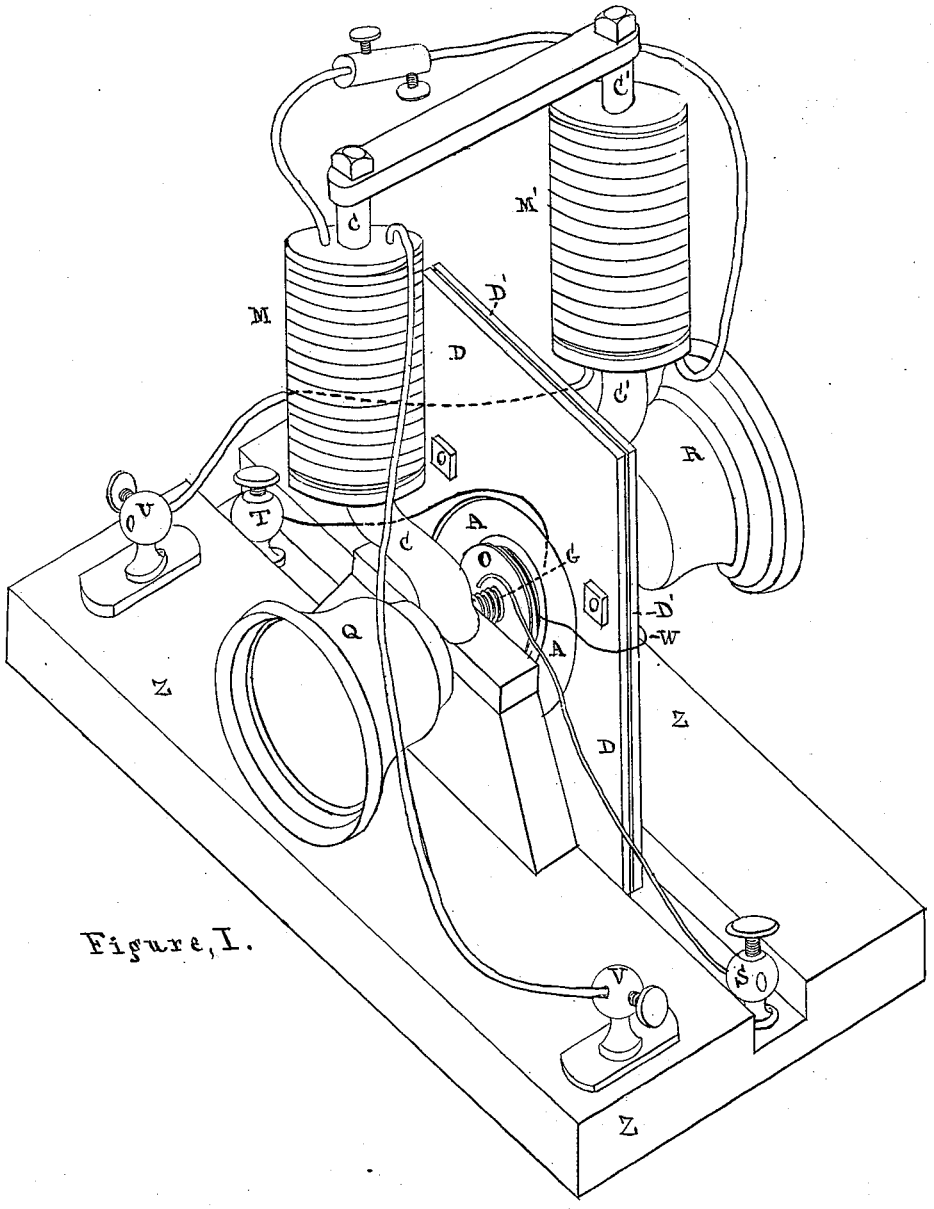
2 Sheets—Sheet 1.

J. TROWBRIDGE.

Telephone.

No. 200,631. Patented Feb. 26, 1878.



Figure, I.

Witnesses:
John M. Batchelder.
Isabel Batchelder.

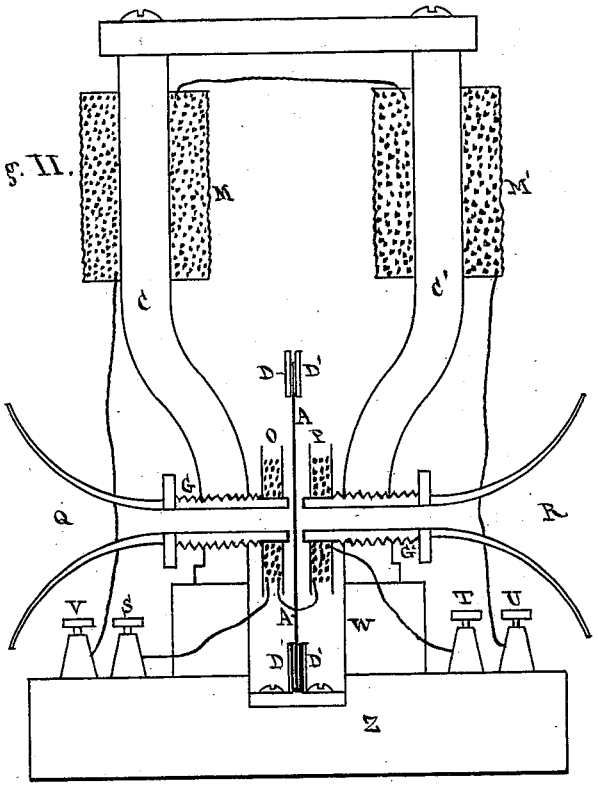
Inventor
John Trowbridge
by John M. Batchelder, Atty.

J. TROWBRIDGE.

Telephone.

No. 200,631. Patented Feb. 26, 1878.

Fig. II.



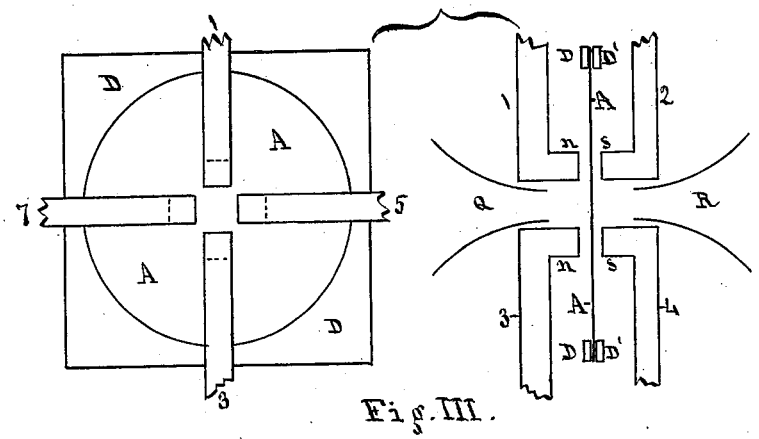


Fig. III.

Witnesses:
In presence of
John M. Batchelder.
Isabel Batchelder.

Inventor
John Trowbridge
by John M. Batchelder, Att'y.

UNITED STATES PATENT OFFICE.

JOHN TROWBRIDGE, OF CAMBRIDGE, MASSACHUSETTS.

IMPROVEMENT IN TELEPHONES.

Specification forming part of Letters Patent No. **200,631**, dated February 26, 1878; application filed December 5, 1877.

To all whom it may concern:

Be it known that I, JOHN TROWBRIDGE, of Cambridge, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Telephones, which improvement is fully set forth in the following specification.

Figure I is a perspective view of the instrument. Fig. II is a vertical section through the core, the coils, the pole-pieces, and the mouth-pieces; Fig. III, relative position of magnets and plate when more than one magnet is used.

The main feature of my improvements in telephones consists in placing a vibrating plate or tympanum in a magnetic field, which can be of any required intensity, and so situated with reference to the permanent magnets and their respective induction-coils as to insure the greatest freedom of vibration and movement of the vibrating plate.

Permanent magnets and coils are placed on opposite sides of the single vibrating plate, the fine wire of the coils being connected by a wire, W, thus causing the electric action to be simultaneous in each of the coils, and producing the same effect upon both sides of the iron or steel vibrating plate. This central vibrating plate, of suitable thickness and elasticity, is thus balanced between two or more magnetic centers, and is not clamped or held to the face of the magnet, and thus prevented from vibrating freely, which is the case in the form of telephones now in use, whenever too strong an electro-magnet or permanent magnet is used for the induction of electric action in the coils of fine wire.

Although invisible to the eye, is is evident that when the whole force of the magnet is applied upon one side only of the plate it assumes a slight curvature, the convex side being nearest to the magnet, thus preventing the free vibration of the plate. In my central plate no curvature takes place, and it is free to respond to the slightest vibration in the strength of the force exerted, either by permanent or by electro magnets.

The letters and numbers indicate the same parts in all of the figures.

Fig. I is on Sheet A, and Figs. II and III on Sheet B.

The instrument is supported upon a suitable base, Z. The plate is shown at A; the electro-magnet at M M′; the induction-coils at O and P; the speaking-tubes at Q and R; the cores of the magnet at C and C′; the tubular pole-pieces at G and G′.

The plate-holders D and D′ are fastened to the base Z, and secure the thin plate A in an upright and fixed position, the center of the plate being opposite the pole-pieces G G′. These pieces, which are made of iron or steel, are short tubes having a thread cut upon the outside, their outer ends being soldered to the speaking-tubes Q and R, while each of the inner ends holds the coils or bobbins of fine wire O and P at opposite sides of the plate A.

The cores C C′ of the magnet M M′ are enlarged near the base. A hole is drilled through each, which is tapped to receive the thread of the tubular pole-pieces.

A few inches of the fine wire is detached from the coils O and P and left slack, thus allowing the pole-pieces to be adjusted to any required distance from the vibrating plate, either by suitable sliding apparatus and guides or by turning the attached mouth-pieces Q and R.

The sounds or articulate words that enter either of the speaking-tubes Q or R cause the vibration of the plate A, which is contiguous to the poles of the electro-magnet M C or the permanent magnet C and its attached induction-coils O and P.

The bobbins of fine wire are connected with the main line by means of the binding-cups S and T. U and V are the binding-cups, connecting the battery with the electro-magnet M M′ in case an electro-magnet is used. If the permanent magnet and its attached induction-coils are used, the cups U and V may be dispensed with.

When greater force is required than can be obtained by the use of a single magnet, two or more may be used upon each side of the central plate, as represented in Fig. III, the position of the magnets being such as will allow the poles to be opposite to each other, and very nearly in contact with the vibrating plate on either side.

The poles *n* and *s* of the upper magnets 1 and 2 are turned in toward the plate. Below

them are the speaking-tubes Q and R, and just below these the magnets 3 and 4, having their poles *n* and *s* also turned inward and on opposite sides of the plate A.

When used in this manner the tubular pole-pieces are dispensed with. The sound enters at the mouth-pieces Q or R, and strikes at or near the center of the plate, in close proximity to the grouped terminals of the series of magnets 1 3 5 7 or 2 4, &c., on the opposite side of the plate.

By the use of the central plate with the series of magnets and coils on both sides thereof, full and forcible vibration is insured, while the double mouth-pieces convey to the plate or diffuse in the air a greater volume of sound.

I prefer to place dissimilar poles opposite to each other, as *n s*; but there will be no great difference in the vibration of the plate if like poles, as *n n* or *s s*, are thus placed.

I do not claim as of my invention an inductive vibrating plate or tympanum, the same being fully described in Letters Patent granted to A. G. Bell; neither do I claim the use of electro-magnets or permanent magnets and their respective coils in connection with the same.

What I claim is—

1. A central plate or tympanum capable of vibration, having near its center and upon each of its sides the terminals of one or more electro-magnets, or of one or more permanent magnets, and their respective coils, by which an intermittent current of electricity is generated, as herein described.

2. The adjustable tubular pole-pieces G G′, serving the double purpose of magnets and of passages for the sound-waves to the central vibrating plates, as herein described.

3. The vibrating plate, having one or more permanent magnets or electro-magnets on opposite sides thereof, in combination with the tubular pole-pieces, the mouth-pieces, and the conducting wire or wires, leading to similar instruments at distant stations, as herein described.

JOHN TROWBRIDGE. [L. S.]

In presence of—
JOHN M. BATCHELDER,
ISABEL BATCHELDER.