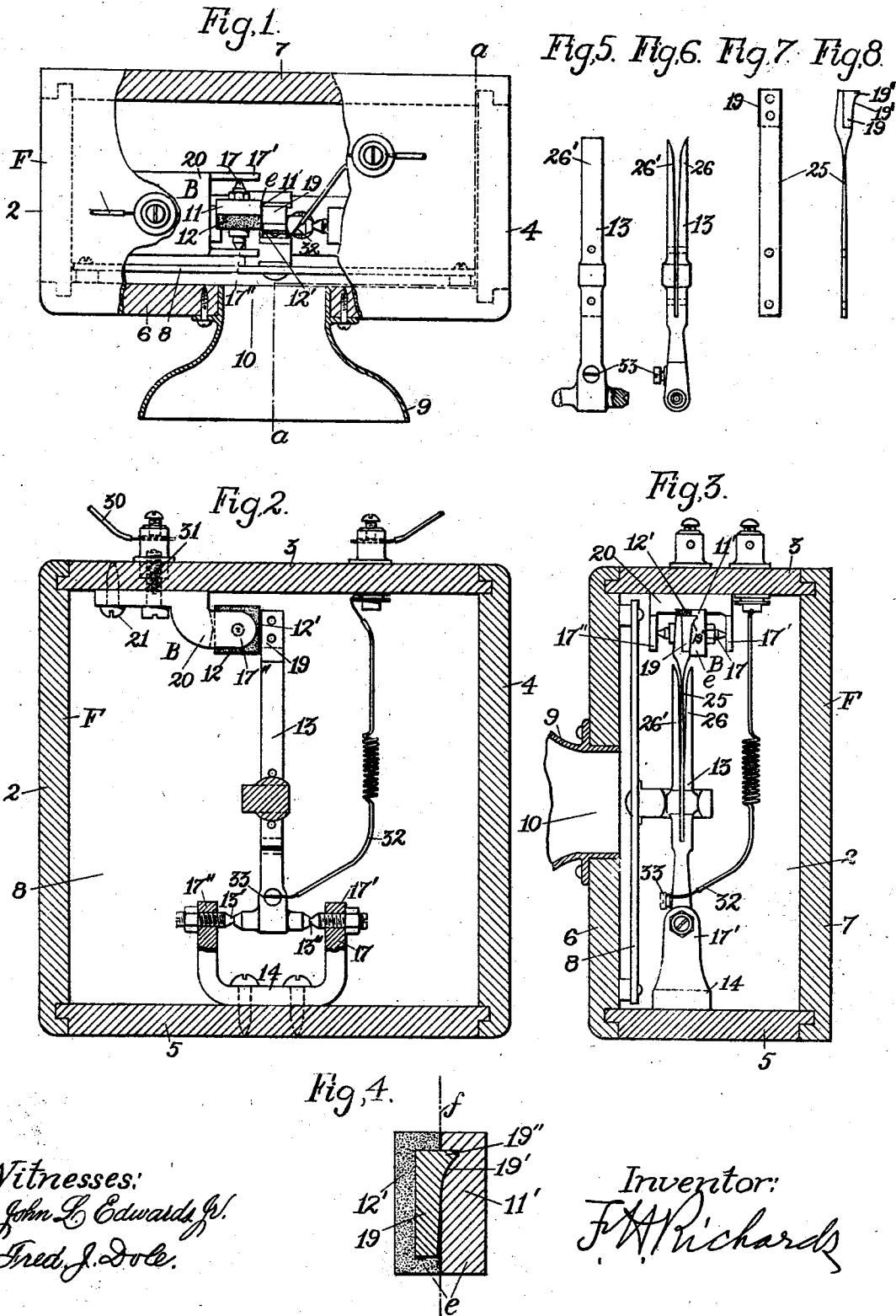


(No Model.)

F. H. RICHARDS.
TELEPHONE TRANSMITTER.

No. 513,729.

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Witnesses:
John L. Edwards Jr.
Fred J. Dole.

Inventor:
F. H. Richards

UNITED STATES PATENT OFFICE.

FRANCIS H. RICHARDS, OF HARTFORD, CONNECTICUT.

TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 513,729, dated January 30, 1894.

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To all whom it may concern:

Be it known that I, FRANCIS H. RICHARDS, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Telephonic Transmitters, of which the following is a specification.

This invention relates to transmitters for electric speaking telephones; the object being to furnish an improved instrument of this class in which the required undulatory currents may be produced by variation of the current-strength resulting from a variation in the amount of contact between surface-contacting electrodes.

In the drawings accompanying and forming a part of this specification, Figure 1 is a sectional plan view of a telephone transmitter made according to my present improvements. Fig. 2 is a front sectional elevation of the same, on line *a-a*, Fig. 1. Fig. 3 is a transverse sectional view, on line *b-b*, Fig. 1. Fig. 4 is a diagrammatic view illustrative of one of the features or details of the invention. Fig. 5 is a front elevation of the principal member of the electrode-carrier. Fig. 6 is an edge view of the same, as seen from the right-hand in Fig. 2, and corresponding to the position of the same in Fig. 3. Fig. 7 is a side view of the spring-arm of the electrode-carrier. Fig. 8 is an edge view of the same with the operative electrode fixed thereon.

Similar characters designate like parts in all the figures.

My improved telephone transmitter has a framework or casing, a plate sensitive to sound-waves, a compound electrode supported by the framework, and a follower-electrode operatively connected with the sensitive-plate and supported for a working-movement against the working-face of the compound electrode. The operative electrode is shown mounted upon a carrier or lever which is supported for movement laterally of itself in the plane of the working-faces of the electrodes; so that the said movement, though it be of considerable extent and the carrier-lever be relatively short, will not tend to vary the position of either electrode relatively to the plane of their working-faces, but will only

operate to slide the one electrode upon the other in true coincidence with that plane.

The casing or frame, F, may be of any convenient description, being preferably of the usual box-like form and consisting of the four sides, 2, 3, 4 and 5, the front-plate, 6, and the top-plate, 7, all suitably held together. The diaphragm, or sensitive-plate, 8, is fixed in place just within the front-plate, after the ordinary manner of supporting the sensitive-plates of this class of instruments; and a mouth-piece, 9, is or may be provided around the aperture, 10, of the front-plate, for directing the sound-waves against the sensitive-plate. This plate and some suitable connection therewith constitute the means for actuating the mechanically-operative electrode, as hereinafter more fully set forth.

The compound electrode, which is designated in a general way by B, consists of two parts, the conducting or electrical member 11 and the non-conducting or non-electrical member 12; these parts or members are held in rigid relation the one to the other, and together constitute a compound electrode whose working-face *e* consists of two fields or areas, 11' and 12', the one electrical and the other non-electrical. The electrode B is shown supported on a pivot or like device, 17, between the wings, 17' and 17'', of a bracket, 20, which is suitably fixed (as, for instance, by the screw 21) to the framework of the instrument. When said bracket 20 is of metal (as it is supposed to be in the present case) one of the terminals, 30, of the usual electric circuit may be connected with the compound electrode through the usual clamp-device, 31.

The two parts 11 and 12 of the compound electrode are made rigidly adherent the one to the other, by means of a thin layer of cement or a weld-surface equivalent thereto, in the line *f*, Fig. 4, so that said compound electrode constitutes a single unitary element of the transmitter, and so that the two portions 11' and 12' of the working-face *e* of said electrode are held in permanent coincidence independently of the device or devices for supporting this electrode in the instrument. In practice the non-electrical portion of the compound electrode may be formed of any substance of relatively low conductivity and also

adapted to have made thereon a smooth and true working-face; and the electrical portion may be formed of any substance of relatively greater electrical conductivity, and adapted to have made thereon the described working-

5 face.
The operative electrode, 19, is carried upon one end of a lever, 13, which is shown supported at the opposite end thereof upon pivots, 13' and 13'', in a bracket, 14, suitably fixed to the framework of the instrument. To this lever, or electrode-carrier, the other terminal, 32, of the electric circuit is shown connected at 23 by means of a binding-screw, 15 after a well-known manner. The pivots 13' and 13'', in the preferred form thereof herein shown, consist of screws adjustable longitudinally thereof in the bracket for the purpose of properly regulating the pivotal connection with the lever, and also for adjusting the lever in the line of its axis to carry the same and the operative electrode 19 toward or from the compound electrode, as may be required. The axis of the pivotal connection 25 or joint here described is arranged vertical to the plane (extended) of the working-faces of the electrodes, so that the vibrational movement of the lever, and of the operative electrode carried thereby, is truly coincident with said plane.

30 According to one feature of my present invention, the co-acting edges of the electrical fields (one of these fields being the surface 11' of the compound electrode, and the other 35 field being the working-face of the operative electrode 19) are made divergent, for the purpose of modifying the ratios of the overlapping electrical surfaces in the successive positions, respectively, of the operative electrode. This will be understood by means of 40 the diagrammatic view, Fig. 4, in which the edge, 19', of the operative electrode 19 is shown formed upon a curved or divergent line crossing the line *f* of the compound electrode (when 45 this is in the position there shown) at an angle thereto; which angle varies, as will be evident from the drawings, with the movement of the operative electrode. The projecting portion or point 19'' of the operative electrode is intended to always extend onto the 50 electrical field 11' of the compound electrode, so as to prevent the sliding action of one electrode upon the other (within the normal working limits of such movement) from entirely 55 interrupting the electrical circuit. At the same time, by modifying the curvature or inclination of said edge-lines *f* and 19', of the two electrodes respectively, the ratio of variation of the overlapping electrical surfaces may 60 be materially modified, within a given limit of movement of the one electrode relatively to the other. In this connection, it should be observed that this feature of my present invention is also applicable to the arrangement 65 of electrodes set forth in my aforesaid prior application; also a curved or inclined electri-

cal-field edge may be made on the compound electrode; in this case, the line *f* of said electrode will, of course, be inclined or curved, instead of being formed straight and located 70 as herein shown.

The mechanically-operative electrode, according to one feature of my present invention, is carried upon the upper end of a spring-arm, 25, which is rigidly supported by one end thereof in the main lever 13 between the opposite arms, 26 and 26', of this lever. Said arms are shown slightly diverging on curved lines from said spring-lever, so as to provide for a slight movement of the spring-lever and 80 the electrode carried thereby, relatively to the upper end of the main lever 13. This is for the purpose of slightly modifying the normal action of the operative electrode, and thereby securing a smoother and more regular operation of the same relatively to the 85 harsher vibrations of the diaphragm; but it should be noted that the carrier 25 may be integral, and made substantially non-elastic, without departing from the principal features 90 of my present invention.

For clearness of illustration, the several working-details of the apparatus herein described are shown somewhat enlarged relatively to the size of the instrument as a whole; 95 but it will be understood that the magnitude of the electrodes relatively to the sensitive-plate and to the general proportions of the instrument, depends, in practice, very much upon the electrical conductivity of the substances of which the electrical portions of the 100 electrodes are formed. It is deemed preferable to make said portions of relatively low conducting power so as to require a considerable amount of overlapping electrical surface 105 for conveying the required amount of current, and so that the vibrational action of the operative electrode need not be restricted within very narrow limits.

It will be understood that by "electrical 110 field" and "non-electrical field" is meant portions of the working-face of the compound electrode of different degrees of electrical conductivity; so that on the movement of the opposite electrode over the line between said 115 fields, the electrical current, when the electrodes are in circuit, will be increased or diminished accordingly as said opposite electrode is moved in one direction or the other. The relatively non-electrical field of the compound electrode is shown of larger area than 120 the electrical field of the opposite electrode, so that neither the total area of surface-contact, nor the area of surface pressure, will be varied by the sliding of one electrode upon the other, even if this action be so great as to 125 carry the electrical field of one electrode entirely off from the electrical field of the opposite electrode.

In some cases the compound electrode when 130 carried upon the frame-work as herein shown, may be adjusted toward and from the oper-

ative non-compound electrode; the described means for adjusting the latter electrode being then omitted.

Having thus described my invention, I claim—

1. In a telephonic transmitter of the class specified, the combination with a plate sensitive to sound-waves, of a pair of electrodes in circuit and one of them having a compound working-face comprising an electrical and non-electrical field, and the other electrode bearing against said working-face and extending onto both of said fields, and an electrode-carrier separate from but in operative connection with the plate and supporting one of the electrodes, and itself supported for vibrational movement only in a plane in coincidence with the plane of said working-face, substantially as described and for the purpose specified.

2. In a telephonic transmitter of the class specified, the combination with a plate sensitive to sound-waves, of an electrode fixed to the framework of the transmitter and having a compound working-face comprising an electrical and non electrical fields, said working-face being located vertical to said plate, an operative electrode bearing upon said compound working-face, and an electrode-carrier carrying the operative electrode and in operative connection with the sensitive plate and supported for swinging movement in the plane of said working-face upon an axis in substantial parallelism with said plate, substantially as described.

3. In a telephonic-transmitter, the combination with the fixed electrode, and with an operative electrode fitted to slide thereon, of an electrode-carrier supported for lateral movement and comprising a principal member and a spring-arm supported thereon and carrying the operative electrode, and means for imparting vibrational movement to the carrier from sound-waves, whereby the normal action of the operative electrode is modified, substantially as described.

4. In a telephonic transmitter, the combination with a sensitive plate and the fixedly-located compound electrode, of the lever and the electrode carried thereby for operative movement only in the plane of its working-face, and means for adjusting the lever on its axial line toward and from the fixed electrode in a direction vertical to the working faces thereof, substantially as described and for the purpose specified.

5. In a telephonic transmitter of the class specified, the combination with a compound electrode having its working-face composed of adjacent electrical and non-electrical fields, of an electrode supported for sliding movement on said working-face and having the edge thereof set on a line divergent from the edge of the electrical field of the compound electrode, substantially as described.

6. In a telephonic transmitter of the class specified, the combination with a compound

electrode having its working-face composed of adjacent electrical and non-electrical fields, of an electrode supported for sliding movement on said working-face and having the edge thereof set on a curved line divergent from the edge of the electrical field of the compound electrode, substantially as described.

7. The herein-described compound electrode for telephonic transmitters, which consists in a relatively-electrical body or member combined with a relatively non-electrical body or member set on one side of and made rigidly adherent to the other, said members having working surfaces in coincident planes and constituting a compound working-face, substantially as described.

8. In a telephonic instrument, the combination with a plate sensitive to sound waves, of an electrode fixed to the framework of the instrument and having a compound working-face comprising electrical and non-electrical fields, said working-face being located vertically to said plate, an operative non-compound electrode bearing on said compound working-face, and an electrode-carrier carrying the operative electrode and in operative connection with the sensitive plate and supported for movement in the plane of said working-face, substantially as described.

9. In a telephonic instrument, the combination with the sensitive plate of the two electrodes, one compound and non-operative and carried on the framework of the instrument, and the other carried by a lever for operative movement only in the plane of its working-face, and means for adjusting one of the electrodes toward and from the other in a direction vertical to the working-faces thereof, substantially as described.

10. In a telephonic instrument, the combination of two electrodes adapted and in position for sliding contact the one upon the other, and one of them having a compound working-face comprising relatively electrical and non-electrical fields, and means for operating one electrode relatively to the other, substantially as described.

11. In a telephonic instrument, the combination with one electrode having its working-face an electrical field, another electrode sliding on the first electrode and having its working-face formed in part of an electrical field and in part of a non-electrical field of larger area than the electrical field of the first electrode, substantially as described.

12. In a telephonic instrument, the combination with one electrode having its working-face an electrical field, of another electrode having its working-face of larger area than and bearing on the face of said first electrode, and divided into relatively electrical and non-electrical fields each extending in part over the working-face of said first electrode, one electrode being supported for sliding movement upon the face of the opposite electrode, substantially as described.

13. In a telephonic transmitter, the combination with a plate sensitive to sound-waves, of a pair of electrodes in circuit, and one of them having a compound working-face comprising an electrical and a non-electrical field, the other electrode bearing against said working-face and extending onto both of said fields, of a vibration multiplier carrying one of the electrodes, in position for vibratory movement in the plane of its electrical face, and operatively connected with the sensitive plate, substantially as described.

10 to move the operative electrode in the plane of its working-face, substantially as described.

14. In a telephonic transmitter, the combination with a plate sensitive to sound-waves and with a pair of electrodes in circuit, and

one of them having a compound working-face 15 comprising an electrical and a non-electrical field, the other electrode bearing against said working-face and extending onto both of said fields, of a vibration multiplier carrying one of the electrodes, in position for vibratory 20 movement in the plane of its electrical face, and operatively connected with the sensitive plate, substantially as described.

FRANCIS H. RICHARDS.

Witnesses:

FRED. J. DOLE,

N. E. C. WHITNEY.