 extending downwardly and outwardly therefrom forming the supporting portions of the bracket.

15 is a recess formed in the under side of the bracket 6 between the downwardly extending portions 14. 16 is a longitudinal recess formed in the upper surface of the upwardly extending portion 13 of the said bracket 6 and 17 is an arm fitting within said recess and rigidly secured to said bracket and extending outwardly therefrom.

18 and 19 are vertical orifices extending through the arm 17 at one end thereof and 20 and 21 are vertical orifices extending through the bracket 6 and registering with the orifices 18 and 19 respectively.

22 and 23 are sleeves of insulating material fitting within the orifices 18 and 20, and 19 and 21 and extending from the upper side of the recess 15 to the upper surface of the arm 17.

24 and 25 are washers of insulating material fitting over the upper ends of the insulating sleeves 22 and 23 and resting on the upper surface of the arm 17 and having orifices therethrough corresponding to the interior diameter of the said sleeves.

26 is a strip of insulating material fitting within the recess 15 at the upper side thereof and abutting the lower ends of the insulating sleeves 22 and 23.

27 and 28 are machine screws extending downward through the sleeves 22 and 23 and through suitable orifices in the strip of insulating material 26. The end of the spring reed 5 secured to the bracket 6 is provided with suitable orifices corresponding to the orifices in the strip of insulating material 26 and the said screws 27 and 28 extend there-through.

29 is a post having a vertical threaded ori-

fice therein engaging the threaded end of the
 screw 27 and 30 is a nut threaded to the lower
 extending end of the screw 28. It will thus
 be seen that the screws 27 and 28 may be
 5 tightened between the said nuts and the wash-
 ers 24 and 25, securely binding the different
 portions closely together making the whole
 perfectly rigid and the said screws are com-
 pletely insulated from the bracket 6 or arm
 10 17 and the spring reed 5 insulated from the
 said bracket from which it is supported.

31 is a longitudinal vertical slot through
 the arm 17 extending from the forward end
 to the orifice 19 and dividing the arm cen-
 15 trally of the width thereof for the major por-
 tion of its length and forming the separate
 arms 32 and 33.

34 is a vertical threaded orifice centrally ar-
 ranged in the arm 17 in proximity to the outer
 20 end thereof and extending therethrough.
 The orifice 34 being centrally arranged will
 be divided centrally by the vertical slot 31 so
 that one half of the wall of the said orifice
 will be in the arm 32 and the other half in the
 25 arm 33 and on the drawing together or the
 spreading of the said arms the said orifice
 will be decreased or increased as the case
 may be.

35 is a contact screw having a knurled
 30 head 36 at the upper end thereof, the threaded
 portion fitting within the vertical threaded
 orifice 34 in the arm 17. The contact screw
 35 is provided at its lower end with the usual
 platinum contact point 37 engaging a corre-
 sponding platinum contact point 38 secured
 35 to the upper surface of the spring reed 5 in
 vertical alinement with the orifice 35.

It will be seen that as the spring reed 5 is
 completely insulated from the bracket 6 and
 40 held in suspension therefrom, when the con-
 tact point 38 is in contact with the point 37
 the path for the electric current from the coil
 1 through the wire 39 to the post 29 and con-
 sequently the spring reed, will be through the
 45 contact screw 35 to the arm 17 and conse-
 quently to the bracket 6 from where contact
 is made to complete the required electric cir-
 cuit.

The contact screw 35 may be adjusted
 50 vertically by turning the same in the thread-
 ed orifice 34 and in order to hold the said
 screw from turning in said orifice through
 the vibration of the instrument, a constant
 pressure is exerted to hold the arms 32 and
 55 33 closely together, thereby causing the walls
 of the vertical orifice 34 to bind on the said
 screw 35.

40 is a horizontal orifice through the arm
 32 preferably arranged near the outer ex-
 60 tremity thereof and 41 is a threaded orifice
 of slightly smaller diameter than the orifice
 40 in the arm 33 and directly opposite the
 said orifice 40.

42 is an arched spring having a central
 65 orifice therethrough, through which is in-

serted a machine screw 43. The machine
 screw 43 extends through the orifice 40 in
 the arm 32 into the threaded orifice 41 in the
 arm 33 the threaded portion thereof engaging
 the threaded wall of said orifice, and the ends 70
 of the arched spring 42 bending inwardly
 engage the vertical face of the arm 32. It
 will be seen therefore that the screw 43 is
 held rigidly in the arm 33 and the tension of
 the arched spring 42 will exert a constant 75
 spring pressure against the arm 32 and as
 the said screw fits loosely in the orifice 40,
 the said arm 32 will be spring held toward
 the arm 33, thus closing the walls of the
 threaded orifice tightly against the screw 35. 80
 The tension of the spring may be regulated
 as desired by adjusting the screw 43.

In order to hold the ends of the spring 43
 in engagement with the side face of the arm
 33 a small recess or indentation is made in 85
 the face of the said arm in proximity to one
 end of the said spring and a small teat 44 is
 formed on one end of the said spring and
 bent inwardly to rest within said recess.
 The spring will therefore be effectually held 90
 from turning by the said teat engaging the
 edge of the said recess.

The electrical connections are not de-
 scribed in detail as they are the same as for
 any ordinary form of vibrator. 95

In the operation of this invention, the end
 of the vibrator reed 5 is attracted to the core
 3 by the magnetic attraction and the spring
 bends downwardly toward the core until the
 contact points 37 and 38 separate, when of 100
 course, the attraction ceases and the vibrator
 springs back. As the vibrator 5 moves
 downwardly toward the core 3 the ball 12 in
 the chamber 11 also moves down resting on
 the circular end 7 of the said vibrator and 105
 when the electrical contact is broken and the
 vibrator springs back the ball is carried with
 it. When the upward movement of the
 vibrator is arrested the ball continues mov-
 ing upwardly until it comes in contact with 110
 the top of the cap 9, and on striking the said
 cap it rebounds, and moving in a downward
 direction strikes against the vibrator.

The rebound of the ball from the top of
 the cap is instantaneous and the downward 115
 movement is so quick that it strikes the
 vibrator 5 before the magnetic attraction
 has drawn it down again. Should the con-
 tact points have any tendency to stick the
 impact of the said ball in its downward move- 120
 ment striking the vibrator will overcome the
 sticking and cause the contact points to
 break apart.

After the first rebound from the top of the
 cap, the ball strikes the vibrator as previ- 125
 ously described and rebounds therefrom be-
 fore the spring has reached the limit of its
 downward movement, and bounding upward
 strikes the top of the cap again, thereby as-
 sisting the upward movement of the said 130

vibrator, effectually overcoming any sticking tendency between the vibrator and the end of the magnet core. 65 of the sticking tendency between the core and the armature eliminated.

What we claim as our invention is:—

1. In a vibrator, the combination with the magnet core, of a vibrator reed having an inclosure at the outer end thereof, and an independent member loosely retained within said inclosure, substantially as described. 70

2. In a vibrator, the combination with the magnet core, of a vibrator reed suitably supported and having a closed chamber at its outer end, and a ball of suitable material held within said chamber and fitting loosely therein, substantially as described. 75

3. In a vibrator, the combination with the magnet core, of a supporting bracket, a vibrator reed fixedly secured to said bracket and extending above said core and having a closed chamber at its outer end, a suitable ball loosely retained within said chamber, an arm fixedly secured to said bracket and extending therefrom above said vibrator reed, and a contact screw adjustably secured in said arm and engaging said reed, substantially as described. 80 85

4. In a vibrator, the combination with a magnet secured to a suitable base having the core thereof projecting through said base, of a supporting bracket having a recess in the underside thereof, a vibrator reed fixedly secured in said recess in said bracket and insulated therefrom and extending outwardly therefrom above said magnet core and having a substantially circular shaped outer end, an inverted cup shaped cap fixedly secured to the circular shaped portion of said vibrator reed, a spherical member loosely retained within said cap, an arm secured to the upper side of said supporting bracket and extending outwardly therefrom above said reed, and a contact screw adjustably secured in said arm, substantially as described. 90 95 100 105

5. In a vibrator, the combination with a magnet secured to a suitable base having the core thereof projecting through said base, of a supporting bracket having a recess in the under side thereof, a vibrator reed fixedly secured in said recess in said bracket and insulated therefrom and extending outwardly therefrom above said magnet core and having a substantially circular shaped outer end, an inverted cup shaped cap having the edge thereof flared outwardly and resting on the circular shaped end of said vibrator reed, said flange being turned over the edge thereof and fixedly securing said cap to said reed, a spherical member loosely retained within said cap, an arm secured to the upper side of said supporting bracket and extending outwardly therefrom above said reed, and a contact screw adjustably secured in said arm, substantially as described. 110 115 120 125

6. In a vibrator, the combination with a magnet secured to a suitable base having the

It will be understood that the action above described occupies but a very brief period of time as the vibrator works very fast and what actually occurs is that the said vibrator and the top of the cap strike the ball in their upward and downward movement, rebounding therefrom, the ball practically remaining stationary midway of the stroke.

The striking effect caused by the use of a ball in a closed cap attached to the vibrator reed makes it possible to use a much stiffer reed than with ordinary constructions and therefore the magnet core may be placed much closer to the said reed and the distance of travel of the armature end of the said vibrator is reduced to a minimum. The reduction of travel of the armature end of the vibrator reed coupled with the increased stiffness of the said reed and the rebounding action described, greatly increases the rapidity of motion of the said vibrator consequently increasing the efficiency of the induced current.

The increased efficiency of current is not the only advantage but on account of the strengthening and shortening of the spring the parts do not need such delicate adjustment as has hitherto been necessary and of course with the use of less delicate parts the life and utility of the instrument is greatly increased and the trouble incidental to the disarrangement of delicate adjustments greatly overcome. The cost of construction is also greatly reduced.

The construction herein shown and described for securing the adjusting screw is very simple and effective as the tension of the spring 41 may be accurately adjusted and while the spring held sides of the split arm 17 hold the said screw securely from turning by the vibration of the vibrator spring, it may be turned with the fingers at any time without having to loosen a lock nut before turning. It is also found in practice that a much finer adjustment of the said screw may be made than where the screw is first adjusted and a lock nut turned to hold it securely, the lock nut almost invariably turning the said screw slightly in the securing thereof.

It must be understood that while the most approved construction is shown and described many modifications may be made in which the rebound of a body carried by the vibrator facilitates the operation thereof. A hardened steel ball is the preferable form of member to be placed within the cup, as it is hard, resisting wear, and of sufficient weight to accomplish the desired result. A sphere is also preferable as it is well known that a sphere has no magnetism and therefore much

core thereof projecting through said base, of a supporting bracket having a central raised portion and a longitudinal recess in the upper surface and a central longitudinal recess in the underside thereof, a vibrator reed fixedly secured in said recess in said bracket and insulated therefrom and extending outwardly therefrom above said magnet core and having a substantially circular shaped outer end, an inverted cup shaped cap fixedly secured to the circular shaped portion of said vibrator reed, a spherical member loosely retained within said cap, a split arm resting in said longitudinal recess in the upper side of said bracket and rigidly secured thereto and extending outwardly therefrom above said reed and having a central threaded vertical orifice therethrough at the outer end thereof, and a contact screw fitting in said central threaded orifice and contacting with said vibrator reed, substantially as described.

7. In a vibrator, the combination with a magnet secured to a suitable base having the core thereof projecting through said base, of a supporting bracket having a central raised portion and a longitudinal recess in the upper surface of said raised portion and a central longitudinal recess in the under side thereof and a plurality of vertical orifices extending through said bracket and communicating with said recesses, an arm fitting within the upper of said recesses and extending outwardly from said bracket and having a plurality of vertical orifices registering with the aforesaid orifices and a vertical threaded orifice therethrough at the outer end thereof, bushings of insulating material within the first mentioned orifices, washers of insulating material abutting the upper edges of said bushings and resting on the upper side of the said arm, a strip of insulating material in the lower of said recesses and abutting the lower edges of said bushings, screws extending downwardly through said washers, bushings and strip of insulating material, a vibrator reed having orifices therethrough and fitting over the ends of said screws, suitable nuts secured on the ends of said screws fixedly securing said vibrator reed and said arm to said bracket, an inverted cup shaped cap fixedly secured to said vibrator reed at its outer end, a spherical member loosely retained in said cap, and an adjusting screw adjustably secured in said vertical threaded orifice in said arm and contacting with said vibrator reed, substantially as described.

8. In a vibrator, the combination with a magnet secured to a suitable base having the core thereof projecting through said base, of a supporting bracket, an arm fixedly secured to said bracket and extending therefrom and having a central longitudinal vertical slot therethrough dividing said arm and a central vertical threaded orifice to one end thereof,

a contact screw fitting in said threaded orifice, spring means for holding the portions of said divided arm together, and a vibrator reed fixedly secured to said bracket beneath said arm and extending above said magnet core, substantially as described.

9. In a vibrator, the combination with a magnet secured to a suitable base having the core thereof projecting through said base, of a supporting bracket, an arm fixedly secured to said bracket and extending therefrom and having a central longitudinal vertical slot therethrough dividing said arm and a central vertical threaded orifice therethrough having one side of the wall thereof in one of said divided portions and the other side of said wall in the other of said divided portions, one of said members having a horizontal laterally arranged orifice therethrough to one end thereof and the other of said arms having a horizontal laterally arranged threaded orifice in alinement with the aforesaid lateral orifice, a screw secured in said threaded lateral orifice and extending through the other lateral orifice, a spring inserted between the head of said screw and said arm and exerting a pressure thereon, a contact screw engaging the walls of said vertical threaded orifice in said arm, and a vibrator reed fixedly secured to said bracket and extending outwardly therefrom below said arm and above said magnet core, substantially as described.

10. In a vibrator, the combination with a magnet secured to a suitable base having the core thereof projecting through said base, of a supporting bracket, an arm fixedly secured to said bracket and extending therefrom and having a central longitudinal vertical slot therethrough dividing said arm and a central vertical threaded orifice therethrough having one side of the wall thereof in one of said divided portions and the other side of said wall in the other of said divided portions, one of said members having a horizontal laterally arranged orifice therethrough to one end thereof and the other of said arms having a horizontal laterally arranged threaded orifice in alinement with the aforesaid lateral orifice, a screw secured in said threaded lateral orifice and extending through the other lateral orifice, an arched spring having the central portion encircling said screw and engaging the head thereof and the outer ends bearing against the side of said arm and a teat extending from one of said ends and engaging a recess in the side of said arm, a contact screw engaging the walls of said vertical threaded orifice in said arm, and a vibrator reed fixedly secured to said bracket and extending outwardly therefrom below said arm and above said magnet core, substantially as described.

11. In a device of the class described, in

combination, a vibrator reed, an electro-magnet, and a member supported from said reed and adapted to impart a vibratory impulse to said reed independent of the electrical attraction and spring pull, substantially as described.

Signed at the city of Toronto, in the county of York, Province of Ontario, in the

Dominion of Canada, this 13th day of March, 1907.

WALTER NELSON NICHOLLS.
FREDERIC WILLIAM NICHOLLS.

Witnesses:

H. DENNISON,
D. S. TOVELL.