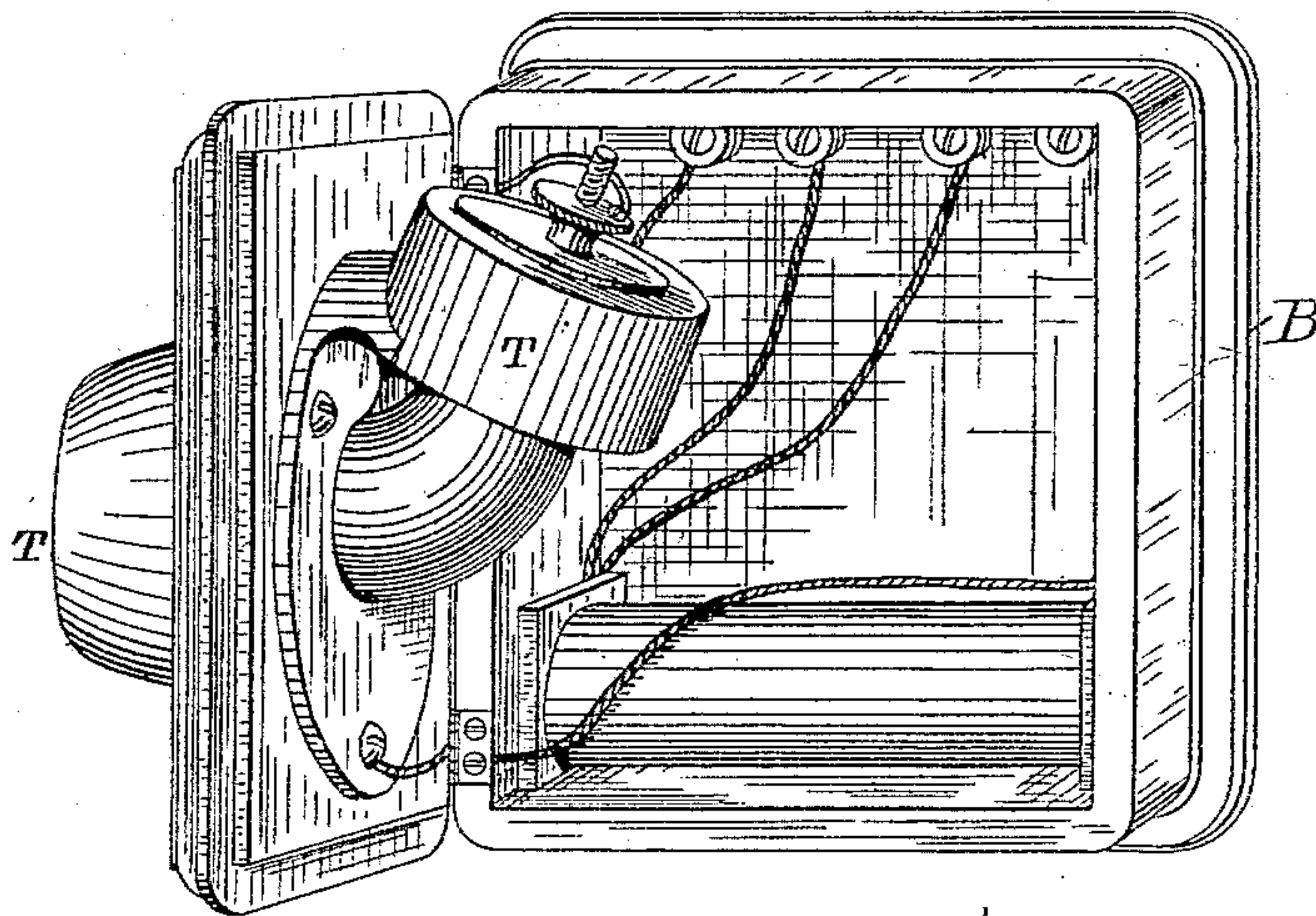


(No Model.)

H. S. THORNBERRY.  
TELEPHONE TRANSMITTER.

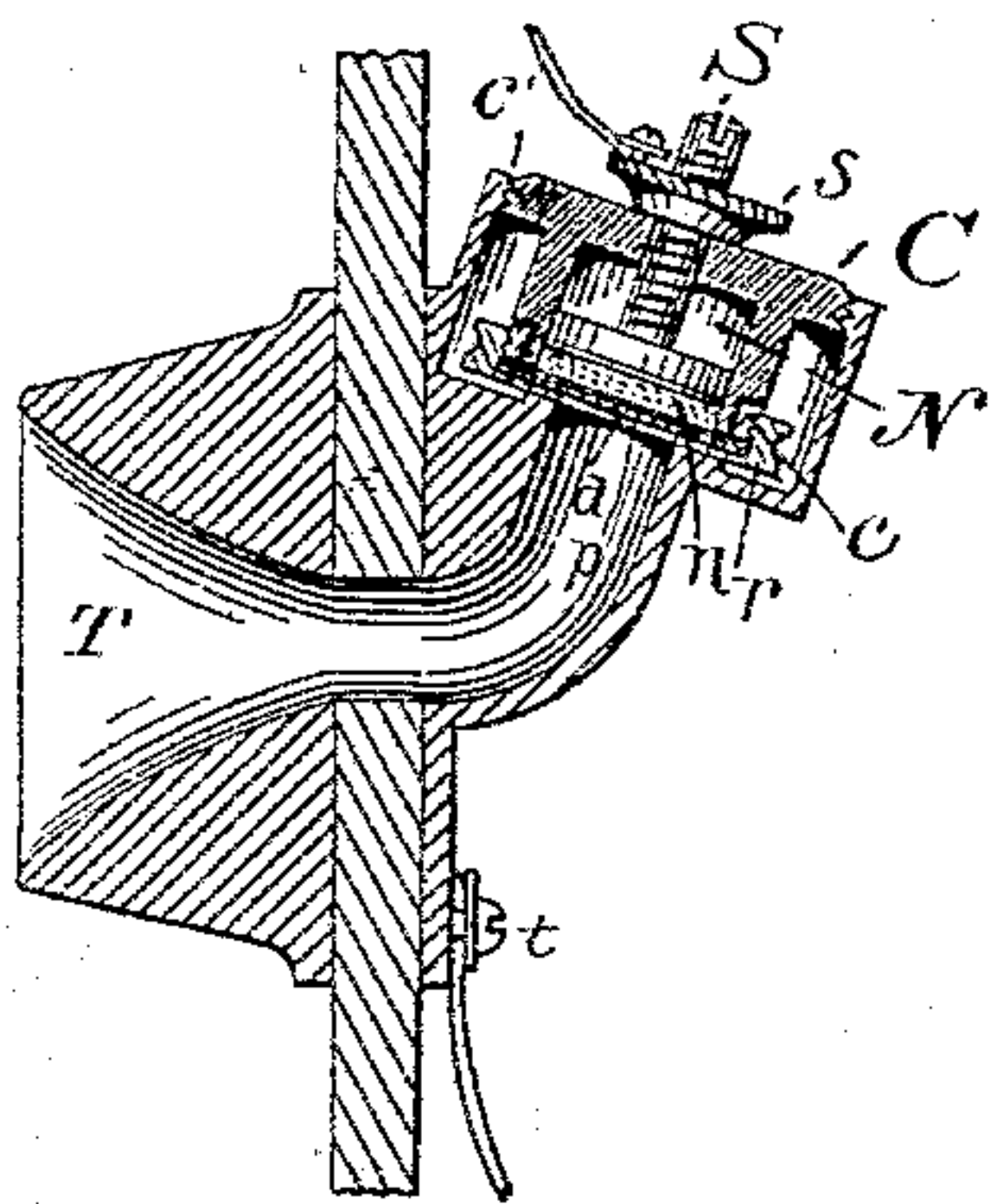
No. 321,323.

Patented June 30, 1885.

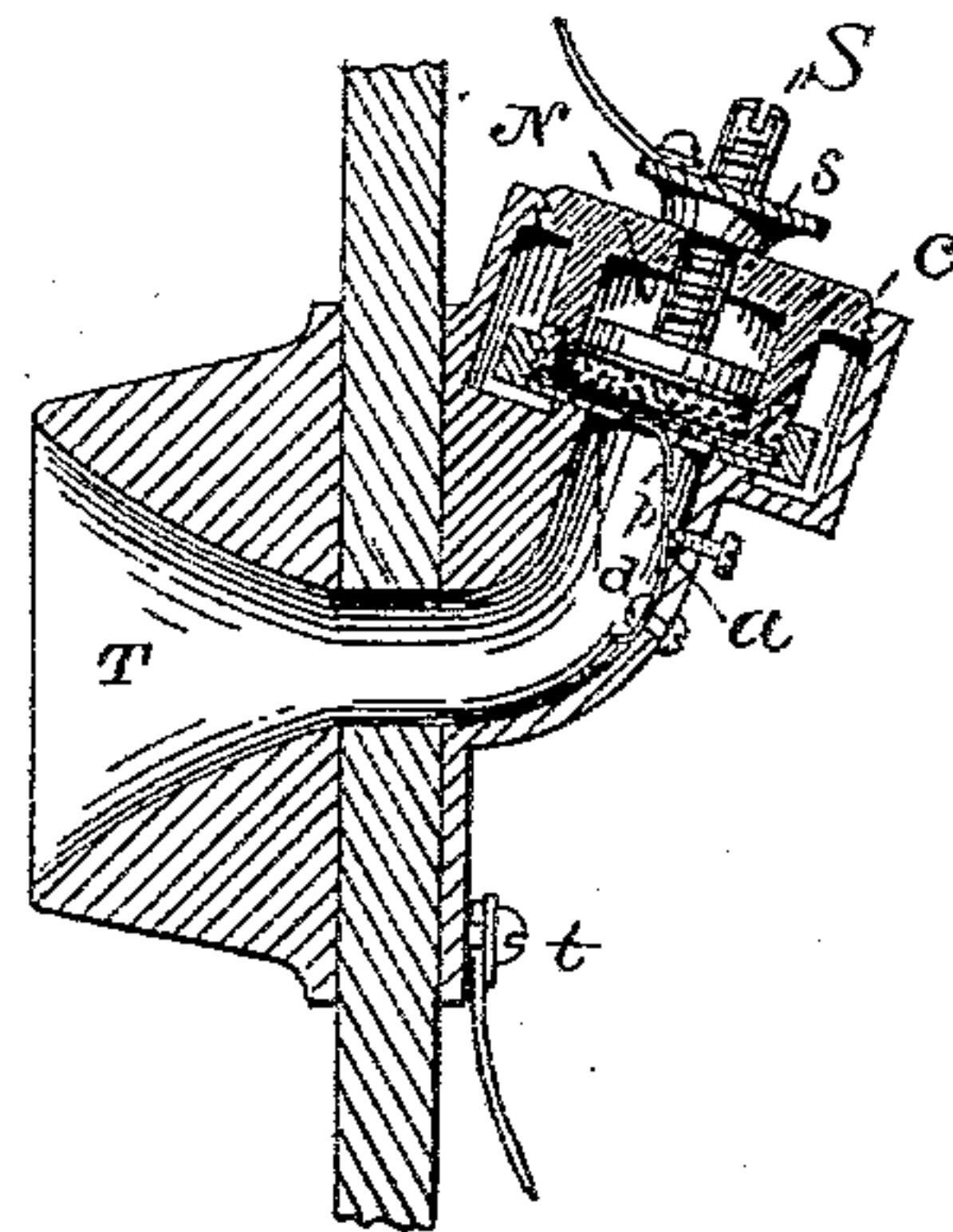


*Fig. 1.*

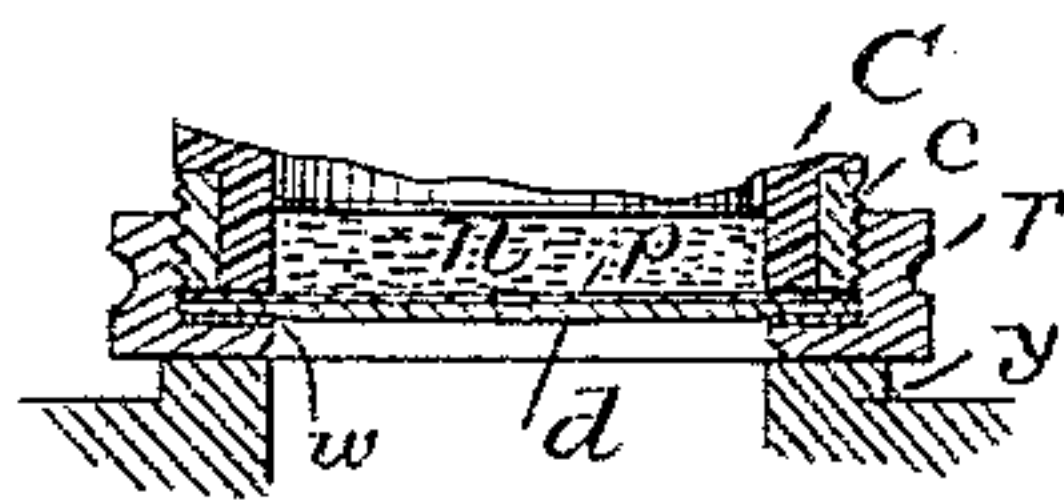
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



Witnesses,

*Geo. Willis Pierce*  
*Wm B. Vansize*

Inventor:

*H. S. Thornberry*



# UNITED STATES PATENT OFFICE.

HENRY S. THORNBERRY, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE  
AMERICAN BELL TELEPHONE COMPANY, OF SAME PLACE.

## TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 321,323, dated June 30, 1885.

Application filed July 5, 1884. (No model.)

### *To all whom it may concern:*

Be it known that I, HENRY S. THORNBERRY, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain improvements in Telephone-Transmitters, of which the following is a specification.

The object of my invention is to improve the construction and to render more popular and effective that form of battery-transmitter in which particles of conducting material, in a loose or free state, form the current-regulating medium.

The transmitter described in United States Letters Patent granted to Henry Hunnings, No. 250,250, November 29, 1881, is of this class. In the practical operation of that transmitter it has been found desirable in attaining the best results to hold the transmitter at a certain angle between the horizontal and vertical, and it has also been found that after such transmitter has been in frequent use the particles become moist and sticky. This is due, it is believed, to the moisture from the breath of the operator, which reaches the particles around the edges of the diaphragm, the edges being, as customary, left free—that is to say, not permanently fastened to its seat, as by solder, but merely held against the same by greater or less pressure. In the ordinary Hunnings transmitter, such as imported into this country, a circular chamber is made in a block of insulating material which contains the loose conducting particles. Above the latter is a very thin platinum diaphragm, and upon this a brass plate having a number of small holes. When the sieve-like brass plate is omitted, which is an improvement, and only the thin platinum diaphragm used, the rotating rubbing movement of the cap which holds it down frequently wrinkles the edge of the disk, leaving a passage sufficient for the moisture to reach the carbon particles. Sometimes a few of these particles will find their way between the disk and its seat and prevent the latter from lying perfectly flat. Thus, in one way or another, it will happen that if moisture is permitted to reach the disk it will find its way behind it. To obviate these difficulties I rigidly fix the chamber confining the variable resistance of my transmitter at that angle from the horizontal in prac-

tice found most desirable, which angle might be slightly varied, and I place before the diaphragm a curved metal trumpet or mouth-piece, against the sides of which any moisture will strike and be precipitated.

My invention further consists in placing the vibrating diaphragm under the mass of conducting medium, or, in other words, placing the particles of conducting material on the diaphragm, where they are normally held by gravity and rendered more sensitive to sound-vibrations than was formerly the case. I further improve the effectiveness of the instrument by using a damper of a substance such as a thin sheet of rubber, cork, or animal tissue placed outside of the platinum-foil diaphragm commonly in use.

My invention also consists in rendering the chamber in which the conducting particles are confined adjustable, and in certain details of construction, to be described.

In the accompanying drawings, Figure 1 shows my transmitter complete. Fig. 2 shows a section of the trumpet, containing-chamber, and operative parts. Fig. 3 shows a modification. Fig. 4 shows details of construction.

T is a metal trumpet or mouth-piece curved and arranged, substantially as shown, so that the particles of moisture conveyed thereto from the mouth in speaking (such particles moving in straight lines) will strike the further side of the tube and be precipitated or retained and the conducting material will not be affected. Metal is the preferred material for the trumpet because, being a better conductor of heat than wood, rubber, and other substances, the moisture will readily condense upon it. The upper end of T is screw-threaded to receive a screw-thread, *c'*, on the containing-chamber C, preferably formed from some non-conducting substance, as vulcanized rubber.

*c* is a collar firmly fixed to chamber C and screw-threaded to receive a metal ring, *r*.

S is a screw-plunger, the head of which enters the chamber N, wherein are placed particles of finely-divided conducting material *n*, as granulated retort-carbon. The enlarged end of S may be projected more or less into chamber N to regulate the size of said chamber. Upon plunger S is fixed a set-screw, *s*,



to which one end of the battery-circuit is connected. The object of this construction is to enable the size of the containing-chamber for the finely-divided material to be changed at will. In transmitters of this class the best results are obtained by filling the chamber about two-thirds full. Sometimes, however, a high normal resistance is required, and consequently a larger quantity of carbon or other particles are needed in the chamber. By turning the set-screw *s* in the proper direction the plunger *S* can be withdrawn, so as to enlarge the size of the chamber to admit the increased amount of conducting particles.

Over the aperture in ring *r* is placed a platinum diaphragm, *p*, and between this platinum diaphragm and the aperture of ring *r*, I place a damper consisting of a thin sheet of animal tissue of a flexible nature, as *d*; or it may be a thin sheet of rubber or cork, which I affix to the platinum diaphragm by a drop of some adhesive substance, as sealing-wax, placed at or near the center thereof.

To avoid the possibility of injuring or changing the form of the damper, I place a thin washer, *w*, Fig. 4, outside thereof, against which the surface of ring *r* will turn in screwing it on.

Instead of fixing the damper *d* to the diaphragm *p* by some adhesive substance, the damper and diaphragm may be held in contact by an adjustable spring, as *a*.

Around the inner orifice of the trumpet *T* a shoulder, as *y*, is turned up, against which the metal ring *r* presses when in position. The second end of the battery circuit is connected to trumpet *T*, as at *t*, circuit passing *via* elements *t T y r p*, conducting particles *n*, *S*, and *s*. This circuit may be the main circuit and battery or a local circuit and induction-coil, as is well known. It will be noticed that at all points this circuit is of sufficient conductivity to avoid heating by any ordinary battery.

The apparatus so constructed is placed in position substantially as shown in Fig. 1. The case *B* is formed and intended to be placed firmly in position, as upon a wall, and the location of trumpet *T* is such that the plane of either or both walls of the chamber *N* will be at an angle from the horizontal, preferably of from twenty to thirty degrees, this being found in practice the most advantageous position, since in this position it is believed that the conducting particles are not so likely to pack or solidify.

The operation of my transmitter is similar to others of its class.

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

1. A telephonic transmitter comprising a mass of finely-divided conducting particles

confined and resting upon a diaphragm located at an angle between a horizontal and perpendicular.

2. In a telephone-transmitter, an adjustable chamber containing particles of finely-divided conducting material resting upon a flexible diaphragm fixed at an angle between a horizontal and perpendicular.

3. In a telephonic transmitter wherein the means for varying the circuit consists of a mass of finely-divided conducting particles, a chamber for containing such particles, and having means for regulating the size of said chamber to admit of a greater or less quantity of such particles.

4. The combination, in a telephone-transmitter, of a mass of finely-divided conducting material resting by gravity upon a metallic diaphragm, a damper consisting of a disk of animal tissue, cork, rubber, or similar material cemented to the diaphragm at or near its center, and clamped thereto at its periphery by a perforated cap or ring, with an intervening ring or washer to prevent displacement of the damper, substantially as described.

5. An electric telephonic transmitter comprising a mass of finely-divided conducting particles confined and resting upon a diaphragm located at an angle between a horizontal and perpendicular, and a damper consisting of a thin sheet of animal tissue, rubber, cork, or other like material.

6. The combination, in a telephone-transmitter, of an inclosing-chamber containing finely-divided conducting material resting upon a metallic diaphragm, with a damper consisting of a disk of animal tissue, cork, or rubber cemented to the diaphragm at or near the center thereof.

7. In a telephonic transmitter, the combination of a chamber for containing the current-varying medium, means for varying the size of said chamber, a flexible metallic diaphragm upon which the said medium normally rests by gravity, a mouth-piece, and an inclosing-case, the whole arranged to permanently retain the diaphragm at an angle between a horizontal and perpendicular, substantially as described.

8. In a telephonic transmitter, the combination of the chamber *C*, adjustable plunger *S*, conducting particles *n*, diaphragm *p*, damper *d*, and trumpet or mouth-piece *T*.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 28th day of June, 1884.

H. S. THORNBERRY.

Witnesses:

WM. B. VANSIZE,  
GEO. WILLIS PIERCE.