J. J. McTIGHE.

Telephone or Speaking-Telegraph.

No. 197,387. Patented Nov. 20, 1877.

Fig. 1

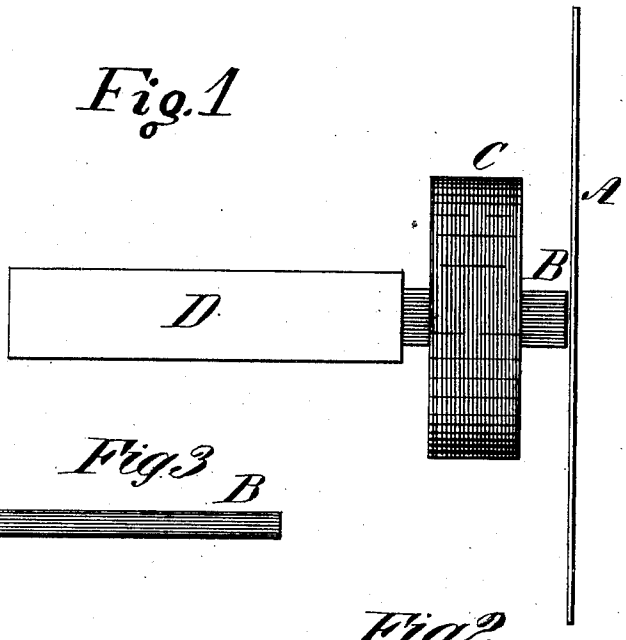


Fig. 3

Fig. 2

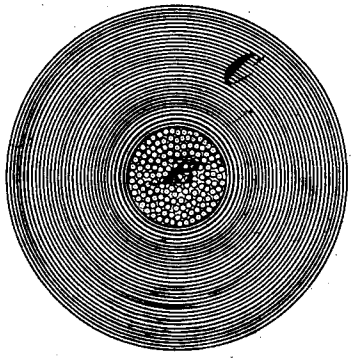
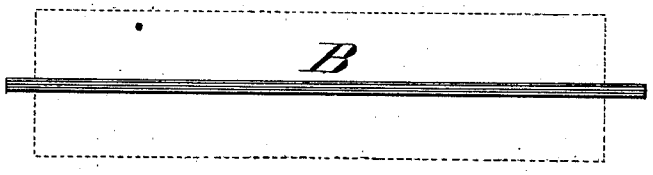


Fig. 4



Witnesses

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UNITED STATES PATENT OFFICE.

JAMES J. McTIGHE, OF ALPSVILLE, PENNSYLVANIA.

IMPROVEMENT IN TELEPHONES OR SPEAKING-TELEGRAPHS.

Specification forming part of Letters Patent No. **197,387**, dated November 20, 1877; application filed September 12, 1877.

To all whom it may concern:

Be it known that I, JAMES J. McTIGHE, of Alpsville, in the county of Allegheny and State of Pennsylvania, have invented a certain new and useful Improvement in Telephones; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawing, which forms part of this specification, in which—

Figure 1 shows the operative devices of a telephone with my improvements. Fig. 2 is an end view of my telephonic electro-magnet. Figs. 3 and 4 show how the core of wires or pieces may be elongated without increasing the mass.

My invention relates to the improvement of the electro-magnets of telephones; and has for its object the production of an instrument which will transmit articulate sounds to any distance, as well as the obtaining of hereinafter-specified qualities. It is a well-known and accepted law that the speed with which the core of an electro-magnet magnetizes and demagnetizes, or loses and regains its magnetism, depends upon the mass of the core. If the mass be great the speed is slow, and if the mass be small the speed is more rapid. Now, in the electro-magnets heretofore constructed for telephones it has been found that only very small and short iron cores would lose and regain their magnetism with a rapidity sufficient to clearly transmit articulate sounds. Such telephonic electro-magnet cores have always been made solid—*i. e.*, in one piece.

From this limitation in the size of the core arises a limit to the usefulness of the telephone, clearly developed in the following inconveniences:

First, the sounds produced are scarcely audible even at a short distance, and entirely inaudible at a long distance, because the necessarily small electro-magnet is too weak to vibrate an armature large enough and thick enough to produce large amplitude of sound waves; also, because the current produced in the wire around the core is too feeble to travel any great distance or to attract a thick vibrating armature at the receiving-station.

Second, conversely of the above, in order to transmit the voice at all, articulation must be firm, clear, and loud, and hence secrecy and privacy are to a great extent impossible.

Third, the vibrating armature at each end of the line, being necessarily so thin, is readily affected by the earth's magnetism, thus producing a constant hissing sound, which very materially detracts from the proper transmission of the sound-waves from the vibrating armature to the tympanum of the observer, and hence renders the instrument defective.

Now, all these troubles are caused by the supposed necessity of using a small core. That necessity was actual under the circumstances—namely, having a solid core. I propose to solve all the foregoing difficulties by my invention, which consists in constructing the telephonic electro-magnet core, instead of in one solid piece, in two or more separate pieces, held together in any suitable manner, and surrounding these with the coil. In this manner I can use a duplex, triplex, or multiplex core, which, according to the laws of electro-magnetism or magneto-electricity, loses and regains its magnetism in the same time and with the same rapidity in and with which each of its constituent parts does. Consequently, while there is no practical limit to the sizes of core which can be used, their periods of magnetization and demagnetization will remain the same, notwithstanding the increase in size. If, now, I diminish the size of the constituent parts of the core, I diminish the time of acquiring and losing magnetism, which gives me facility for transmitting and receiving the most delicate shades of articulation. Further, I can lengthen the component parts of the core, and make them thinner, thus preserving the same mass, and consequently the same period, of magnetization and demagnetization; hence, I can give the electro-magnet any degree of power attainable without destroying the telephonic character of the apparatus.

From these combined qualities, the following chief advantages are derived: I can, by increasing the size of the electro-magnet, increase its attractive power, and lessen, or at least not increase, the time required in losing and regaining its magnetism; consequently, I can increase the size and thickness of the vi-

brating armature, both, indeed, *ad libitum*. The result of this quality is that I can obtain a louder and better articulation at the receiving-station, or, by leaving the armature unchanged, effect a vastly higher degree of sensitiveness, so that even whispers may be reproduced on a long circuit. By making the vibrating armature very large and thick, any sound which will vibrate it at the sending-station will be reproduced at the receiving-station. Being able, then, to construct and use a large and powerful electro-magnet and a corresponding armature, I hold that the armature can be made of such dimensions that it will be ordinarily unaffected by the earth's magnetism, and produce sounds distinct enough to be clearly heard at a distance from the instrument, thus dispensing with the present signaling-instrument, required to call attention. With the increase in size and power of the electro-magnet, it is possible to use a much more powerful magnet, and so to produce a current which will travel any distance.

Having the multiplex core to construct, it is obvious that it may be accomplished in many ways. It may consist of a bundle of wires or rods, or a box of iron-filings, or of iron finely comminuted, or a series of disks, or a nest of cylinders—in short, of any arrangement of two or more pieces of metal capable of inductive action, and so placed as to receive the coil necessary to constitute the electro-magnet.

In the drawings, A is the vibrating armature; B, the core of the electro-magnet; C, its coil; and D, the magnet.

I claim as my invention—

In a telephone, the combination, with the vibrating armature and magnet, of an electro-magnet whose core consists of two or more separate pieces, substantially as described.

In testimony that I claim the foregoing I have hereunto set my hand this 10th day of September, 1877.

JAMES J. McTIGHE.

Witnesses:
THOS. J. McTIGHE,
G. J. LIGHTENHELD.