

E. S. PRIDHAM AND P. L. JENSEN.
 METHOD OF AND APPARATUS FOR TELEPHONICALLY TRANSMITTING SPEECH.
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Fig. 1.

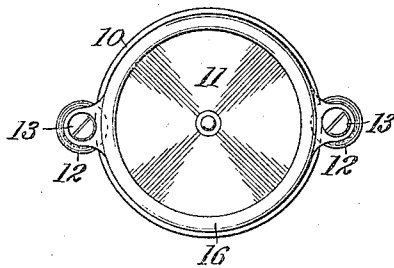


Fig. 2.

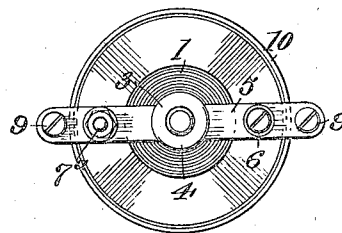
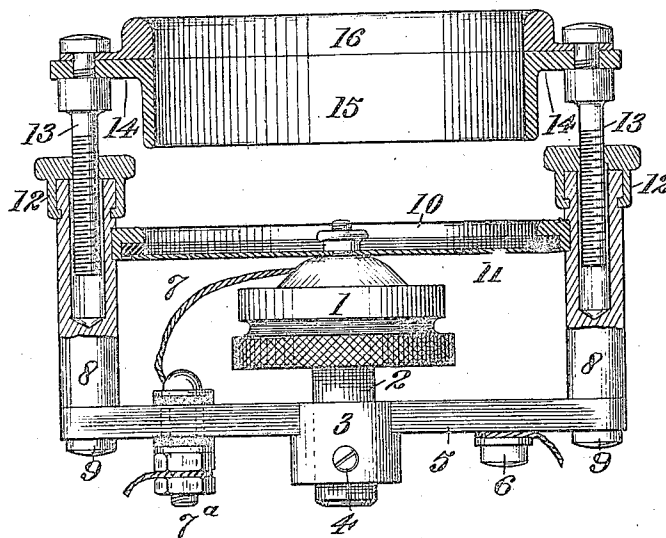


Fig. 3.



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METHOD OF AND APPARATUS FOR TELEPHONICALLY TRANSMITTING SPEECH.

Application filed August 21, 1917. Serial No. 187,361.

To all whom it may concern:

Be it known that we, EDWIN S. PRIDHAM and PETER L. JENSEN, citizens of the United States, residing at the city and county of San Francisco and State of California, have invented new and useful Improvements in Methods of and Apparatus for Telephonically Transmitting Speech, of which the following is a specification.

This invention relates to telephone systems and more especially to the transmitting element thereof.

The need for a telephone system which will clearly and distinctly transmit speech from an observer to a pilot, or vice versa, in an aeroplane is especially crying and since the beginning of the present war inventors and research workers everywhere have been striving to produce such an apparatus. Many attempts have been made to solve this problem by insulating the transmitter from the noises of the engine and propeller, muffling the noise of the latter, using loud speaking attachments and so forth, all of which require elaborate mechanisms and fail in a large measure to produce the desired effects.

In the present invention we have effectively attained the desired end in a startlingly simple manner which consists in letting in the noise rather than in attempting to shut it out, by exposing the diaphragm of the transmitter on both sides to the extraneous noises, so that the vibrations caused by the noise will oppose each other, resulting in keeping the diaphragm normally in a state of rest. Then by talking into one side only of the transmitter the speech vibrations will be clearly and faithfully transmitted in the usual way. As a consequence of this plan of operation we are able to produce a transmitter of even simpler and cheaper construction than the standard transmitters in use to-day and one which is practically unaffected by extraneous noises or side tones and yet responsive to the intended speech vibrations.

Such a transmitter has a wide variety of uses, being advantageous wherever the surrounding noises tend to interfere with speech transmission, as in factories, switch yards, and so forth.

One form of apparatus for practicing our

invention is exemplified in the following description and illustrated in the accompanying drawings, in which—

Fig. 1 shows a plan view of the same.

Fig. 2 shows an inverted plan view.

Fig. 3 shows a partial cross section.

The operation of this transmitting element is based upon the principle that if two equal and opposite pressures are exerted simultaneously upon a diaphragm the resultant force will be zero, while if a third force be acting on one side of the diaphragm in conjunction with the two opposing forces the transmitting circuit will only be affected by this third force. As an illustration of a condition where such a principle could be used to advantage, consider the use of a telephone on an aeroplane. Here the terrific noise of the engine and the propellers make communication with the ordinary transmitters impossible. In the transmitting element under consideration the extraneous noise is permitted to strike both sides of the diaphragm equally while the voice vibrations are restricted to only one side. In this way the noise vibrations are balanced against the diaphragm and consequently only the voice vibrations affect the transmitting circuit.

In putting this principle into use certain details of construction should be adhered to in order that the diaphragm may be acted on equally from both sides. The transmitter button which holds the electrodes and carbon granules and to which the diaphragm is attached, is firmly held in a frame-work which leaves both sides of the diaphragm exposed to existent noise vibrations. The frame-work is extended to the front side of the diaphragm and this frame-work is used as a support for an adjustable front for the transmitter. This front, which is provided with an opening for a mouth-piece, is constructed with a downwardly projecting flange around its edge so that by means of adjusting screws more or less of the front side of the diaphragm may be exposed to the noise vibrations.

In practice the openings are made as large as possible on either side of the diaphragm and are approximately equal; the front side being a trifle more exposed than the rear side. Thus by listening in with a receiver

to the effect of the outside noise vibrations on the transmitter, the transmitter front may be gradually adjusted until a minimum disturbance is noticed in the receiver.

5 In general where the noise is not directive, as is the case on an aeroplane, but exists with practically the same intensity at any point, the adjustment once attained is practically constant.

10 Referring now in detail to the accompanying drawings, the transmitter button 1 is provided with a shank 2 which is adjustably held in a bushing 3 by a set screw 4. This bushing is fixed to a bridge 5. One electrode of the transmitter button is grounded on the bridge to which connection is made through terminal 6, the other electrode being connected by a conductor 7 to the terminal 7^a which is insulated from the bridge.

20 Posts 8—8 are fixed to the bridge 5 by means of screws 9 and support a recessed ring 10 against which the diaphragm 11 of the transmitter button 1 rests. The adjustment of the pressure of the diaphragm 11 against the ring 10 is procured by adjusting the position of the shank 2 within the bushing 3. The posts 8—8 are made hollow for a portion of the length of their upper ends and are capped with tapped bushings 12—12.

30 These tapped bushings are adapted to be freely rotatable on the posts 8—8 and to engage with threaded rods 13—13. The rods 13—13 support a ring 14 which is provided at its inner circumference with an inwardly projecting flange 15, and a slightly projecting mouth-piece 16.

It will be seen from the drawings that the diaphragm 11 is exposed to the extraneous noise vibrations on both of its sides. The more open the construction of the transmitter the more nearly will be the equalizing effect on the diaphragm of any disturbing noise. By adjusting the distance of the flange 15 from the diaphragm 11 the effect of the disturbing vibrations on that side can be reduced to a negligible quantity and thereby a proper balance of the opposing noise vibrations can be attained. In actual test of this transmitter next to a very powerful aeroplane engine speech was received

50 clearly and articulately with a minimum of disturbing effect from the terrific noise, while with a transmitter of the ordinary construction the distressing effect of the noise was such that it was impossible to separate the speech from the noise.

It is understood that although we have disclosed in this application a specific case whereby speech may be transmitted effectively in an environment of extraneous noises, the general principle is capable of being applied in other ways to accomplish the same results. What we hold to be new is the balancing out of the disturbing vibrations which are permitted to enter the transmitter

and although the transmitter is fully exposed to these disturbing vibrations, the effect upon the transmitting circuit is negligible for the force of the disturbing vibrations is caused to act in equal degree and opposite in direction on the transmitter diaphragm. Then by directing the desired vibrations into the transmitter in such a manner that there is no counter equal force acting against them it will be understood that the desired vibrations are transmitted free from the effects of the disturbing noises.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:—

1. The method of telephonically transmitting speech vibrations in an environment of extraneous noises which consists in balancing the noise vibrations in the transmitter system so as to maintain a static condition of the telephone circuit normally and directing the speech vibrations into the transmitter system in a manner to have them unopposed.

2. The method of telephonically transmitting speech vibrations in the presence of disturbing noise vibrations which consists in so positioning the transmitter with respect to the noise vibrations and the speech vibrations that the noise vibrations are balanced against themselves in the transmitter and the speech vibrations are alone effective to actuate the transmitter.

3. A telephone transmitter for use in excessively noisy places having a diaphragm exposed at both sides to vibrations due to said noise, means for increasing or decreasing the effect of said noise on one side of the diaphragm to obtain a static condition of the diaphragm, and means for directing desired speech vibrations against one side only of said diaphragm.

4. A method of telephonically transmitting speech vibrations in the presence of surrounding noise vibrations which consists in exposing a transmitter diaphragm at both sides to vibrations due to noise and at one side only to vibrations of speech.

5. In a transmitter for use in noisy places, comprising a variable resistance element, a diaphragm in connection with said variable resistance element, a partial casing for the support of said variable resistance element and said diaphragm, said casing being so constructed as to permit free access of extraneous sound vibrations to strike both sides of the diaphragm, an annular ring mounted on said partial casing and spaced away from the front of the diaphragm, said ring being in substantially a parallel plane with the diaphragm at a distance to allow a close approach of the user's lips to, but preventing them from touching said diaphragm.

6. In a telephone system, a transmitter having sound detecting elements exposed to

noise vibrations on opposite sides so as to be in static condition in the presence of noise waves, and means permitting the directing of sound waves against the transmitter to overcome the static balance.

7. The method of causing a diaphragm to vibrate in response to certain sounds while remaining substantially unresponsive to other sounds, consisting in exposing a diaphragm to sound vibrations so that air pressure variations caused by relatively distant sounds are substantially equalized on the two sides of the diaphragm, but pressure variations caused by sounds relatively near and substantially opposite one side of the diaphragm are impressed upon only the adjacent side of the diaphragm without exerting an equalizing effect upon the other side.

8. The method of making a diaphragm responsive to desired sound vibrations while practically unresponsive to undesired sounds, consisting in permitting air pressure variations caused by sound vibrations to have such free access to both sides of the diaphragm as to cause the diaphragm to vibrate in response to sound vibrations of one class and

to be substantially unresponsive to vibrations of another class.

9. The method of selecting sound for telephonic transmission, employed in connection with a sound-responsive diaphragm and means for converting sound vibrations thereof into electrical vibrations for transmission, consisting in supporting and arranging said diaphragm so that it is accessible to sound vibrations freely on both sides, whereby the diaphragm responds readily to sounds intended for reproduction proceeding from a near source substantially opposite a side of the diaphragm, and responds to a slight or negligible extent to sounds proceeding from sources relatively distant or approximately in the plane of the diaphragm.

In testimony whereof we have hereunto set our hands in the presence of two subscribing witnesses.

EDWIN S. PRIDHAM.
PETER L. JENSEN.

Witnesses:

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M. E. EWING.