(No Model.) 2 Sheets—Sheet 1.

R. PLANT & E. PERRY.

RESONATOR FOR HARMONICONS.

No. 375,833. Patented Jan. 3, 1888.

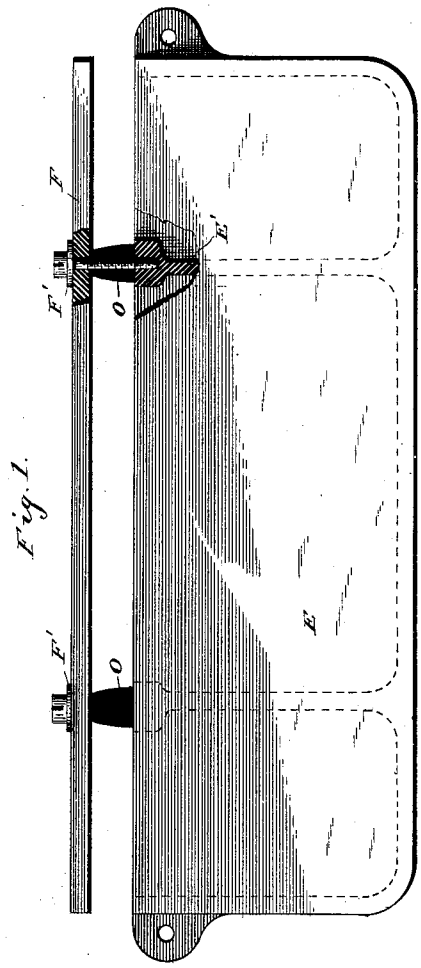


Fig. 1.

WITNESSES
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(No Model.) 2 Sheets—Sheet 2.

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RESONATOR FOR HARMONICONS.

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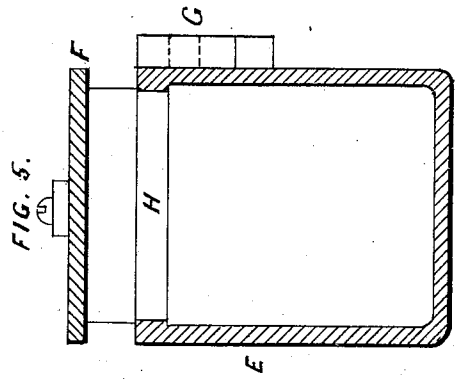


FIG. 5.

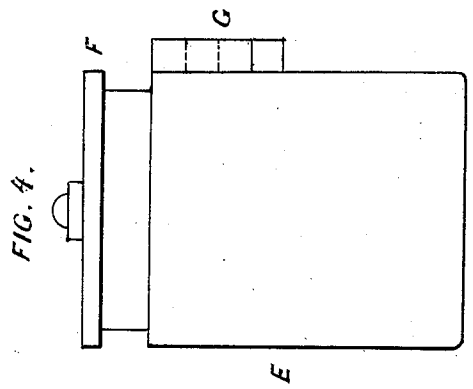


FIG. 4.

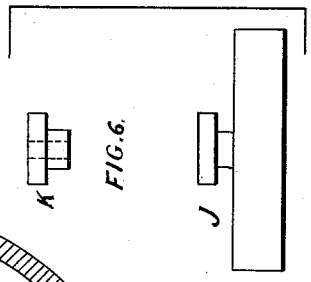


FIG. 6.

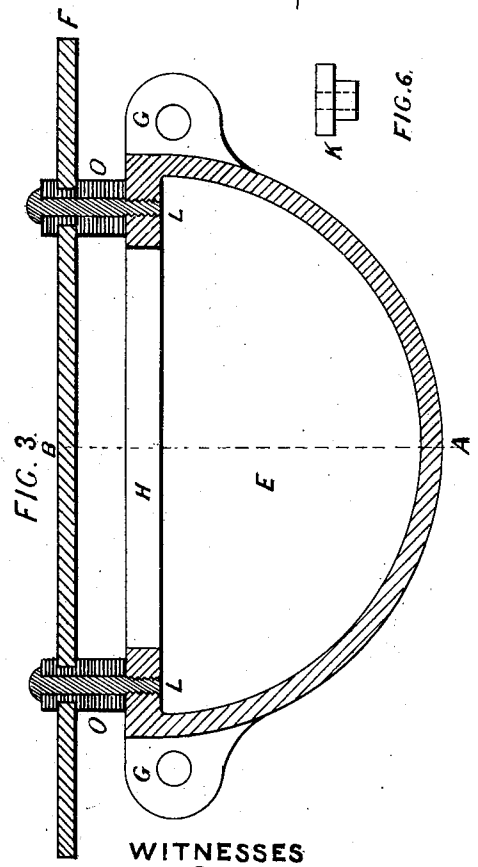


FIG. 3.

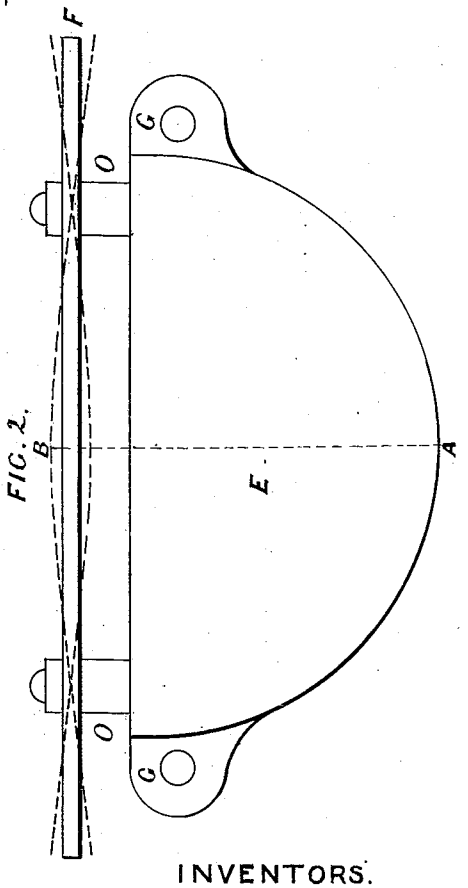


FIG. 2.

WITNESSES

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UNITED STATES PATENT OFFICE.

RICHMOND PLANT AND EDMUND PERRY, OF BIRMINGHAM, COUNTY OF WARWICK, ENGLAND.

RESONATOR FOR HARMONICONS.

SPECIFICATION forming part of Letters Patent No. 375,833, dated January 3, 1888.

Application filed June 23, 1885. Serial No. 169,594. (No model.) Patented in England March 22, 1884, No. 5,320; in France July 23, 1884, No. 163,445, and in Belgium July 28, 1884, No. 65,886.

To all whom it may concern:

Be it known that we, RICHMOND PLANT, of Nelson Street South, mechanician, and EDMUND PERRY, of Icknield Port Road, hardware-dealer, both of Birmingham, in the county of Warwick, England, have invented an Appliance for Augmenting the Sound of the Notes of a Harmonicon or of a Gong, (for which we have obtained a patent in Great Britain, No. 5,320, bearing date March 22, 1884; in France, July 23, 1884, No. 163,445, and in Belgium, July 28, 1884, No. 65,886;) and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This our invention relates to the construction, combination, or arrangement of parts forming a resonant chamber with a free vibrating metallic plate or bar applied thereto, the object of the said chamber being the producing, increasing, or modifying of musical sounds, the same being applicable to musical purposes in part, and also to bells or gongs and other analogous purposes.

We will describe our invention thus: We construct the said resonant chamber of any desired shape or configuration and capacity, according to the purposes of application. It may be a closed chamber with one or more holes—as sound-holes—of any required form at its end or side or other place, or it may be open at one or both ends and in various other ways. The resonant chamber we may construct of wood, metal, or any material we find by practice most suitable to our requirement. This said resonant chamber receives a plate or bar, preferably of the oblong form, as used in the harmonicon, constructed of any metal or alloy or other suitable material and of any desired form, the same being supported or suspended at two points and in such a manner that it will withstand repeated blows without being loosened or detached, and at the same time the points of support or suspension shall be free to vibrate. To effect this the points of suspension shall be at or near the transverse nodal lines, always providing that the chamber is so constructed that the reflected or induced wave shall not interfere with but re-enforce the next succeeding wave proceeding from the plate or bar, our aim and object being the construction of a chamber (which we designate a "resonant chamber") and of such capacity that the column of air which it contains shall vibrate in unison, or nearly so, with and re-enforce the note given out by the bar or plate.

In order that this our said invention may be more clearly understood and readily carried into effect, we will proceed with a more explanatory description, aided by the accompanying drawings.

Our invention relates (as before set forth) to an appliance for augmenting the sound of the notes of a harmonicon or of a gong; and it consists in the application of an air-chamber (which we designate a "resonant chamber") to a free vibrating plate or bar for the purpose of augmenting and re-enforcing the sound of the note given out by such plate or bar when the said plate or bar is struck with a suitable hammer or mallet or otherwise put in a state of vibration. The plate or bar which originates the note may be of any desired shape or configuration, but preferably of the oblong form—as in the notes of a harmonicon—and may be constructed of metal, glass, or other suitable material. This plate or bar is suspended at or by one or both of its transverse nodes to a resonant chamber, or to a support sufficiently near such a chamber, and in such a manner that the column or volume of air contained in the said chamber shall cause a re-enforcement of the note produced by the vibrations of the plate or bar.

The resonant chamber may be constructed of wood, iron, or any other suitable material, and may be of any desired shape or configuration, according to the purposes of application. It may be a closed chamber with one or more sound-holes communicating with the outer air, or a chamber having one large opening or aperture with the vibrating plate or bar bridging or spanning such aperture in such a manner that the ventral segment of the bar where the amplitude of vibration is greatest—that is to say, between its transverse nodal lines—shall be opposite to it, (the said aperture,) or

any other shape or form that may be found most suitable to the required purpose, providing always that the said chamber is so constructed that the column or volume of air which it contains shall have the same period of vibration as has the plate or bar to which it is applied—that is to say, the vibrating plate and the column or volume of air contained in its corresponding resonant chamber shall each perform the same number of vibrations in a given time, or as near the same number as may be necessary to produce the requisite quality of tone. For example, the normal tone of a given chamber is found to be D. The plate or bar proper and suitable for such chamber, in order to develop the most perfect resonance and fullness of tone, must therefore give out the same note D. The great fullness of tone, however, resulting from the exact isochronism of the vibrations of the plate and its chamber may not be always desirable—as in the case where the invention is to be used in lieu of table or other gongs and bells where a more prolonged note may be preferred. To produce this prolonged note we first construct the resonant chamber in such a manner that its period of vibration does not exactly coincide with that of its plate or bar; or, second, we may obtain the same result by altering the pitch of the note given out by the plate or bar.

There may be a difference of a semitone or more between the note of a given plate and that of its corresponding chamber without seriously injuring the resulting tone. For example, a plate whose normal tone is C may have a chamber applied to it whose normal tone may be C♯ or D or other note immediately above or below that of its plate or bar. Conversely, a chamber whose normal tone is C may have a plate applied to it whose normal tone is C♯ or D or other note immediately above or below it; or it may carry two or more such plates.

The chamber is tuned to the required note by opening or closing the sound hole or holes, or in various other ways. In cases, however, where a very full note of short duration is required—as in some musical applications—it is necessary that perfect isochronism in the vibrations of the plate and its resonant chamber be secured. To produce the fullest and most sonorous tone, it is also necessary that, first, the plate or bar be broad, in order that it may agitate as much air as possible; second, that the central or full ventral segment of the said plate or bar be opposite the aperture in the resonant chamber; third, that the points of suspension or attachment of the plate be sufficiently elastic to admit of its free vibration and at the same time sufficiently strong to allow of repeated blows of a hammer or striker; fourth, that the plate or bar be struck at its center or at either of its ends—that is to say, as far from its nodes as possible.

To still further develop the tone we may attach two or three resonant chambers to the vibrating plate or bar, as seen in Figure 1—that is to say, we may place a chamber under the central or full ventral segment, and also a chamber under one or both of the ends or half ventral segments, the volume of air contained in each of the said chambers having the same period of vibration as that of the plate or bar, or as near the same number of vibrations as may be necessary, as before set forth.

The accompanying sheet of drawings illustrates our invention; but we do not limit ourselves to configuration or dimensions, as various methods of application may be employed without in any way affecting the principle of our invention.

Fig. 1 is a view showing several resonant chambers connected with one vibrating plate. Fig. 2 is a side view in elevation; Fig. 3, the same in section; Fig. 4, an end-view elevation; Fig. 5, the same, cross section; Fig. 6, parts detached.

The same letters of reference indicate the same parts in the several figures.

F is the free vibrating plate or bar, constructed of iron, steel, bell-metal, glass, or other suitable material. It has a perforation at the center of each of its transverse nodal lines, by means of which it is attached to the resonant chamber.

E is the resonant chamber, which may be constructed of wood or metal or other material. Its shape is shown in all the figures. It is provided with two lugs, G G, by means of which it is secured or affixed in the desired position according to its application.

The chamber E is preferably divided into several compartments—say three—as shown in Fig. 1, between which a partition, E′, extends, forming a division. These partitions are preferably formed integrally with the body of the chamber. These chambers are open at one side, as seen in Fig. 1, and in proximity to these openings is placed a plate, F, which is secured at its transverse nodes and rests upon two cushions, O, of india-rubber or other yielding material, and is maintained in place by means of screws passing through it, through the caps, and entering threaded apertures in the partitions E′. The plate is kept out of contact with the screws and jarring prevented by interposition of tubular bushings F′. (Clearly shown in the several figures.)

Referring to Sheet 2 and the several figures thereon, we would observe that there is one aperture in the chamber, as shown in the sections at H, and the vibrating plate or bar is placed symmetrically over or opposite this aperture in such a manner that its full ventral segment, where the amplitude of vibration is greatest, rests directly over the center of the aperture.

The dotted lines at F in Fig. 2 show the directions in which the segments of the plate move during vibration, the point where the amplitude of vibration is greatest being on the line A B. The plate is attached to its cham-

ber at its transverse nodes and rests upon or against two pads or cushions, O, of cloth, or wood covered with cloth, india-rubber, or other material of an elastic or yielding nature. These pads are perforated in the center, and a screw passes through the plate and pad or cushion, and is then screwed securely into a small shelf at each end of the resonant chamber, as shown at L L, Fig. 3. To prevent the jarring of the plate against the metal screw, we place in each case a small flanged collar or tube on the said screw (see K, Fig. 6) in such a manner that the small pad or collar goes into the hole at the node of the plate F, while the flange fits down on the surface of the plate, in which position it is securely held by the screws. This small collar is made, preferably, of india rubber, and in the case where the pad or cushion is of the same material may be made in the same piece, (see J, Fig. 6,) the flange of collar being squeezed or forced through the hole of the node of the plate.

We may construct the resonant chamber of sheet or plate brass, or other metal or material, of a hemispherical, conoidal, ovate, or other form, the plate being opposite the large or open end of the chamber or in other positions.

Having thus described the nature of our invention and the manner in which the same may be carried practically into effect, we wish it to be distinctly understood that we do not confine ourselves to the precise details hereinbefore described, since they may be considerably modified without departing from the principle of the invention.

We claim—

1. In a sounding-instrument, the combination, with a resonant chamber divided into a plurality of compartments by partitions and having an opening between the partitions, of a vibrating plate mounted upon said partitions and in proximity to the opening in the compartment.

2. In a sounding-instrument, the combination, with a resonant chamber divided into a plurality of compartments by integral partitions having cushions upon them and having openings between the partitions, of a vibrating plate mounted upon said cushions and secured thereto with its ends extending beyond its supports and over the outer openings, while its greatest ventral segment is opposite the openings between the partitions.

In testimony whereof we affix our signatures in the presence of two subscribing witnesses.

RICHMOND PLANT. [L. S.]
EDMUND PERRY. [L. S.]

Witnesses:
THOMAS KENDRICK,
THOMAS LOWBRIDGE.