O. C. ARLITZ.

MECHANICAL HORN.

APPLICATION FILED JUNE 4, 1910.

979,246.

Patented Dec. 20, 1910

Fig. 1.

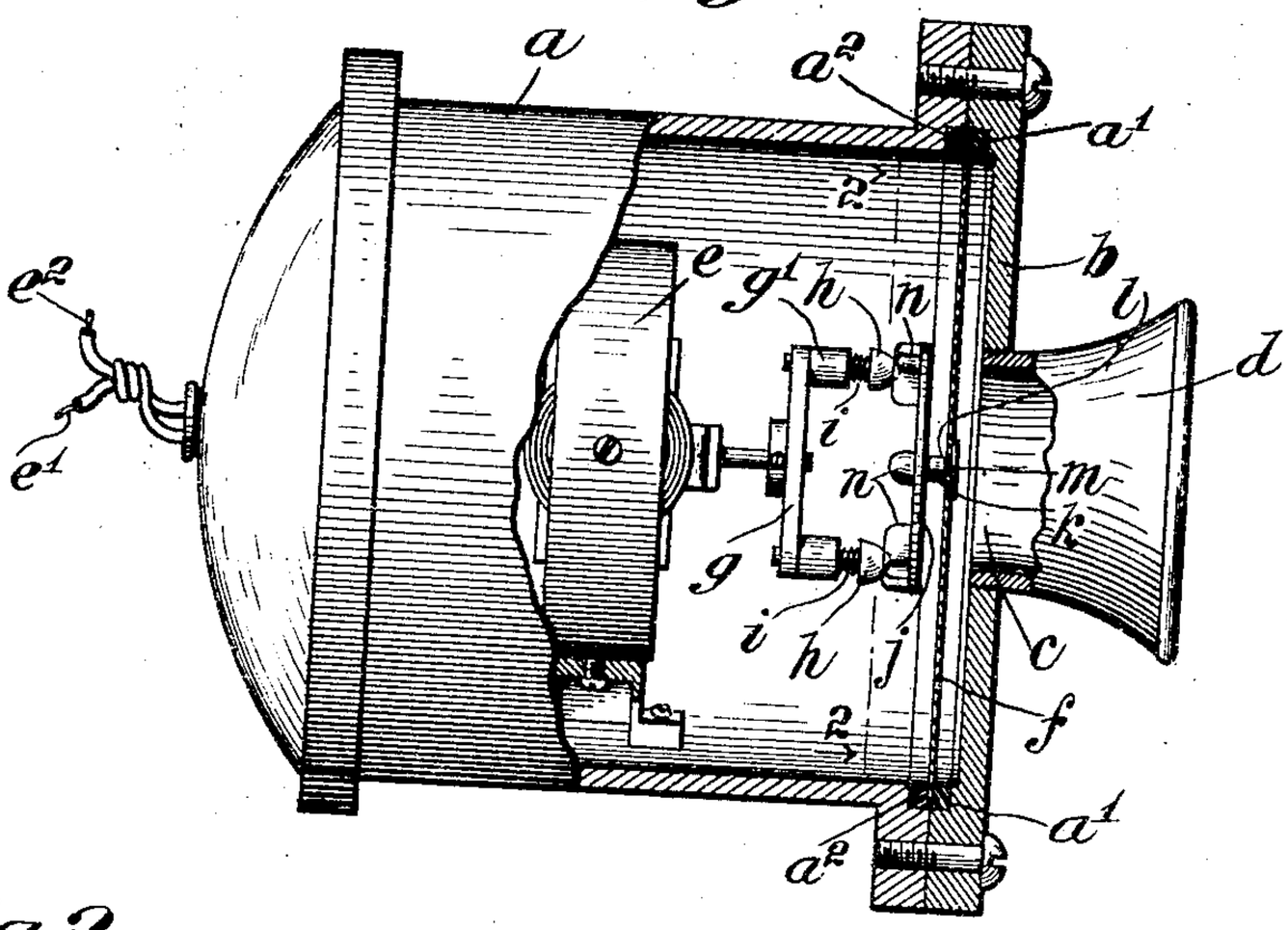


Fig. 2.

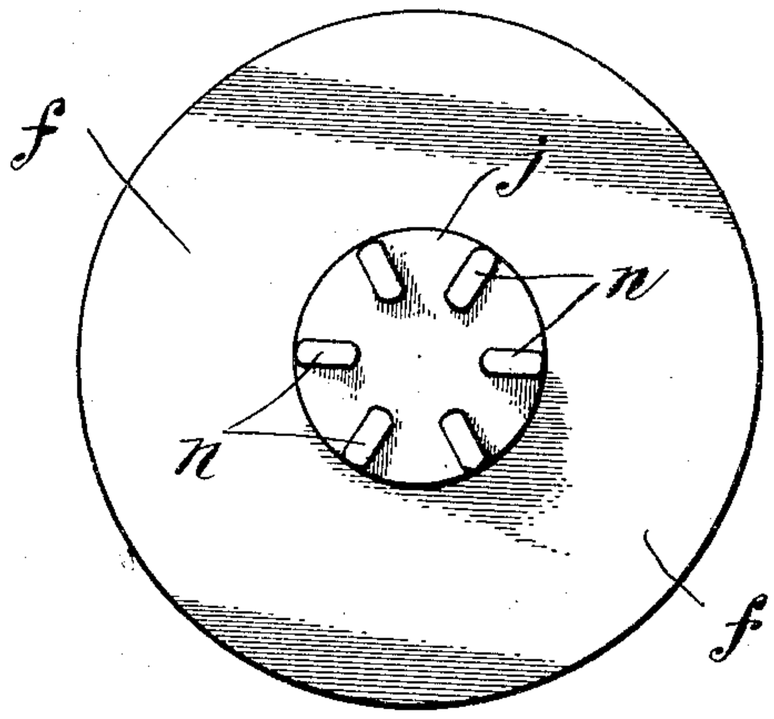
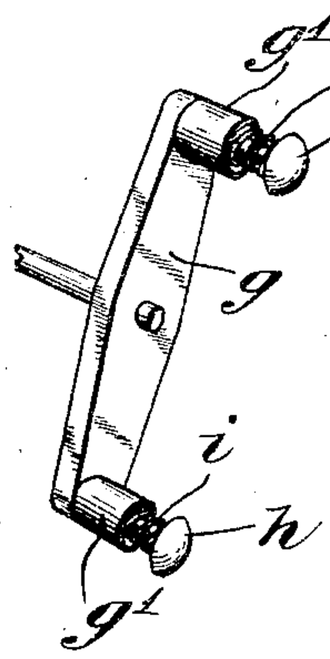


Fig. 3.



Attest:

P. C. Wenning.

Oscar C. Arlitz Inventor:

by Frank P. Wentworth

his Atty.

UNITED STATES PATENT OFFICE.

OSCAR C. ARLITZ, OF NEW YORK, N. Y.

MECHANICAL HORN.

979,246. Specification of Letters Patent. Patented Dec. 20, 1910.

Application filed June 4, 1910. Serial No. 564,908.

To all whom it may concern:

Be it known that I, OSCAR C. ARLITZ, a citizen of the United States, residing in the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Mechanical Horns, of which the following is a specification, reference being had therein to the accompanying drawings, which form a part thereof.

My invention relates to mechanical horns and more particularly to a type thereof embodying therein a mechanically flexed diaphragm.

The main object of my invention is to provide a horn of this character, the arrangement of which will be such as to permit simplicity and compactness of structure while insuring the production of sound waves in volume and intensity sufficient to adapt the device to signal purposes.

A further object of the invention is to provide a horn of this character wherein the hammer member will cause a rapid flexure of the diaphragm without likelihood of interfering with the reflex action thereof.

A still further object is to provide a horn of this character wherein the hammer member while having a sharp impact with a cooperating impact member carried by the diaphragm, will be capable of yielding under the reflex action of the diaphragm in a manner to avoid material interference with the vibrations thereof.

A still further object is to provide in a horn of this character a hammer member adapted to impart with each rotation thereof a series of vibrations to the diaphragm, irrespective of the position of said diaphragm in its vibratory movement.

A still further object is to provide a device of this character embodying therein a series of impact members carried by the diaphragm and a series of hammers adapted to flex the diaphragm by engagement with said impact members, to increase the volume of the resultant sound waves, the construction of the hammers being such that they will not interfere with the reflex action of the diaphragm.

A still further object is to provide a horn of this character embodying therein a succession of impact members, and a hammer adapted to successively engage said members to impart a series of rapid vibrations to the diaphragm, wherein the force resulting from each impact will be exerted upon the diaphragm at a substantially central point so as to secure the maximum flexure thereof with each impact.

A still further object is to provide in a horn of this character, a diaphragm carrying a plurality of impact members arranged concentrically about the axis thereof and adapted to impart the force of the impact from the hammer member directly to the center of the diaphragm, a hammer mechanism adapted to simultaneously impart a blow to impact members arranged diametrically opposite each other so as to equalize the force of the blow upon opposite sides of the axis of the diaphragm and thus avoid the development of an unbalanced condition in the diaphragm or the impact member carried thereby. And a still further object is to provide a horn of this character which may be inexpensively produced.

The invention consists primarily in a mechanical horn embodying therein a flexible diaphragm having an impact member thereon and a rotary member carrying a hammer head adapted to engage said impact member, said head being capable of movement axially of said diaphragm whereby interference between the diaphragm and the hammer is avoided; and in such other novel features of construction and combination of parts as are hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings:—Figure 1 is a side elevation of a horn embodying my invention, the diaphragm casing being broken away to disclose the construction and arrangement of the operative mechanism within same; Fig. 2 is a vertical section through the casing upon the line 2—2 of Fig 1, and Fig. 3 is a perspective view of the hammer mechanism upon a larger scale.

Like letters refer to like parts throughout the several views.

In the embodiment of my invention shown in the drawings, I have shown at *a* a hollow casing supporting the diaphragm which extends across and closes the forward portion thereof, the rear portion of this casing being, as shown, closed to insure the presence of an inert body of air of fixed volume, limiting

the direction of the projection of sound waves to the front of the casing.

The diaphragm is held between the rings a' and a^2 adapted to inclose the edges thereof, the manner of attachment of the diaphragm being immaterial to this invention, any well known and approved practice being suitable for this purpose.

The forward end of the casing a, is provided with a closure b having a reduced sound opening therein indicated at c which sound opening is in communication with an amplifier d which may be of any well known or desired type. Secured in the casing a is an electric motor e of any desired or approved construction, the casing a having small openings therethrough, through which the wires e' e^2 pass to said motor. The diaphragm is indicated by the letter f and its axis and that of the shaft of the motor e are in substantial alinement. While I prefer to operate my improved horn by means of an electric motor as described, it is apparent that any other mechanical expedient may be used without departing from my invention which relates more particularly to the construction and arrangement of the diaphragm, and of the hammer flexing same. The center of the diaphragm f is also in substantial alinement with the sound outlet opening communicating with the amplifier to secure the greatest volume of sound waves.

Mounted upon the shaft of the motor e is a hammer member adapted to impart the desired vibrations to the diaphragm f which member consists of a plurality of laterally extended arms g having raised bosses g' at the ends thereof, which bosses are at equal radial distances from the said shaft. Mounted in the recesses in the bosses g' are a plurality of hammer heads h normally projected beyond said bosses by springs i each said hammer head being provided with a shank extending through a reduced opening at the rear of said bosses and upset, or otherwise equipped, to retain same upon the arms g. The operative faces of the heads h are semi-spherical to cause their rotation to impart a direct thrust to the diaphragm irrespective of any position which the hammer head may assume while permitting the heads to be thrust rearwardly in case of the engagement therewith of the diaphragm upon its reflex action. This capability of the hammer heads to recede with the diaphragm in case of a loss of synthetic operation of these parts is of primary importance as it places no limitation upon the structure of the hammer or the vibration of the diaphragm thereunder. This construction permits a sufficiently high frequency of the flexure of the diaphragm to secure a sufficient displacement of the air column in advance of the diaphragm to produce sound waves and of a length and frequency to develop a signal having the desired volume and capability of penetration, and at the same time eliminate any and all necessity for any readjustment of the device to compensate for wear or any loss of elasticity in the diaphragm itself.

The point of impact of the hammer with the diaphragm being necessarily distant from the axis thereof, it is necessary to provide an impact member for the diaphragm, which, to avoid the limitation of the flexure thereof under the hammer, will, while receiving the impact radially from the axis, flex the diaphragm axially thereof thus securing the advantage of a maximum flexure of the diaphragm.

The impact member carried by the diaphragm consists of a circular metallic plate j having a shouldered stem k, the shoulder l of which stem, is adapted to engage the diaphragm upon one side thereof, the reduced end m of said stem being riveted upon the other side of said diaphragm so as to hold the diaphragm tightly between the shoulder and the upset portion of the stem. The plate j is spaced away from the diaphragm so as not to interfere with the flexure thereof, the reduced area of the upset portion indicated at m, permitting the desired quantity of flexure and reflexure of the diaphragm.

The plate j is provided with a plurality of abutments n adjacent to the edge thereof, adapted to be engaged by the hammer heads h, the top surfaces of said abutments being rounded as shown to facilitate the operation of the said hammer. The abutments n are preferably arranged diametrically opposite each other to insure simultaneous impacts upon opposite sides of the axis of the diaphragm f.

The plate j is of metal, preferably malleable iron, to secure the desired rigidity, durability, and facility of assembling. The diaphragm f is a metallic diaphragm and may be made of any desired or approved material so long as it possesses the essential characteristic of strength to withstand the stresses of use.

The operation of the herein described mechanical horn is substantially as follows:— When it is desired to sound a signal, it is merely necessary to close the circuit through the wires e' e^2 thus starting the motor and causing the arms g to rapidly rotate about an axis concentric with the axis of the diaphragm f. As the said arm rotates, the sides of the rounded hammer heads h, with each rotation thereof, engage, in sequence, the abutments n upon the plate j, the curvature of the engaging surfaces upon the said hammer heads and the said abutments causing the diaphragm to flex sufficiently to develop sound waves forwardly thereof, the degree of the flexure varying with the velocity of the said arms. This will be governed, to a

large extent, by the resistance offered by the abutments *n* to the hammer heads *h*. The stresses upon the hammer heads being substantially perpendicular to their shanks, there will be no tendency to cause said hammer heads to recede toward their supporting bosses, thus causing the full force of the impact to be directly upon the abutments *n*. As the diaphragm vibrates, the resistance offered to the hammer heads will be minimized by the residuary vibrations of said diaphragm *f* thus aiding and increasing the flexure of said diaphragm with a resultant increasing volume of sound. If the diaphragm should reflex at the moment of impact between the opposite abutments *n* and the hammer heads *h*, the said abutments would carry the hammer heads with them, said heads receding with the diaphragm, against the tension of their springs *i*, thus not only avoiding any material interference with the vibrations of the diaphragm by the hammer heads, but automatically positioning these hammer heads so as to cause the desired impact irrespective of the position of the diaphragm during the vibratory movement thereof. If the hammer heads have been forced back, as described, through the reflex action of the diaphragm, the springs *i* controlling the said heads will thrust them forwardly again with the flexure of the diaphragm so that these heads will automatically assume a position relative to the diaphragm to maintain a substantially constant relation thereto as to the force of the impact between the heads and the abutment carried by the diaphragm.

By reason of the arrangement of the plate *j*, this plate will not interfere with the movements of the diaphragm in any way, and the thrust upon said plate by the hammers *h* will result in a flexing force applied to the diaphragm axially thereof so as to secure the maximum displacement of said diaphragm consistent with the movement of the impact member carried centrally thereof.

The series of impacts between the hammers *h* and the abutments *n*, with each rotation of the former, results in the diaphragm reaching the maximum number of vibrations within the shortest space of time, thus securing vibrations of the desired frequency practically instantly upon the closing of the circuit controlling motor, or the application of the other power, driving said hammers.

I am aware that it is old in the arts to produce sounds for signaling purposes by mechanically vibrating a metallic diaphragm, and I therefore do not wish to be understood as claiming this broadly. I believe it to be broadly new, however, to provide a plurality of contacts disposed radially about the axis of the diaphragm and an impact or hammer member adapted to revolve about an axis alined with the axis of said diaphragm, adapted to engage the said abutments successively, and I intend to claim such broadly.

It is apparent that the details of construction shown in the drawing may readily be departed from while retaining all of the essential characteristics of my invention, and, therefore, I do not intend to limit myself to the precise details shown in the drawings.

Having described the invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. A mechanical horn embodying therein a flexible diaphragm, a hammer member adapted to engage and flex said diaphragm, and means imparting a rotary movement to said hammer on a plane parallel to said diaphragm, said hammer being capable of movement under a force exerted axially of said diaphragm, whereby the rotation of said hammer will flex said diaphragm, but the reflex action of said diaphragm will cause said hammer to recede with the diaphragm.

2. A mechanical horn embodying therein a flexible diaphragm carrying an impact member and a rotary member carrying a hammer head adapted to engage said impact member and flex said diaphragm, said head being capable of movement axially of said diaphragm whereby interference between the diaphragm and the hammer is avoided.

3. A mechanical horn embodying therein a flexible diaphragm carrying a plurality of impact members concentric with the axis of and carried by said diaphragm and a rotary member carrying a hammer head adapted to successively engage said impact members and flex said diaphragm, said heads being capable of movement axially of said diaphragm whereby interference between the diaphragm and the hammer is avoided.

4. A mechanical horn embodying therein a flexible diaphragm, a plate carried by said diaphragm centrally thereof, spaced away therefrom, and movable therewith, said plate having a plurality of impact members arranged in a circle concentric with the axis of said diaphragm, and a rotary member adapted to engage said impact members successively.

5. A mechanical horn embodying therein a flexible diaphragm, a plate carried by said diaphragm centrally thereof, spaced away therefrom, and movable therewith, said plate having a plurality of impact members arranged in a circle concentric with the axis of said diaphragm, and a rotary member carrying a hammer head adapted to engage said impact members successively and flex said diaphragm through said plate, said head being capable of movement axially of said plate to avoid interference between the diaphragm and the hammer mechanism.

6. A mechanical horn embodying therein a flexible diaphragm and a hammer mechanism comprising a rotary member and a spring sustained hammer head carried thereby, said head being normally projected axially of and toward said diaphragm by said spring, whereby said diaphragm will be flexed by the rotary or side impact of said head, and said diaphragm if it engage said head upon its reflex action, will overcome said spring and cause said head to recede with said diaphragm to avoid interference between the diaphragm and the hammer.

7. A mechanical horn embodying therein a flexible diaphragm, a plate carried by said diaphragm centrally thereof, spaced away therefrom, and movable therewith, said plate having a plurality of impact members arranged diametrically opposite each other in a circle concentric with the axis of said diaphragm and a rotary member having oppositely disposed hammer heads adapted to simultaneously engage diametrically opposite impact members successively and flex said diaphragm through said plate, each of said heads being capable of movement axially of said plate to avoid interference between the diaphragm and the hammer mechanism.

8. A mechanical horn embodying therein a flexible diaphragm, a plate carried by said diaphragm, centrally thereof, spaced away therefrom, and movable therewith, said plate having a plurality of impact members arranged diametrically opposite each other in a circle concentric with the axis of said diaphragm and a rotary member having oppositely disposed spring sustained hammer heads adapted to simultaneously engage diametrically opposite impact members successively and flex said diaphragm through said plate, said heads being normally projected by their springs axially of and toward said diaphragm whereby said diaphragm will be flexed by the rotary or side impact of said heads, and said impact members if they engage said heads upon the reflex action of said diaphragm will overcome said spring and cause said heads to recede with said diaphragm to avoid interference between the diaphragm and the hammer.

9. A mechanical horn embodying therein a flexible diaphragm, a plate carried by said diaphragm centrally thereof, spaced away therefrom, and movable therewith, said plate having a plurality of gradated impact members arranged diametrically opposite each other in a circle concentric with the axis of said diaphragm and a rotary member having oppositely disposed spring sustaining gradated hammer heads adapted to simultaneously engage diametrically opposite impact members successively and flex said diaphragm through said plate, said heads being normally projected by their springs axially of and toward said diaphragm whereby said diaphragm will be flexed by the rotary or side impact of said heads, and said impact members if they engage said heads upon the reflex action of said diaphragm will overcome said spring and cause said heads to recede with said diaphragm to avoid interference between the diaphragm and the hammer.

10. In a mechanical horn, the combination with a casing and means engaging the edges of and sustaining a diaphragm within said casing. of a diaphragm, an impact member carried by said diaphragm, a rotary member carrying a hammer head adapted to engage said impact member and flex said diaphragm, said head being capable of movement axially of said diaphragm whereby interference between the diaphragm and the hammer is avoided, and means whereby said rotary member is actuated, said member, said hammer and said actuating means being arranged in said casing upon one side of said diaphragm, whereby a volume of inert air is provided, said casing upon the opposite side of said diaphragm being provided with a sound outlet opening, and an amplifier communicating with said outlet opening.

11. In a mechanical horn, the combination with a casing, and means engaging the edges of and sustaining a diaphragm within said casing, of a diaphragm, said casing having a sound outlet upon one side of said diaphragm and being inclosed on the other side of said diaphragm to form a chamber containing an inert body of air, a motor the shaft of which is in alinement with the axis of said diaphragm, a plate carried by said diaphragm centrally thereof, spaced away therefrom and movable therewith, said plate having a plurality of impact members arranged in a circle concentric with the axis of said diaphragm and said motor shaft, radially projected arms carried by said shaft, spring sustained hammer heads carried by said arms and adapted to be projected by their springs into engagement with said impact members whereby said diaphragm will be flexed by the engagement of said hammer heads with said impact members successively, said motor and said hammer mechanism being mounted within said inclosed chamber and an amplifier communicating with said sound outlet opening in said casing.

In witness whereof, I have hereunto affixed my signature, this 20th day of May, 1910, in the presence of two witnesses.

OSCAR C. ARLITZ.

Witnesses:
OTTO MUNK,
F. T. WENTWORTH.