

(No Model.)

A. G. SAFFORD.
ELECTRIC TELEPHONY.

No. 366,190.

Patented July 5, 1887.

FIG. 1.

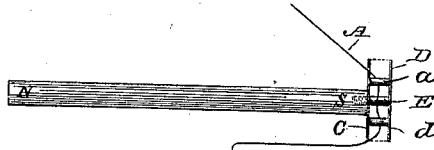


FIG. 2.

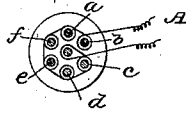


FIG. 3.

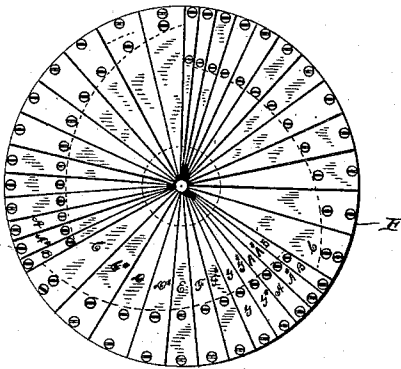
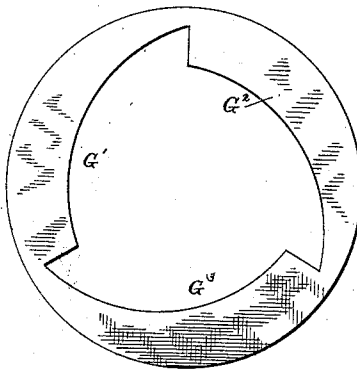


FIG. 4.



Witnesses -

L. G. Corbett Jr.
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UNITED STATES PATENT OFFICE.

ALFRED G. SAFFORD, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR
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ELECTRIC TELEPHONY.

SPECIFICATION forming part of Letters Patent No. 366,190, dated July 5, 1887.

Application filed January 15, 1887. Serial No. 231,462. (No model.)

To all whom it may concern:

Be it known that I, ALFRED G. SAFFORD, a citizen of the United States, residing at Washington, in the District of Columbia, have invented certain new and useful Improvements in Electric Telephony, of which the following is a specification.

My invention relates to reed electric telephones; and the objects of my improvements are to provide a more thorough demagnetization of the induction-head of the combined permanent magnet or cores of the electro-magnet, and also to provide a resonant sensitive series of tuned reeds for the reception of the electro-motive force of the magnets as varied by the energy transmitted from the distant station.

In the drawings, Figure 1 is a longitudinal cross-section of the magnet. Fig. 2 is a transverse cross-section of the soft-iron induction-head. Fig. 3 is a front view of the tuned reeds. Fig. 4 represents the frame to which the reeds are attached and by the peculiar form of which the several reeds are tuned.

I am aware that magnets having soft-iron induction-heads and a series of cores surrounded by coils of insulated wire have long been used both for telephonic and other purposes. The same have not, however, been used in combination with attuned reeds, and I make no claim except for such combination.

I am also aware that reeds, as distinguished from a solid plate, have been used in the construction of speaking apparatus; but my invention provides for the attuning of said reeds through an entire octave and covering at least one reed for each semitone of the diatonic musical scale.

I am also aware that tuned reeds have been suggested for this purpose; but the limitation and qualification of the suggestion was, that all the reeds in the same instrument should be attuned to the same pitch—that is to say, that each reed should have in the same instrument the same natural rate of vibration. My invention proceeds upon the contrary theory, and depends for its usefulness upon the fact that the free vibratory reeds are to be attuned to different rates of vibration. The number of said reeds may be increased indefinitely and through one or more octaves.

In Fig. 1, N S is a permanent magnet. A represents the wire from one or more distant stations under electric control. B represents the spool containing the insulated circumvolved wire. The faces C and D of the spool B are of soft iron or other metal capable of inductive action.

In Fig. 2 the magnet is not presented, nor the face D of the spool B; but the soft-iron cores *a, b, c, d, e, and f* are shown, together with the soft-iron screw-plug E, which holds the spool firmly and in its entirety against the magnet N S. The wire A is wound successively around the cores and screw-plug until sufficient resistance is attained. But one convolution is shown in the drawings. The two faces of the spool B and the connecting-cores are magnetized by induction from the magnet N S. The electro-motive force of the soft-iron induction-head remains constant until a change takes place in the electrical condition of the wire A, when it is increased or diminished, according as the electrical impulses in the wire A coincide with or are opposite to the character of the induced magnetism. If that induced magnetism be positive and the electrical impulse be positive, then the electro-motive force is increased. If it be negative, the electro-motive force is decreased, and the increment and decrement of the force is measured relatively by the strength and pulsation of the transmitted electrical energy. If that energy be a continuous varied one, the same variations are developed in the electro-motive force.

Fig. 3 shows the attuned reeds which are set up on the frame F immediately in front of the magnet and circumvolved insulated wire, (shown in Figs. 1 and 2;) and said reeds being made of material capable of inductive action, the variations in the electro-motive force of the soft-iron induction-head are communicated to said reeds. Said reeds are free and vibratory, so fashioned as to present nearly a continuous surface to the action of the charges in the electro-motive force of the spool B. Said reeds are so constructed and attached to the frame F that they have different natural rates of vibration, or more than one may be tuned to the same rate of vibration; but altogether they present at least one reed for each semitone of

an entire octave of the diatonic musical scale. The frame F has flanges G G' G², which facilitate the tuning of the reeds by shortening the vibrating end. As thus constructed, said
 5 reeds respond very readily to all sounds or to all electrical impulses having the same rate of pulsation as the rate of vibration, which determines the pitch of sounds, acting upon the familiar principle of co-vibration or sympathetic vibration, besides producing those over-
 10 tones which give the characteristic quality or *timbre*, which marks the difference between those sounds having the same pitch and the same force.

15 In the construction of my improved instrument, I prefer to arrange the reeds upon a circular frame with the free ends pointing toward the center and with three scales of twelve semitones each, each scale commencing with the
 20 the same fundamental tone. This method brings all the reeds within the field of the electro-motive force and brings three reeds having the same natural rate of vibration and representing each semitone at equal distances apart.

25 When the electro-motive force is varied in the soft iron of the spool B, all the reeds attached to the frame F are thrown into corresponding vibration; but with every vibration some of the reeds respond more readily than others, by
 30 reason of the principle of co-vibration, and become sonorous if the impulses correspond to the normal pitch or natural rate of vibration of said reeds or any multiple thereof. Some of the reeds vibrate to any and all sounds in
 35 this manner and reproduce the sound transmitted. They are re-enforced by the vibration of all the other reeds, and the sound thus produced may be carried to the ear by any kind of defective apparatus which shall convey the
 40 sound-waves to a common point; and by this means sounds which have been used at a dis-

tant station to produce variations in an electrical current, whether the same be musical or complicated, such as articulate speech, are
 45 by means of the wire A, the spool B, the magnet N S, and the attuned reeds reproduced and rendered audible at the receiving station, with all their characteristics of relative pitch, intensity, and quality.

I expressly acknowledge the fact that prior
 50 to my invention sounds were transmitted by electrical devices; but

What I claim as my invention, and desire to secure by Letters Patent, is—

1. An inductive spool, B, having several
 55 cores of soft-iron or other inductive material connecting its faces, around which the insulated wire is successively wound, in combination with a series of attuned reeds, substantially as set forth.

2. In a telephone, a series of free vibratory
 60 reeds attuned to different rates of vibration and brought within the field of the actuating electro-motive force, for the purpose of making the variations of such force appreciable as
 65 audible sounds.

3. In a telephone where the electro-motive
 70 force is received upon free vibratory attuned reeds, the combination of said reeds with the frame F, having the flanges G G' G², for the purpose of attuning the said reeds to different rates of vibration, substantially as set forth.

4. The combination of a magnet in tele-
 75 phones with a series of reeds attuned to different rates of vibration and capable of inductive action, for the purpose of transmitting and reproducing vocal or other sounds, substantially as set forth.

ALFRED G. SAFFORD.

Witnesses:

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 L. A. CONNER, Jr.