C. L. CHISHOLM.

TELEPHONE TRANSMITTER.

APPLICATION FILED MAR. 9, 1909.

964,214. Patented July 12, 1910.

Fig. 1.

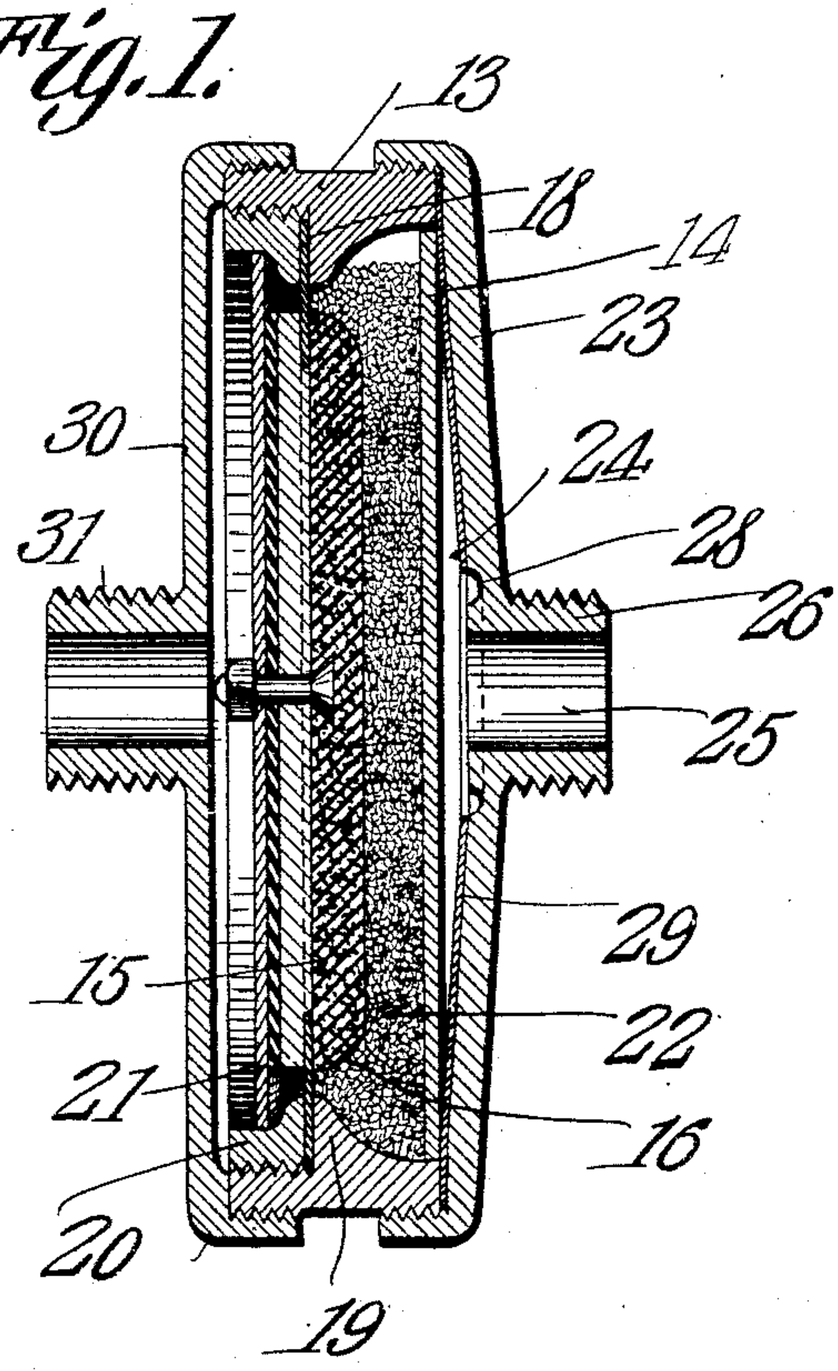


Fig. 2.

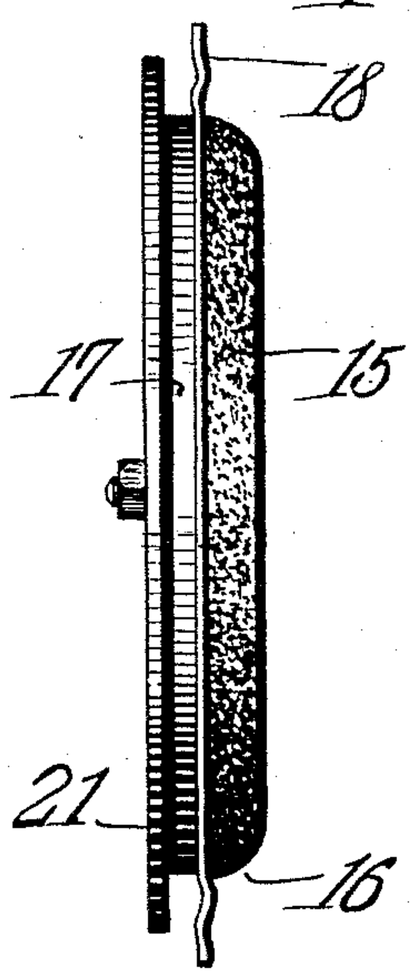
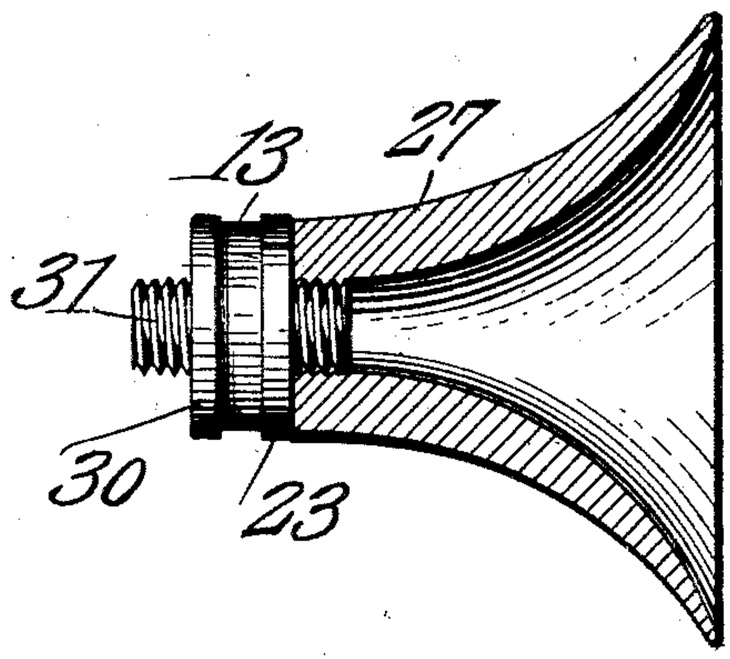


Fig. 3.



Witnesses

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TELEPHONE-TRANSMITTER.

964,214. Specification of Letters Patent. Patented July 12, 1910.

Original application filed January 20, 1909, Serial No. 473,374. Divided and this application filed March 9, 1909. Serial No. 482,212.

To all whom it may concern:

Be it known that I, CHARLES L. CHISHOLM, a subject of the King of England, residing at Marysville, in the Province of New Brunswick, Canada, have invented a new and useful Telephone-Transmitter, of which the following is a specification.

This invention has reference to improvements in telephone transmitters and while adapted for general purposes, is especially adapted for use in connection with the individual telephone transmitter for which on January 20, 1909, I made application for Letters Patent under Serial No. 473,374, the present application being a division of the said application above enumerated.

The object of the present invention is to provide a transmitter in which the overtones are transmitted to the line and there is thereby preserved to a degree impossible in the ordinary commercial transmitter, the timbre of the voice and consequently the naturalness and recognizability of the voice. For this purpose the voice receiving diaphragm and the granule chamber of the microphonic element are made substantially coextensive, the diaphragm being very small as compared with the diaphragms of microphonic transmitters in common use. The microphonic element is about the size of those in ordinary use and the diaphragm is reduced in diameter to correspond to that of the microphonic element. The fundamental of the diaphragm is thus raised until well above the voice sounds usually used in the transmission of speech, while the inclosing chamber for the granules of the microphonic element has all the walls highly polished to present the minimum resistance to the movement of the granules. Furthermore, the back contact of the microphonic element is mounted on a diaphragm offering less mechanical resistance to the sound impulses than the diaphragm against which the sound waves directly impinge. The second named or back diaphragm is separated from the chamber containing the granules by a highly flexible membranous wall which prevents the lodging of the granules against the back diaphragm in inert masses and so prevents the damping of the back diaphragm thereby and also obviates a more vital defect, that is of damping the active granules themselves.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification, in which drawings,

Figure 1 is a central section through the transmitter microphonic element or unit on an enlarged scale. Fig. 2 is a view of the back contact and parts carried thereby. Fig. 3 is a section of the mouthpiece which may be used in connection with the transmitter, the latter being shown in elevation.

Referring to the drawings there is shown a microphonic unit comprising a cylindrical box 13 having at one end a diaphragm 14 secured thereto in such manner as to be without initial strains of any character. It is customary in ordinary transmitters to seat the diaphragm against which the sound waves impinge upon an annular ledge and to hold such diaphragm in place by means of a clamp ring. Such a manner of holding the diaphragm results in putting the diaphragm under strains in zones or lines and the diaphragm will no longer vibrate as a whole in response to the sound waves. The result of this ordinary manner of holding the diaphragm is that there is a loss sufficient to obliterate many of the overtones and the naturalness or timbre of the transmitted sounds is correspondingly affected. Theoretically the ledge for supporting the diaphragm should have no area, but of course a supporting ledge must in practice have some area but this should be reduced to the least practical minimum so that the diaphragm is superficially unobstructed. It is quite feasible to utilize the theoretical conditions by supporting the diaphragm without any ledge and this is done by cementing the periphery of the diaphragm to the casing 13 by any suitable cement. In the case of a metal diaphragm a suitable solder may be used and in the use of a carbon diaphragm the periphery of the diaphragm may be metallized by electro-plating or otherwise and then the diaphragm may be readily soldered to the interior wall of the box 13 thus supporting the diaphragm without an actual supporting ledge.

As has been intimated the diaphragm 14 may be made of metal but it is preferred to make it of carbon with the inner face highly polished and it is even better to use a silver diaphragm with the inner face gold plated.

In close relation to the inner face of the

diaphragm 14 there is provided a back contact 15 which may be made of carbon with its periphery rounded toward the diaphragm 14 as indicated at 16. The entire face of the back contact 15 as well as the rounded edges 16 should be highly polished. The back contact 15 is secured to a plate 17 which may be made of brass or other suitable material and between this plate and the back contact an annulus 18 of silk or gold beater's skin or substances of like nature is secured. The annulus 18 is firmly cemented between the back contact 15 and the plate 17 and projects beyond the same sufficiently to engage against a shoulder formed at a thickened portion 19 of the inner wall of the shell 13. A sleeve 20 is screwed into a suitably threaded end of the cylinder or box 13 and serves to clamp the annulus 18 firmly in the said box 13. Firmly secured to the outer face of the plate 17 is a diaphragm 21 which may be similar to the diaphragm 14 and be similarly connected to the inner wall of the sleeve 20. If the diaphragm 21 be of metal it may be soldered to the plate 17 and if of mica it may be otherwise cemented to the plate 17, or even firmly clamped thereto. The diaphragm 21 serves to support the plate 17 and back contact 15 while the annular membrane or ring 18 has no supporting function for the back contact 15 and plate 17.

The inner wall of the box 13 between the diaphragm 14 and back contact 15 is highly polished and in the chamber formed between the said diaphragm 14, back contact 15, inner wall of the box 13 and the annulus 18 there is contained a quantity of granules indicated at 22, these granules being preferably though not necessarily of carbon and should be very fine in size. The quantity of granules is sufficient to nearly fill the chamber but the amount is actually small because of the small size of the chamber and such small amount also prevents damping the diaphragm to any material extent.

Applied to the box 13 is a cover 23 and the cover may be so shaped as to inclose between it and the diaphragm 14 a flat conical chamber 24 or the cover may be otherwise shaped with the chamber of different shape if desired.

At the center of the cover is a passage 25 interior to a neck 26 which latter is externally threaded for the reception of a mouth-piece 27 as shown in Fig. 3, this mouth-piece being about the size of mouth-piece usually employed with telephonic transmitters and the smaller end of the mouth-piece is about coincident with the outer diameter of the box 13. Because of the extremely small size of the chamber 24 it is advisable to increase the air space therein by forming one or more grooves 28 on the inner wall of the cover 23 as shown in Fig. 1.

It has been demonstrated from many tests that large diaphragms such as are employed in the ordinary types of microphonic transmitters are fatal to the transmission of the higher overtones upon which depend the timbre of the voice. This defect is partly due to the large reverberating chambers, comparatively speaking, which are formed between the diaphragm and the outer casing or cover and also between the diaphragm and the inner walls of the casing exterior to the microphonic element and it may be that sound wave interferences set up in these chambers are also responsible for the defective transmission of the original sound uttered against the transmitter diaphragm.

Whatever be the cause it is found that when the sound receiving diaphragm is reduced in size so as to not exceed the diameter of the chamber containing the granules of the microphonic element that the defects above noted are practically overcome and more especially is this true when the interior of the microphonic element is constructed in the manner already described, that is with all the walls with which the granules come in contact highly polished with the amount of granules which are inactive reduced to the minimum, and with the back contact yieldingly supported.

The chamber between the sound receiving diaphragm and the cover is also by this means reduced to a minimum, and to prevent even a trace of reverberation the inner face of the casing or cover 23 may be covered with some soft material such as cloth or felt, this covering being indicated at 29 in Fig. 1. However, it is to be understood that this lining 29 is not absolutely essential and may under some circumstances be omitted.

By making the sound receiving diaphragm 14 and the interior diameter of the box or shell 13 co-extensive and both parts of small size the fundamental tone of the diaphragm 14 is raised to a high point while the thickness of the diaphragm 14 as well as the material of which it is made is so chosen that the fundamental of the diaphragm exceeds the rate of vibration of the ordinary speaking voice and for the best results should exceed the rate of vibration of the speaking voice quite materially. The fundamental of the diaphragm 21 should also be high but this diaphragm should be less resistant to the sound waves when the diaphragm is in the free state, than the diaphragm 14. It is to be noted that the diaphragm 21 is entirely free from contact with the granules 22, being separated from the chamber containing the granules by the annulus 18.

The manner of supporting the transmitter is immaterial to the present invention and

so has not been shown further than the indication of a back plate 30 screwed on the box 13 with the back plate provided with a central hub 31 externally screw threaded for attachment to any suitable support, and this hub may be made hollow as shown for the passage of one of the leads from the microphonic element although such lead is not shown in the drawings.

What is claimed is:—

1. A telephone transmitter having a diaphragm for receiving the direct impact of sound waves, said diaphragm being peripherally supported without stress, and superficially unobstructed on its sound receiving face and also having a fundamental rate of vibration higher than the rate of vibration of the normal voice waves to be transmitted.

2. A microphonic transmitter having a diaphragm for receiving the direct impact of sound waves, said diaphragm being superficially unobstructed on its sound receiving face, and having a fundamental rate of vibration higher than the rate of vibration of the normal voice waves to be transmitted and a granule chamber substantially co-extensive with the diaphragm.

3. A telephonic transmitter having a metallic diaphragm for receiving the direct impact of sound waves, said diaphragm being peripherally supported without stress, and superficially unobstructed on its sound receiving face and also having a fundamental rate of vibration higher than the rate of vibration of the normal voice waves to be transmitted.

4. A microphonic transmitter having a metallic diaphragm for receiving the direct impact of sound waves, said diaphragm being superficially unobstructed on its sound receiving face and having a fundamental rate of vibration higher than the rate of vibration of the normal voice waves to be transmitted, and a granule chamber substantially co-extensive with the diaphragm.

5. A microphonic transmitter having a sound receiving diaphragm with a fundamental rate of vibration above that of the normal voice waves to be transmitted, a granule receiving chamber of substantially the same diameter as the diaphragm, and a yieldingly mounted back contact in said chamber out of the direct path of the voice waves.

6. A microphonic transmitter having a sound-receiving diaphragm and a granule-receiving chamber of substantially the same diameter, a back contact in said chamber and a back diaphragm supporting said back contact and located outside said granule chamber.

7. A microphonic transmitter having a sound-receiving diaphragm and a granule-receiving chamber of substantially the same diameter, a back contact in said chamber, a back diaphragm supporting said back contact and located outside the granule chamber, and a flexible wall between the granule chamber and the back diaphragm.

8. A microphonic transmitter having a sound receiving diaphragm superficially unobstructed on its sound receiving face and having a fundamental rate of vibration higher than that of the normal sounds to be transmitted, a granule receiving chamber of substantially the same diameter as the diaphragm, a back contact in said chamber, and a back diaphragm supporting said back contact and out of the direct path of the sound waves.

9. A microphonic transmitter having a single sound receiving diaphragm, a granule receiving chamber of substantially the same diameter as the diaphragm, and a back contact within said chamber, the sound receiving diaphragm having a fundamental rate of vibration higher than that of the normal sound to be transmitted and the inner walls of the granule chamber, the diaphragm, and the back contact where engaged by the granules being highly polished.

10. A microphonic transmitter having a sound-receiving diaphragm and a granule-receiving chamber of substantially the same diameter, a back contact within said chamber, the said diaphragm having a fundamental rate of vibration higher than the rate of vibration of the normal sounds to be transmitted, the interior walls of the granule chamber, the diaphragm, and the back contact being highly polished, a back diaphragm supporting the back contact, and a flexible wall separating the granule-receiving chamber from the back diaphragm.

11. A microphonic transmitter having a single sound receiving diaphragm the fundamental rate of vibration of which is higher than the rate of vibration of the normal voice waves to be transmitted, a granule receiving chamber of substantially the same diameter as the diaphragm, a back contact within said chamber, and a back diaphragm supporting said back contact, the inner walls of the granule chamber, the diaphragm, and the back contact where engaged by the granules being highly polished.

12. A microphonic transmitter having a granule chamber and a sound receiving diaphragm of substantially the same diameter as the granule chamber and having a fundamental rate of vibration higher than the rate of vibration of the normal voice waves to be transmitted, and a cover for the diaphragm provided with a central opening for the passage of the sound waves to the diaphragm and inclosing a chamber of which the diaphragm forms one wall, the inner face of the cover being non-resonant to the sounds actuating the diaphragm.

13. A microphonic transmitter having a

granule chamber and a sound receiving diaphragm of substantially the same diameter, the diaphragm having a fundamental rate of vibration higher than the rate of vibration of the normal voice waves to be transmitted and a cover for the diaphragm provided with a central opening for the passage of sound waves to the diaphragm and inclosing a chamber of which the diaphragm forms one wall, the inner wall of the cover being over-laid with non-resonant material.

14. A microphonic transmitter having a metallic diaphragm with a fundamental rate of vibration higher than that of the normal voice waves to be transmitted and a support of practically negligible radial extent for said diaphragm to which the latter is united without stress or strain by a metallic cement.

15. A microphonic transmitter having a sound receiving diaphragm with a fundamental rate of vibration higher than the rate of vibration of the normal voice waves to be transmitted, and a peripheral support for said diaphragm of practically negligible radial extent to which support the diaphragm is united without stress or strain.

16. A microphonic transmitter provided with a sound receiving diaphragm having a fundamental rate of vibration higher than that of the normal voice waves to be transmitted, a peripheral support for the diaphragm of practically negligible radial extent and to which the diaphragm is united, and a granule chamber substantially co-extensive with the diaphragm.

17. A microphonic transmitter having a granule chamber, a back contact in said chamber, a support for the back contact located outside the granule chamber, and a flexible non-elastic wall between the granule chamber and the support for the back contact.

18. A microphonic transmitter having a granule chamber, a back contact in said chamber, a diaphragm supporting the back contact and located outside the granule chamber, and an intermediate flexible non-elastic wall between the granule chamber and the support for the back contact.

19. A microphonic transmitter having a sound receiving diaphragm with a fundamental rate of vibration above that of the normal voice waves to be transmitted, the said diaphragm having the sound receiving side superficially free or unobstructed and the other side engaged by the granules only.

20. A microphonic transmitter having a sound receiving diaphragm with a fundamental rate of vibration above that of the normal voice waves to be transmitted, said diaphragm being superficially free or unobstructed on its sound receiving face and engaged only by the microphonic granules on the other face, and a peripheral support for the diaphragm of practically negligible radial extent and to which the diaphragm is firmly cemented.

21. A microphonic transmitter provided with a diaphragm support of practically negligible radial extent, and a metallic sound receiving diaphragm united at the periphery and without stress or strain to the support by a metallic cement.

22. A microphonic transmitter provided with a diaphragm support of practically negligible radial extent, a metallic sound receiving diaphragm united at the periphery and without stress or strain to the support by a metallic cement, and a granule chamber substantially co-extensive with the diaphragm.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

CHARLES L. CHISHOLM.

Witnesses:

LOUIS MADORE,

BLANCHE C. RUSE.