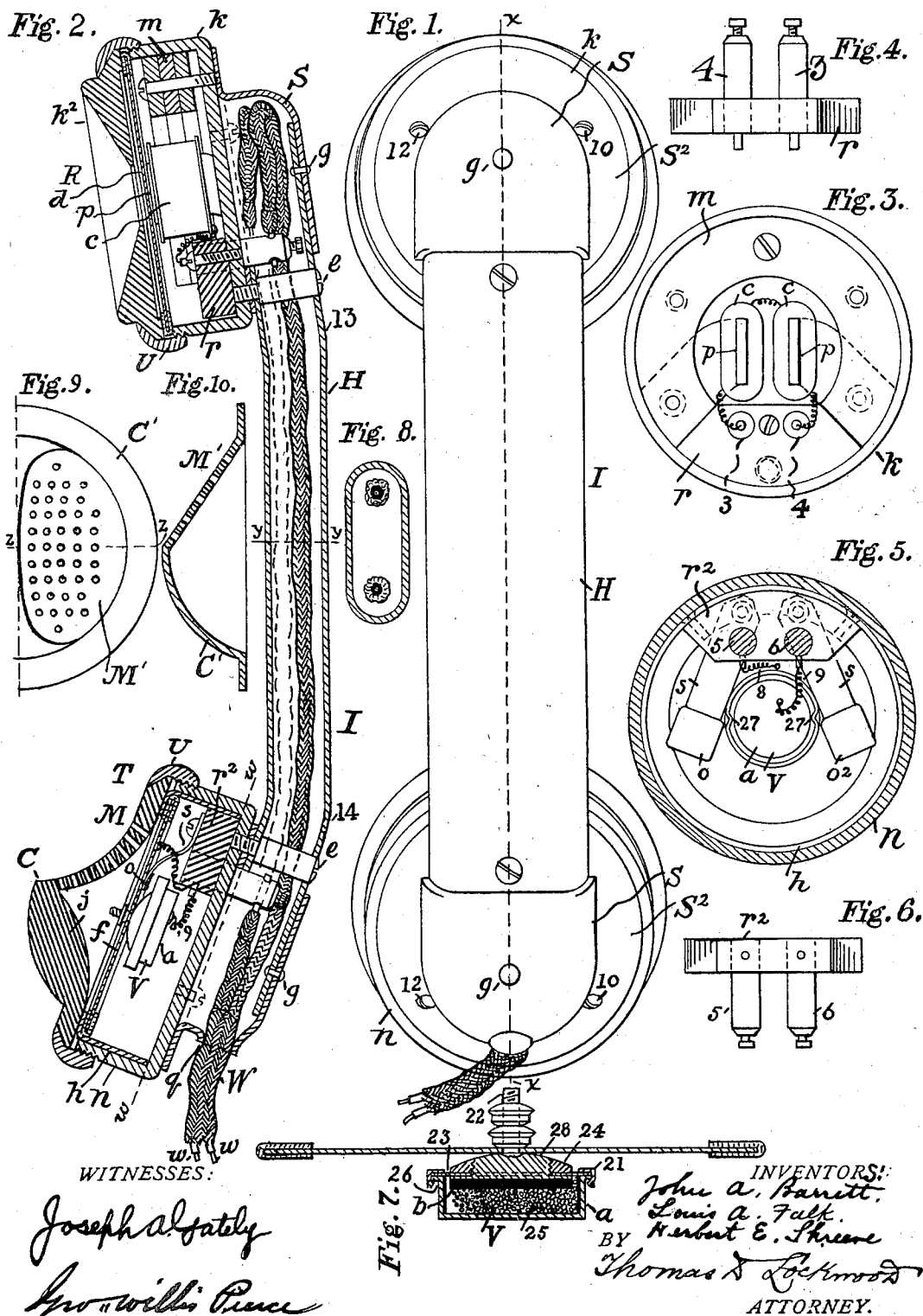


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NO MODEL.



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TELEPHONE.

SPECIFICATION forming part of Letters Patent No. 736,672, dated August 18, 1903.

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To all whom it may concern:

Be it known that we, JOHN A. BARRETT, LOUIS A. FALK, and HERBERT E. SHREEVE, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Telephones, of which the following is a specification.

This invention relates to telephones, and in particular to such as have the transmitter and receiver combined in a single instrument, and are therefore especially adapted for use by linemen, inspectors, or other employees. It is comprehended in a telephone instrument having a handle-bar to be grasped by the hand of the user, to the ends of which the receiver and transmitter are respectively attached in such wise that the former can be held in approximation to the ear and the latter held simultaneously near the mouth of the user.

The object of the invention is to provide a combination instrument which shall be compact, of light weight and high efficiency, and which, though utilizing a granular-carbon transmitter, shall insure that when in use with the mouthpiece and receiver in proper juxtaposition to the lips and ear of the user the granular variable-resistance button shall be held in a position most favorable for successful operation.

By the present invention the great advantages inherent in the use of the granular-carbon transmitter may be obtained without introducing any counterbalancing mechanical defects. Accordingly a prominent feature of the invention consists in certain improvements in the construction of the handle-bar, the transmitter, and the means for attaching one to the other, whereby it is provided with certainty that when the combined instrument is in use the diaphragm and carbon-containing button attached thereto shall be caused to assume a position inclined at a moderate angle from the vertical, such position being adapted to insure the highest operative efficiency of the transmitter, the mouthpiece or passage directing the sound-waves of the voice upon the diaphragm being at the same time brought into an effective position to re-

ceive the said sound-waves substantially opposite to or in front of the lips of the user.

The invention consists also in providing a cap or socket, each of corresponding shape to the one end of the handle-bar, at the back of the transmitter and receiver, in making the handle-bar hollow to contain the connecting-conductors, and in socketing and securing the ends of said handle-bar in the correspondingly-shaped caps or sockets of the said transmitter and receiver, the cap or socket of the transmitter being formed with an orifice for the ingress of such circuit-conductors as are required. The caps or sockets are preferably removably secured to the transmitter and receiver.

It consists also in certain details relating to the construction, adjustment, and mounting of the transmitter, as will be fully described herein and pointed out in the claims formulated at the end of this specification.

In the drawings which accompany this specification, Figure 1 is a rear view of the combination-telephone, the transmitter being at the lower end. Fig. 2 is a longitudinal section on the line *x x* of Fig. 1; Fig. 3, a view of the receiver with cap-piece and diaphragm removed; Fig. 4, an edge view of the terminal-supporting insulating-block of Fig. 3. Fig. 5 is a section on line *w w* of Fig. 2 and affords a view of the interior of the transmitter looking toward the diaphragm. Fig. 6 is an edge view of the terminal-supporting insulation-block of Fig. 5; Fig. 7, an enlarged sectional view of the variable-resistance button and diaphragm; Fig. 8, a section on line *y y* of Fig. 2. Fig. 9 is a half plan view of a modified form of the transmitter cap-piece, and Fig. 10 a section on the line *z z* of Fig. 9.

I represents the combination-telephone as a whole; H, the handle-bar thereof; T, the transmitter, and R the receiver, said transmitter and receiver being mounted on the two ends, respectively, of said handle-bar. The receiver is of the ordinary "watchcase" type and consists of a suitable containing shell or casing *k* in the form of a short rearwardly-closed cylinder provided, as usual, with the earpiece or cap *k'*, a curved compound

permanent magnet *m*, reverting at its poles to the center of the case and having pole-pieces *p* projecting toward the earpieces, inducing-coils *c*, encircling said pole-pieces, and the diaphragm *d*. A rubber block *r* is fastened within the case between the ends of the magnet, and upon it are mounted the receiver-circuit terminals 3 and 4, the coils *c* being electrically connected between said terminals.

The transmitter *T* has three essential or characteristic parts—viz., the vibratory diaphragm *f*, the variable resistance *V*, and the peculiarly-formed cap-piece *C*, the two former being inclosed within the short cylindrical containing-case *n*.

The handle-bar *H* is tubular or hollow throughout, and its form in cross-section is that of a flat oblong with rounded corners, as shown in Fig. 8. Similarly-shaped open-ended sockets *S*, of sheet metal or like material, are attached to the backs of the transmitter and receiver, respectively, by means of screws 10 12, which pass through the circular flanges *S*² of said chambers, and the terminals of the receiver and transmitter are thus inclosed within their respective chambers or sockets. The ends of the handle-bar project through the open end of and are socketed within the transmitter and receiver caps, respectively, the sockets being made slightly larger than the said ends of the bar for this purpose, and are secured in place by the rivet *g*, which unites the handle-bar and cap, and the screws *e*, which pass through the tubular bar from side to side and also through the flange *S*² and into the substance of the instrument-casing. The front wall of the tubular handle-bar is at both ends cut away, as shown, or, in other words, the front wall of said tubular handle-bar is merely long enough to enter the cap-chamber, while the back wall of said bar extends well thereinto. One of the caps *S* (preferably that of the transmitter) has at its inner end an aperture *q*, through which the circuit-conductors *ww*, usually made up in a flexible cord *W*, pass to make connection with the circuit-terminals, these being inclosed in the said caps, the said conductors extending through the hollow handle-bar to the terminals of the receiver and between the terminals of the transmitter and receiver. By this construction the connections are entirely within the caps *S* and the tubular handle, and the handle and exposed metal parts of the combined instrument are not at any point in contact or liable to come into contact with unprotected portions of the circuit-conductors.

The handle-bar *H*, as best shown by Fig. 2, is bent or otherwise formed or turned forwardly near its receiver and transmitter ends, respectively, as at any points 13 and 14, into lesser and greater angles, the said transmitter and receiver being thus turned toward one another, so that when the complete in-

strument is assembled there shall be an angle between them of about one hundred and fifty degrees. This disposition, as clearly shown in the figure, places the transmitter when in use in a suitable position well adapted for the favorable and highly-efficient action of the variable-resistance button. If, however, any ordinary cap-piece and mouth-piece were employed, the diaphragm, though well placed for the operation of the variable resistance, would not be suitably placed to receive the direct impact of the voice of the user. A new form of cap and mouth piece has therefore been devised, the same being adapted to coöperate with the obliquely-placed diaphragm and button in bringing about the most satisfactory operative results. One form of cap and mouth piece which has been operated and found to produce these results is shown in Fig. 2 as being associated with the transmitter *T*. This form of cap-piece *C* has an approximately semiglobular or hemispherical contour externally and is made as a metal casting having on one side a reëntering or concave curved portion *M*, constituting a mouthpiece. This may, if desired, have a single moderately-large air-passage through its substance, through which the sound-waves of the voice may be directed upon the diaphragm; but preferably a number of small perforations are made to serve as sound-channels for this purpose. In cap-pieces of this specific form the inner wall of the casting opposite the inner convex surface of the reëntering curve is thickened, as shown at *j*, so as to provide a nearly symmetrical vocalizing-chamber in front of the diaphragm.

Figs. 9 and 10 represent an alternative form of cap-piece *C'*, which while substantially similar in principle, operative efficiency, and cost is in some respects to be preferred as being more convenient in manufacture. This form is or may be pressed or struck up from sheet metal, the mouthpiece portion *M'* being made with a plane surface, which is substituted for the reëntering curve, and the walls being of uniform thickness throughout. This form may have an air-passage or a plurality of passages through its plane surface to constitute a mouthpiece, exactly in the same way as in the form first described they are made through the reëntering curved surface. By employing a cap-piece having the characteristics of these forms in combination with the peculiar handle-bar shown and described and the granular-carbon transmitter mounted on said bar in such manner that the diaphragm and variable-resistance button occupy a position well adapted for efficient operation it will be observed that though such position of the working parts of the transmitter tends to turn the face of the diaphragm away from the lips of the speaker or into a position oblique thereto this is compensated for by the provision of a mouth-piece reversely oblique to the diaphragm.

By this means the best operative results are secured without introducing any material counterbalancing disadvantage. The cap-pieces of the transmitter and receiver are secured by means of the clamping-ring nuts U.

Referring now to the specific construction of the transmitter, it will be seen that a thin shell *h* fits freely within the containing-case *n*, the same being open toward the back of said case and flanged at its front edge to serve as a seat for the diaphragm, which is held in such seat by spring-pressure, its edge being, moreover, insulated and cushioned by an overlapping soft-rubber ring in the usual manner. A rubber block *r*² is secured to one side of the interior of the shell and forms a support for the screw-terminals 5 and 6, and two springs *s*, likewise secured to said block, extend into contact with the rear face of the diaphragm, supplying the spring-pressure required to hold the said diaphragm in place and also acting to dampen the same as far as may be necessary or desirable, these springs being provided with cushions or pads *o o*³ at their ends, which press upon the diaphragm.

The variable resistance V comprises a hollow button containing front and rear electrodes separated at their edge conductively by the insulating side wall of the button and granular carbon constituting the variable-resistance medium placed between said electrodes. The button is supported solely by the diaphragm, being centrally secured thereto by means of a screw-stud 22, attached to the front electrode *b*, which is, by preference, a carbon disk. The chamber *a*, which contains the granular carbon 25, is of thin sheet metal, such as brass, pressed into the form shown. The inner surface of the said chamber, gold-plated to prevent the deposition of oxid or other non-conducting film, serves as the back electrode, and the front electrode is carried, as usual, by the elastic disk of mica 23, perforated to slip over the boss 28 of the stud 22 and secured in place by the threaded ring 24. The mica disk, which in addition to its usual function of furnishing a spring-support for the front electrode, is required to sustain the entire weight of the granular carbon, and the chamber containing the same extends radially beyond the edges of the threaded ring and carbon electrode, and its edge rests upon the flange 26 of said containing-chamber, being secured thereto by a clamping-ring 21 at two points only, these being placed at diametrically opposite positions. By thus securing the clamping-ring and mica disk at two points only the expansion of the metal and mica under heat developed by the working current is enabled to take place without any buckling or permanent displacement of the mica disk. A convenient plan for thus fastening the mica disk between the flange on which it rests and the clamping-ring is to pinch in the said ring, which is made of thin metal, on the under

side of the flange at the two points 27, as shown in Fig. 5.

The front and rear electrodes have circuit connections 8 and 9, respectively, with the terminals 5 and 6, and thereby with the circuit-conductors W.

The invention having been fully described is thus claimed:

1. A portable combination-telephone comprising a hollow handle-bar; a transmitter and a receiver of watchcase form mounted upon the two ends respectively of said handle-bar, and each having a cap at its rear face inclosing its terminals and of corresponding shape to the ends of the handle-bar which are socketed and secured therein, the cap on the transmitter being provided with an aperture for the ingress of circuit-conductors which pass through the handle-bar to and between the inclosed terminals of the transmitter and receiver.

2. In a compound telephone, the combination with a handle-bar; of a receiver secured to one end thereof; and a transmitter secured to the other end of said handle-bar provided with a cap-piece having a perforated and a non-perforated side the former disposed at an angle to the diaphragm and inclined toward and facing the receiver.

3. In a compound telephone, the combination with a handle-bar rigid throughout its length; of a receiver secured to one end thereof; and a transmitter secured to the other end of said handle-bar provided with a cap-piece having a perforated and a non-perforated side the former disposed at an angle to the diaphragm and inclined toward and facing the receiver; the said handle-bar having its receiver and transmitter ends turned respectively into lesser and greater angles toward one another.

4. In a compound telephone, the combination with the handle-bar; and a magneto receiver mounted thereon and secured to one end thereof; of a granular-carbon transmitter secured to the other end of said handle-bar and provided with a substantially hemispherical cap-piece having a non-convex side disposed at an angle to the diaphragm and inclined toward and facing the receiver and perforated for the ingress of the sound-waves of the voice; the said handle-bar having its receiver and transmitter ends turned respectively into lesser and greater angles toward one another, in such manner that when the receiver is placed at the ear, and the air-passages of the transmitter in front of the lips, of the user, the carbon-containing button or cell shall be in efficient operative position; substantially as described.

5. In a compound portable telephone, the combination with the handle-bar; and a magneto receiver mounted thereon and secured to one end thereof; of a granular-carbon transmitter secured to the other end of said handle-bar; and provided with a cap-piece of generally hemispherical shape but formed on the

side toward the receiver with a plane surface sloping from the apex to the edge of the base of said cap-piece, and having a channel or channels through it to serve as a mouthpiece; 5 the said handle-bar having its receiver and transmitter ends turned toward one another at greater and lesser angles respectively; whereby when the receiver is placed at the ear, and the transmitter opposite the lips of 10 the user, the carbon-containing transmitter-button shall be held at an appropriate angle or position for efficient transmission; substantially as set forth.

6. A granular-carbon telephone-transmitter 15 for a portable combined transmitting and receiving telephone, comprising a watch-shaped case; a diaphragm held by spring-pressure in a ring-seat at the front of said case; a hollow button containing granular variable-resistance 20 material supported wholly by and at the center of said diaphragm, the said button having a light metallic casing closed forwardly by a mica disk or annulus clamped thereto, and provided with a front electrode carried 25 by said mica disk, and a back electrode constituted of the inner surface of the said metallic casing; and a cover or cap-piece of substantially hemispherical shape, one side thereof being formed with a non-convex surface 30 from apex to edge at an angle to the diaphragm, and perforated with sound-channels to serve as a mouthpiece; substantially as described.

7. In a granular-carbon transmitter for a 35 portable combined transmitting and receiving telephone instrument, the combination of a watch-shaped containing-case, a cap-piece therefor of substantially hemispherical external form, with a channeled non-convex surface on one side sloping from apex to edge to 40 to serve as a mouthpiece; an internal shell fitting within said containing-case and flanged at its forward edge to constitute a diaphragm-seat; a vibratory diaphragm held in such seat 45 by spring-pressure; and a hollow variable-resistance button supported wholly by and at the center of said diaphragm and comprising a light metallic flanged chamber with a non-conducting internal side wall, and conducting 50 rear surface constituting the back electrode,

a mica disk closing said chamber forwardly centrally attached to the diaphragm-center and extending peripherally over the flange of said metallic chamber, a clamping-ring for the edge of said mica disk secured to said 55 flange at two opposite points only, a front electrode carried by said mica disk, and granular carbon between said electrodes; substantially as set forth.

8. In a granular-carbon transmitter, the 60 combination with the vibratory diaphragm; of a variable-resistance button carried wholly thereby and participating in the vibrations thereof, the same comprising a light metallic flanged chamber with conducting rear wall 65 serving as the back electrode, and non-conducting interior side wall, a mica disk or annulus resting on the flange of said chamber and closing the said chamber forwardly, a front electrode carried by said mica disk with- 70 in said chamber, a clamping-ring for the edge of said mica disk, pinched under said flange at two opposite points only, and granular carbon inclosed in said chamber between said electrodes; substantially as set forth. 75

9. In a granular-carbon transmitter adapted for use in association with a combined telephone instrument comprising a transmitter and receiver mounted respectively at opposite 80 ends of a handle-bar; the combination with the transmitter-casing in the form of a watchcase or short cylinder; a diaphragm closing the said casing forwardly; and a granular variable-resistance button carried by said diaphragm within said casing; of a cap- 85 piece for said casing of substantially hemispherical contour, but with one side formed from apex to edge into a non-convex surface, having a sound-passage therethrough to serve as a mouthpiece; substantially as described. 90

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 26th day of November, 1902.

JOHN A. BARRETT.
LOUIS A. FALK.
HERBERT E. SHREEVE.

Witnesses:

GEO. WILLIS PIERCE,
FRANK C. LOCKWOOD.