

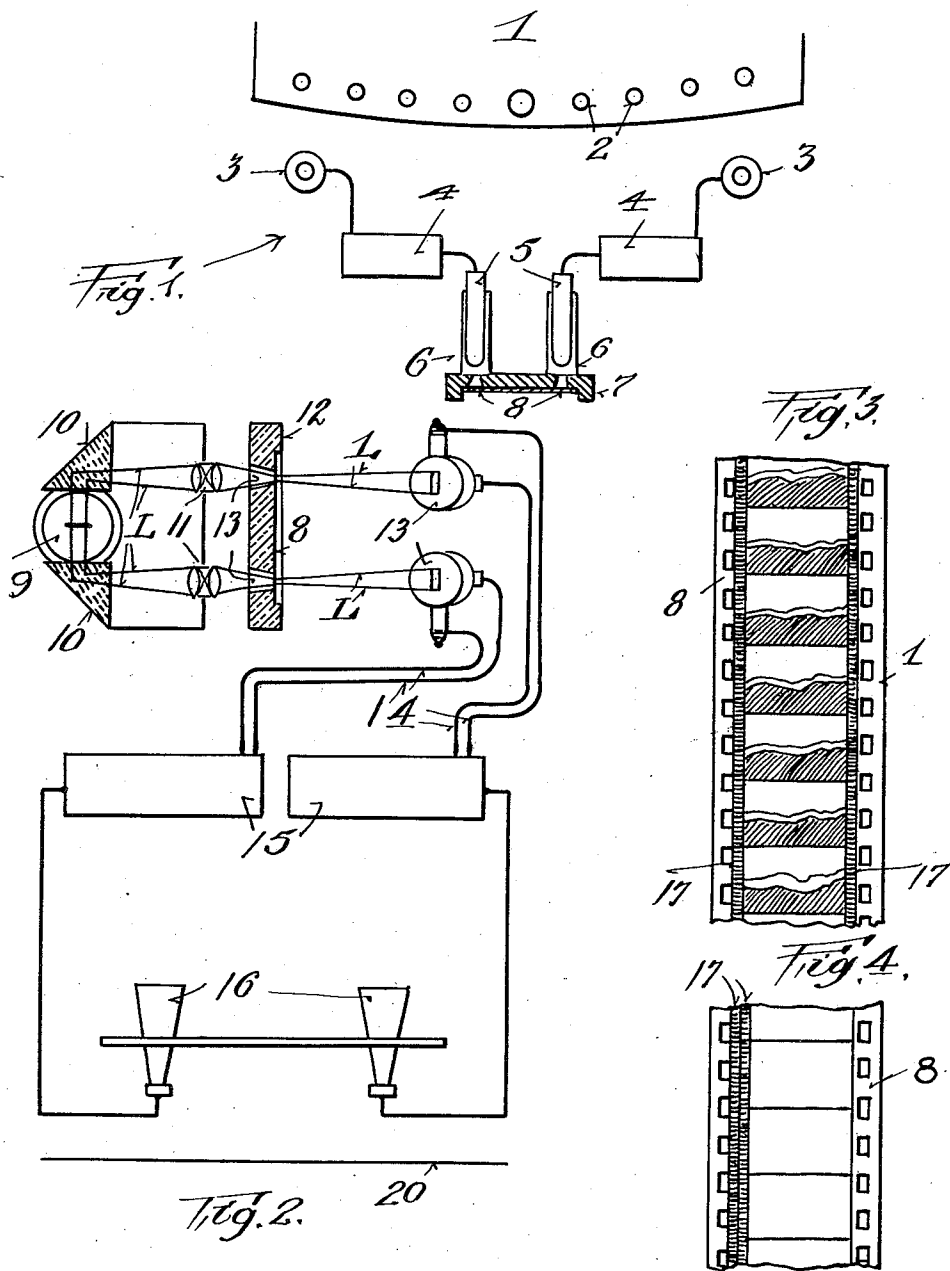
July 1, 1930.

L. DE FOREST

1,769,908

RECORDING AND REPRODUCING SOUND

Filed July 10, 1926



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UNITED STATES PATENT OFFICE

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RECORDING AND REPRODUCING SOUND

Application filed July 10, 1926. Serial No. 121,679.

This invention relates to improved methods for recording and reproducing sounds particularly those used in connection with the talking motion picture.

One of the objects of this invention is the provision of an apparatus for recording and reproducing sound waves, especially photographically by means of which a much more realistic reproduction of sound when the same originates from several sources is secured.

Another object of the invention is the provision of an apparatus of this type which is relatively simple and easy to construct and operate and is efficient in operation.

This invention resides substantially in the combination, construction, arrangement and relative location of parts and circuital connections as will be clearly described in the following specification and pointed out in the appended claim.

Referring to the drawings in which the same reference numerals will be used throughout the several views to indicate the same or similar parts,—

Figure 1 represents a diagrammatic view of the system of recording sound employed in this invention;

Fig. 2 is a diagrammatic view illustrating the reproducing apparatus;

Fig. 3 represents the portion of a film having thereon sound and picture records;

Fig. 4 represents a modified method of applying the sound record to the film.

The arrangement of this invention is adapted to produce or secure what is known in the art as "binaural" sound reproduction.

It is well known that when it is attempted to record and reproduce sound from many sources simultaneously, such as from a large orchestra, it is almost impossible to secure faithful reproduction.

In order to overcome the difficulties incident to recording and reproducing sound from a large orchestra, I have devised an apparatus employing a plurality of microphones and loud speakers suitably placed with respect to the orchestra and the audience so that all the sound will be picked up, recorded and reproduced.

By referring to the annexed drawings a

clear illustration of my apparatus employed for securing the desired results is obtained.

1 represents a plan view of the orchestra pit in which are distributed the various players

2. For purposes of illustration I have shown two microphones spaciouly placed with respect to each other and the orchestra pit. I

do not however wish to be limited to the use of two microphones since any suitable number may be employed in this connection.

The microphones 3 are electrically connected to the amplifiers 4. These amplifiers have been shown diagrammatically since any suitable amplifying devices may be used such as audions with suitable associated circuits.

The output from these amplifiers is fed to the photion tubes 5 which are well known devices for transforming electric current variations into light variations and are of the type described in my Patent No. 1,482,119.

These two tubes are supported in suitable casings 6 and the light therefrom is directed through slots in the camera gate 7 on to a sensitive film 8. In the arrangement shown in Fig. 1 the gate 7 is so constructed that the sound records 17 are recorded on the film on opposite sides of the picture record and within the perforations in the film. By this arrangement the sounds are faithfully picked up, transformed into electric currents, amplified, transformed into light variations and recorded on the sensitive film 8 which may then be developed. When it is desirable the two sound records 17 may be both recorded to one side of the picture record on the film 8 as shown in Fig. 4. It may be pointed out that these sound records while representing sounds from the same source, will not be exactly the same since they have been produced from sounds picked up at different points with respect to the orchestra or other sound source. They are, however, normal sound records being of corresponding amplitude and wave form with respect to the original sounds.

Referring to Fig. 2 I have shown my apparatus for reproducing sounds. Where it is desirable to place the two sound records at one margin of the film, it may not be pos-

sible to arrange the photion tubes 5 side by side and therefore, they could be arranged in staggered relation one above the other relative to the film and slightly displaced right and left so that the light will shine through its own slit upon the narrow portion of the film reserved for its particular record.

In the reproducing machine shown in Fig. 2 schematically I have disclosed an arrangement for securing binaural reproduction. A suitable light source 9 which may be an incandescent lamp having a straight line filament supplies the necessary light for the reproducing apparatus. The light rays from the filament are directed by means of the two reflecting prisms 10 through the lens systems 11 to the slots 13 in the film gate 12. As the film 8 moves past these slots the light rays L will vary in intensity as they pass through the sound records on the film and thereby influence the photo electric cells 13. The currents from the photo electric cells, representing the light fluctuations are fed to the two amplifiers 15 by means of the wires 14. The output of these amplifiers which may be as before of any suitable type, is fed to the two sound reproducing elements or loud speakers 16 which are disposed adjacent to the screen 20 but spaced therefrom and from each other. In this arrangement the steady light rays from the light source are changed on their passage through the records on the films to varying light rays which influence the photion cells and are changed into corresponding varying electric currents, which are amplified and then fed to the loud speakers where the currents are transformed into sound waves.

It will be evident from the foregoing disclosure that it is possible by means of the apparatus disclosed to secure a more realistic recording and reproduction of sound from a source comprising many sound originating units. While I have disclosed in the drawings one form which my invention may take, I am aware that many modifications and changes in construction will occur to those skilled in the art without departing from the spirit and scope of my invention and I do not therefore desire to be restricted except by the breadth of my appended claim.

What I seek to secure by United States Letters Patent is:

In a system of binaural recording and reproduction of sound, the combination of a single film having two distinct sound records thereon of the same source, a single source of light, a lens system for causing said light source to produce two light bands each influenced by one of said records, two photo electric cells one being actuated by one of said bands and the other by the other of said bands, an amplifier connected to each of said

cells and a loud speaker connected to each of said amplifiers, one to each amplifier.

In testimony whereof I have hereunto set my hand on this 30th day of June A. D. 1926.

LEE DE FOREST.