H. G. PAPE.

COMBINED SOUND REPRODUCER AND LIGHTING FIXTURE.

APPLICATION FILED DEC. 17, 1914.

1,272,843.

Patented July 16, 1918.

2 SHEETS—SHEET 1.

FIG. 1.

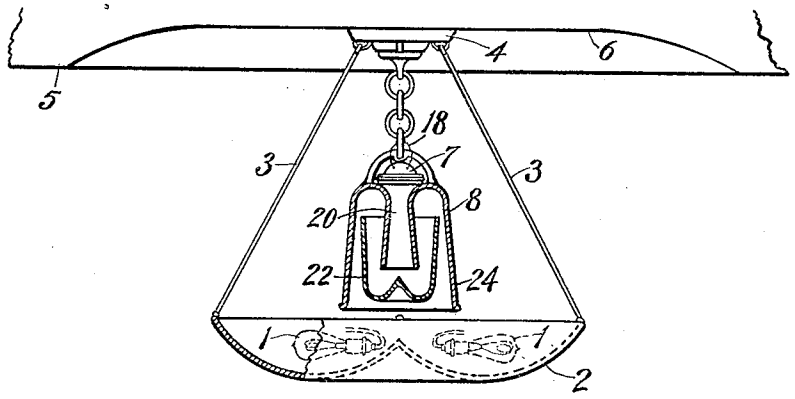
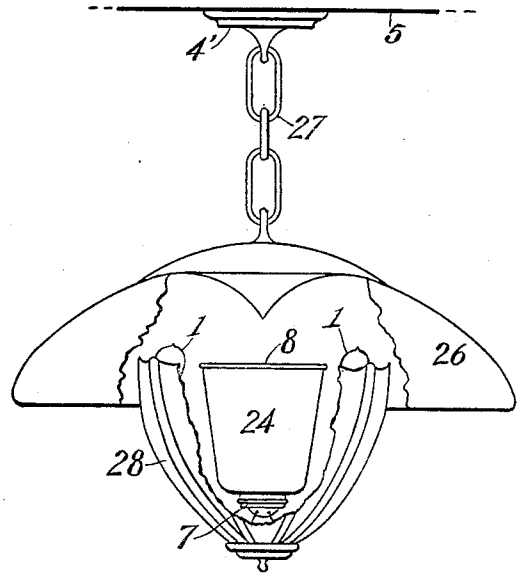


FIG. 2.



WITNESSES

S. A. Rule.

Wm. T. Berlin

INVENTOR

Herman G. Pape

BY

J. F. Rule

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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2 SHEETS—SHEET 2.

FIG. 3.

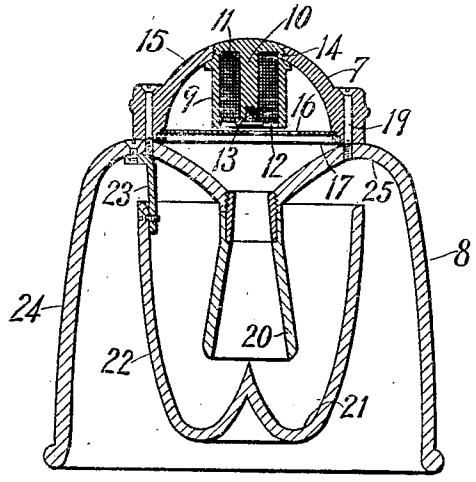
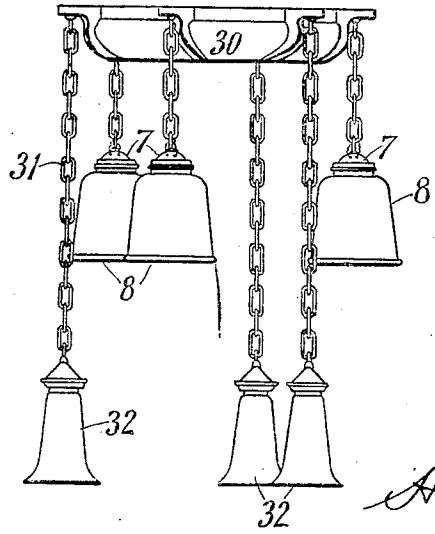


FIG. 4.



WITNESSES

S. a. Rule.

Wm. T. Berlin

Herman G. Pape

INVENTOR

BY J. F. Rule.

ATTORNEY

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

HERMAN G. PAPE, OF NEW YORK, N. Y.

COMBINED SOUND-REPRODUCER AND LIGHTING-FIXTURE.

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Application filed December 17, 1914. Serial No. 877,802.

To all whom it may concern:

Be it known that I, HERMAN G. PAPE, a citizen of the United States, and resident of New York, in the county of New York and State of New York, have invented a certain new and useful Combined Sound-Reproducer and Lighting-Fixture, of which the following is a specification.

My invention relates particularly to compact stentoric or megaphonic apparatus combined with lighting and sound reproducing apparatus, and adapted for use in auditoriums, churches, theaters, railroad depots, offices, homes, sitting rooms and other situations in which sound reproducing and amplifying devices may be employed to enable an individual, or individuals or an audience to hear operatic, or musical reproductions, addresses or other sounds which may be electrically transmitted to the reproducer from some other place.

In accordance with my invention the sound reproducers and amplifiers may be combined with chandeliers or other lighting fixtures supported from the ceiling or walls, and the ceiling and the light reflectors may also serve as sound reflectors. The sound reproducers as well as the lights may be hidden by certain reflectors from the view of the audience. It will thus be seen that the invention provides an arrangement whereby the need of reflectors and other fixtures for the sound reproducers is dispensed with, the lighting fixtures in addition to their usual functions serving as supports and reflectors for the sound reproducers, and the ceiling, arch or dome structure of the room, auditorium, or compartment, serves not only as a diffused lighting deflector, but also as a diffused sound deflector.

The invention further provides an improved sound amplifying device in which the sound by a multiple reflection and expansion is magnified to a state of distinct audibility and shot out either with great force, or greatly increased in volume, or both, according to its spread or choke construction. This device may also be used as a sound collector or concentrator. It is very compact and pleasing in contour, adapting it for use in compact and elaborate places.

Another feature of the invention is the provision of an improved form of sound reproducer in which the electromagnet comprises a cylindrical magnet shell having a central core, a coil mounted on said core, a washer surrounding the core and holding the coil in position and a screw of magnetic material threaded into the end of the core and serving the double function of holding the washer and coil in place and also increasing the area of the pole face opposed to the diaphragm.

Other features and advantages will appear hereinafter.

In the accompanying drawings,—Figure 1 is a sectional elevation view of a combined lighting and sound reproducing apparatus constructed in accordance with the principles of my invention. Fig. 2 is an elevation view of a modified construction, parts being broken away to show the apparatus. Fig. 3 is a sectional view on a larger scale of my sound mortar, or sound reproducing and amplifying device. Fig. 4 is an elevation view of a modified form of chandelier or lighting fixture comprising a group of lighting and sound reproducing elements.

In the combined lighting and sound reproducing and amplifying apparatus shown in Fig. 1, electric lamps 1 are supported above a reflector 2 suspended by means of rods 3 from a support 4 attached to the ceiling 5. The reflector 2 which may be made of any suitable material either opaque, or translucent, hides the lamps from the view of persons in the room and screens them from the direct rays of light, the light being reflected on the ceiling which may be in the form of a concave reflecting surface 6 by which the light is reflected and diffused through the room.

In combination with the lighting apparatus is a sound reproducing and amplifying device comprising an electrical sound reproducer 7 and a sound amplifier 8. Referring particularly to Fig. 3, the sound reproducer 7 comprises an electromagnet consisting of a cylindrical shell 9 of magnetic material having a central core 10 and a magnet coil 11 within the shell 9. The coil 11 is held in position within the magnet shell by a washer or disk 12 of non-magnetic material, said washer surrounding the core 10 and held in position by a screw 13 threaded into the core 10. Said screw is made of magnetic material, and the head of the screw being of a greater diameter than the core 10 forms an enlarged pole face as well as holding the washer 12 and the magnet coil in position. The upper end of the magnet shell is threaded at 14 into a correspond-

ingly threaded opening in the casing 15. A diaphragm 16 extending across the lower face of the casing 15 is secured to the casing by means of a ring 17 which may have a screw threaded connection with the casing.

The terminals 18, (Fig. 1) of the magnet coil may be connected through suitable conductors to an ordinary telephone transmitter or other instrument for converting sound into electrical impulses which in the reproducer (Fig. 3) set up vibrations in the magnetic diaphragm 16 and reproduce the sounds in a well understood manner.

The volume of the sounds is greatly increased by the amplifier 8 to which the magnet casing 15 is secured as by means of screws 19. The sound waves are transmitted through a funnel 20 by means of which they are expanded and then reflected on the concave surface 21 of an inner bell or deflector 22, the latter being secured as by means of a bracket 23 within an outer shell 24. The sound reflected on the concave surface 21 is further expanded as it passes upward and strikes the concave surface 25 of the outer bell 24 and is deflected downward through the open mouth of the bell, being further expanded in its downward passage through the bell 24. The sound waves being expanded during their passage through the funnel 20, the deflector 22, and the bell 24, the volume is greatly increased. The sound waves emerging from the bell 24, Fig. 1, strike the upper surface of the reflector 2 and are reflected upward to the ceiling and then reflected and diffused through the room.

Fig. 2 shows a modified arrangement in which a reflector 26 is suspended by means of a chain 27 from a support 4'. The sound reproducer and amplifier 8 are in this arrangement inverted as compared with Fig. 1 so that the sound waves are projected upward therefrom and striking the reflector 26 are deflected downward through the room. An inverted bell or reflector 28 may form a support for the sound reproducing means as well as for electric or other lights contained therein. The reflector 26 serves to deflect the light as well as the sound waves.

Fig. 4 shows a chandelier or lighting fixture comprising a base 30 from which are suspended by means of chains 31 a group of bells or reflectors 32 which may contain incandescent or other lamps. The bells 32 may alternate with sound reproducers 7 also suspended from the base 30 and which may be at a somewhat higher level than the lighting element 32 to assist diffusion of the sounds, avoid crowding and to produce a more convenient and artistic arrangement. It will be noted that with the arrangement shown in this view the sound may be thrown directly downward through the room from the amplifiers 8. Electric lamps may, if desired be placed directly within the amplifiers 8.

Various other modifications than those herein disclosed may be resorted to within the scope of the invention, and parts of the invention may be used without others.

What I claim is:—

1. The combination of a reflector, means to support a light in position to be reflected thereby, a sound reproducer comprising a diaphragm supported adjacent said reflector, electro-responsive means to vibrate the diaphragm, and a sound amplifying bell having an open mouth facing the reflector, the latter arranged with its reflecting surface extending across said open mouth, so that the sounds from the reproducer are directed from said mouth against the reflector.

2. The combination of a reflector, means to support a light in position to be reflected thereby, a sound reproducer comprising a diaphragm supported adjacent said reflector, electro-responsive means to vibrate the diaphragm, a sound amplifying bell interposed between the diaphragm and said reflector and having an open mouth facing the reflector, and means within said bell to increase the volume of the sound by a series of expansions and reflections, the sound being directed through the open mouth of the bell directly against said reflector.

3. The combination of a chandelier comprising means for supporting lights thereon, a reflector for said lights, a sound producing and amplifying apparatus carried on the chandelier; said apparatus comprising a sound reproducing membrane, a casing inclosing said membrane, and a sound amplifying device comprising means for increasing the volume of the sound and directing it against the reflector, the latter arranged with its reflecting surface extending across the mouth of the amplifying device.

4. A combined lighting and sound reproducing apparatus comprising a light reflector, means to suspend said reflector from a ceiling, a lamp and a sound reproducer supported above said reflector, said reproducer having an electro-responsive diaphragm, and means to vibrate said diaphragm, an open mouthed sound directing device by which sounds from the diaphragm are directed against the reflector, said reflector extending across said open mouth and arranged to reflect light and sound from said lamp and reproducer.

5. The combination with a reflector, of an electric sound reproducing device, a sound amplifier arranged to receive and amplify the sounds from said device, said amplifier positioned and arranged to direct the sounds on to the reflector, the latter arranged with its reflecting surface extending across the mouth of the amplifier, and a lamp adjacent to said reflector in position for the light

therefrom to be directed against said reflector.

6. The combination of an electro-responsive sound reproducing device, a sound amplifying device arranged to receive and amplify the sounds and formed with an open end or mouth through which the sounds are ejected, a reflector, means to suspend said reflector from a ceiling, and means to support said amplifying device above the reflector with said open end adjacent to and facing the reflector in position for the sound waves to be thrown against the reflector, the latter extending across the open end of the amplifying device and spaced therefrom.

7. The combination of an electro-responsive sound reproducing device, a sound amplifying device arranged to receive and amplify the sounds and formed with an open end or mouth through which the sounds are ejected downwardly, a reflector beneath, means to suspend said reflector from a ceiling, and means to support said amplifying device above the reflector with said open end adjacent to and facing the reflector in position for the sound waves to be thrown downwardly against the reflector, the latter extending transversely across the path of the sound waves, and a lamp supported above the tranverse reflector in position for the light to be thrown on the reflector, said amplifying device and lamp positioned to be hidden from the view of persons, beneath the reflector.

8. The combination of an electro-responsive sound reproducing device, a sound amplifying device arranged to receive and amplify the sounds and formed with an open end or mouth through which the sounds are ejected, a reflector, means to support said reflector adjacent to and facing a wall or ceiling, means to support said amplifying device between the reflector and said wall or ceiling with said open end facing the reflector in position for the sounds to be thrown against the reflector.

9. In a sound reproducing and amplifying mechanism, the combination of a sound reproducing diaphragm, an amplifying bell open at one end for the ejection of sound waves, the opposite end of the bell having a reëntrant wall leading to a restricted central opening and forming a chamber flaring outwardly from said opening toward the diaphragm, means for supporting said diaphragm opposite said chamber in position for the sound waves produced thereby to be directed through said chamber and opening, and means within the bell for expanding, reflecting and directing the sound waves through said open mouth of the bell.

10. The combination with a ceiling, of an electro-responsive sound reproducing device, a sound amplifying device therefor, a lamp, means whereby said devices and said lamp are supported from said ceiling, a reflector, said lamp and amplifying device positioned to direct the light and sound waves therefrom against the reflector, said reflector arranged to throw the light and sound waves against the ceiling, the latter serving to reflect and diffuse the light and sound.

11. The combination with a ceiling, of an electro-responsive sound reproducing device, a sound amplifying device therefor, a lamp, means whereby said devices and said lamp are supported from said ceiling, and adjacent thereto, and means to direct the light and sound waves against the ceiling so that the latter serves as means for the amplification or diffusion of the sounds ejected from the amplifier and the light from said lamp.

12. The combination with an arched or dome-shaped ceiling, of an electro-responsive sound reproducing device, a sound amplifying device therefor, a lamp, means whereby said devices and said lamp are supported from said ceiling, and adjacent thereto, and means to direct the light and sound waves against the ceiling so that the latter serves as means for the amplification or diffusion of the sounds ejected from the amplifier and the light from said lamp.

13. The combination of an electro-responsive sound reproducing device, a sound amplifying device, means for supporting said devices from a ceiling, means forming a concave reflecting surface arranged above the amplifying device and facing downward, the sounds from the amplifying device being directed against said reflecting surface.

14. The combination of an electro-responsive sound reproducing device, a sound amplifying device, means for supporting said devices from a ceiling, means forming a concave reflecting surface arranged above the amplifying device and facing downward, means providing a concave reflecting surface beneath the amplifier, the latter having an open mouth facing said last named surface, through which mouth the sounds are directed against said upwardly facing reflector, and reflected upward against the downwardly facing reflecting surface.

Signed at New York, in the county of New York and State of New York, this 11th day of Dec., A. D. 1914.

HERMAN G. PAPE.

Witnesses:
IDA B. PAPE,
IDA D. PAPE.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."