

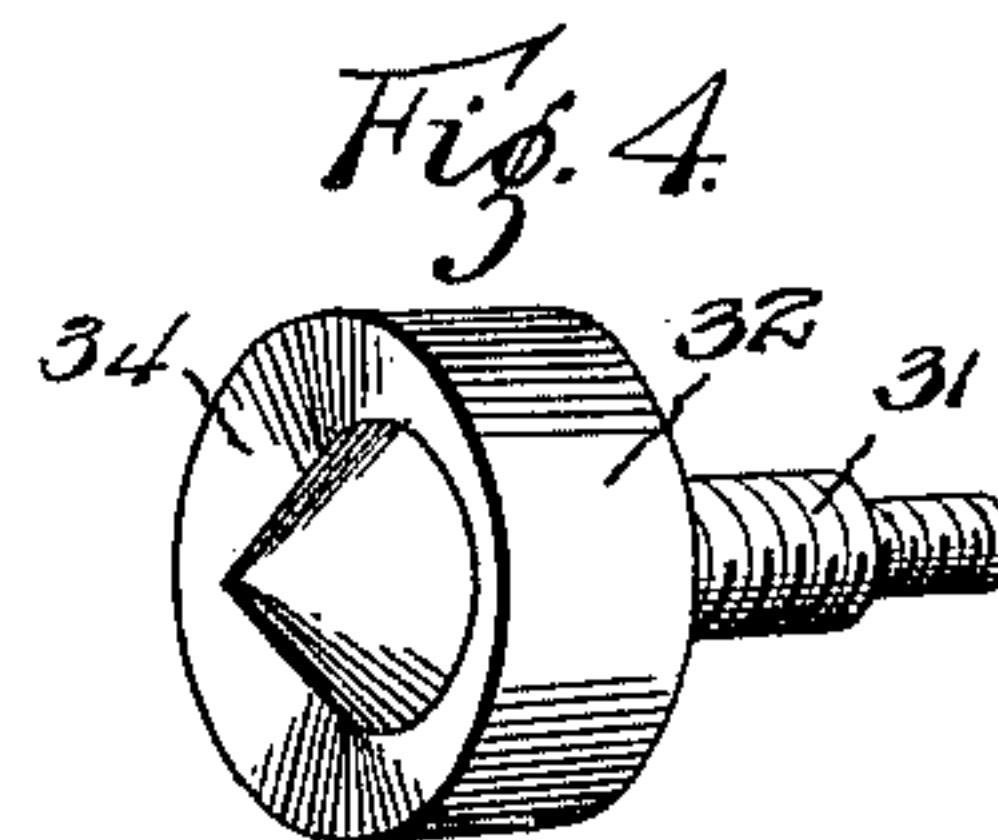
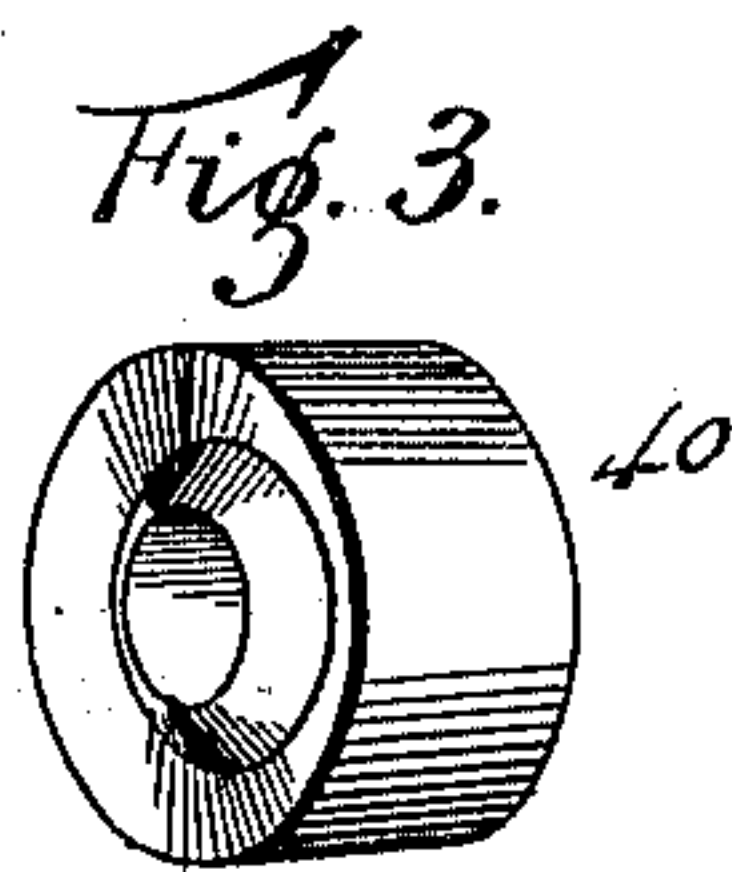
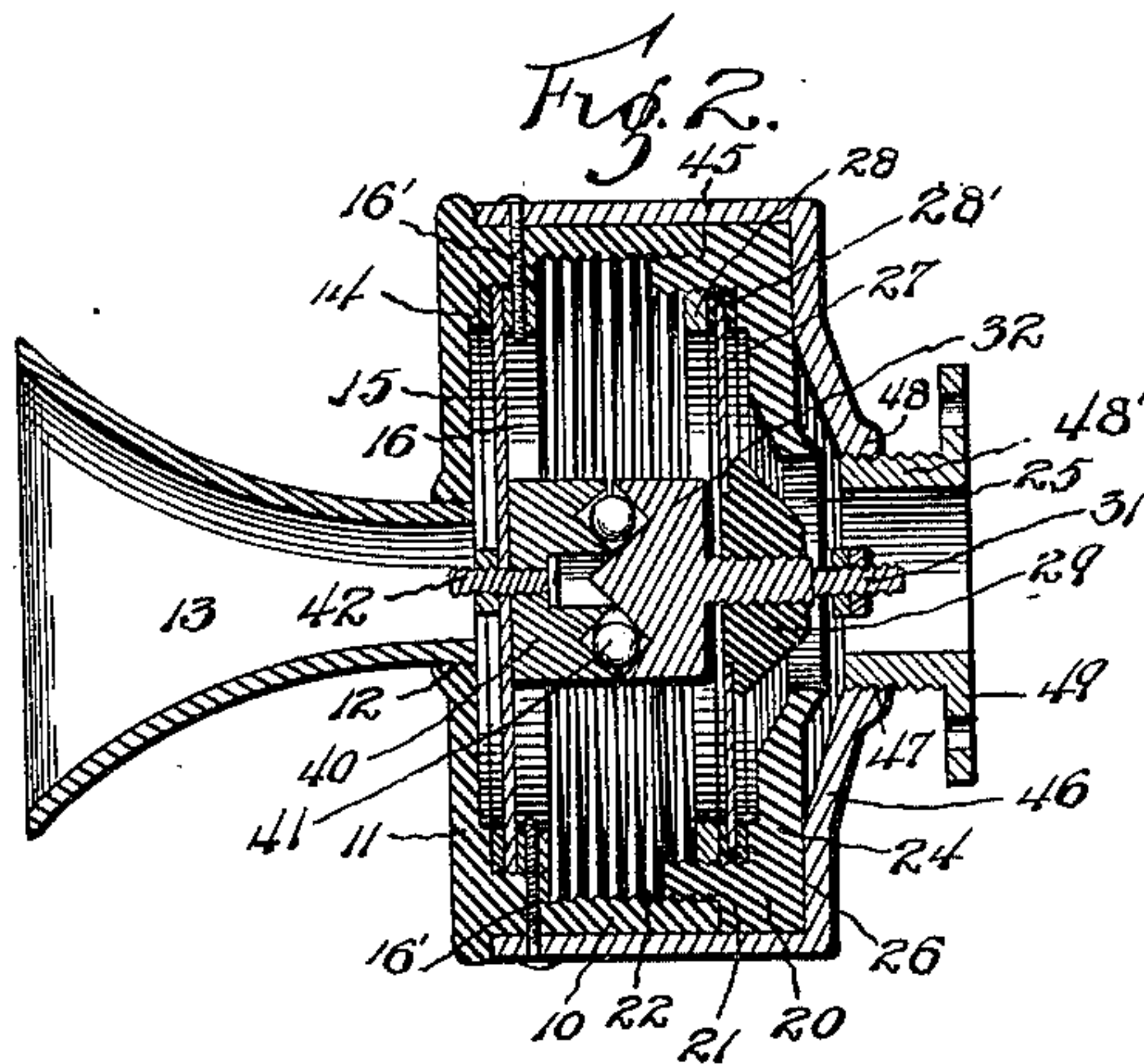
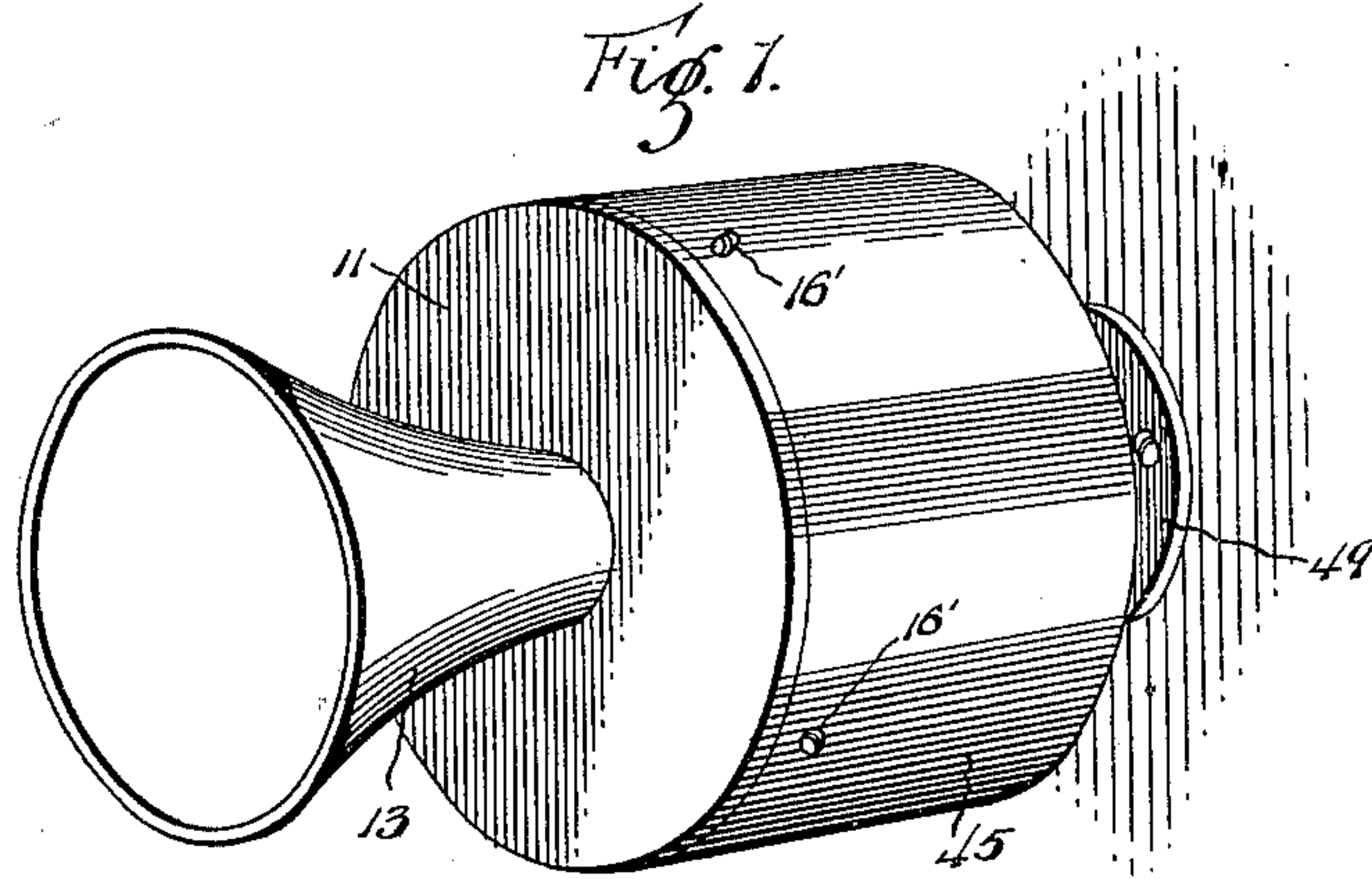
No. 672,621.

Patented Apr. 23, 1901.

C. C. HUGHES.
TELEPHONE TRANSMITTER.

(Application filed Apr. 14, 1900.)

(No Model.)



Witnesses
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UNITED STATES PATENT OFFICE.

CHARLES C. HUGHES, OF BALTIMORE, MARYLAND.

TELEPHONE-TRANSMITTER.

SPECIFICATION forming part of Letters Patent No. 672,621, dated April 23, 1901.

Application filed April 14, 1900. Serial No. 12,953. (No model.)

To all whom it may concern:

Be it known that I, CHARLES C. HUGHES, a citizen of United States, residing at Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Telephone-Transmitters; 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 appertains to make and use the same.

This invention relates to telephone-transmitters in general, and more particularly to microphone-transmitters, one object of the invention being to provide a construction which, while being suitable for interior use, will be especially fitted for exterior use and in long-distance telephony.

A further object of the invention is to provide a construction in which packing will be absolutely prevented and in which the efficiency of the instrument will not be impaired under whatever conditions it may be used.

A further object of the invention is to provide a construction wherein the variation in current intensity will be produced by variation of the area of surface contact and to secure a maximum of variation of surface contact with a minimum of vibration of the diaphragm.

Further objects and advantages of the invention will be evident from the following specification.

In the drawings forming a portion of this specification, and in which like numerals of reference indicate similar parts in the several views, Figure 1 is a perspective view showing the complete instrument. Fig. 2 is a central longitudinal section taken through the complete instrument and showing some of the interior parts in elevation. Fig. 3 is a detail perspective view showing one of the electrodes. Fig. 4 is a perspective view showing the electrode that is carried by the sound-receiving diaphragm.

Referring now to the drawings, the transmitter of the present invention consists of a preferably cylindrical box 10, one end of which is open, while the other end has a closure 11, in the center of which is formed a sound-opening 12, which is threaded for engagement of the minor end of a funnel 13 of

usual shape and into which the voice is delivered.

Within the box 10 and adjacent the inclosed end thereof there is formed a shoulder 14, and against this shoulder is disposed a diaphragm 15, which is held in place by a clamping-ring 16, which may be held in place in any suitable manner, as with screws 16' or by means of threads thereon which engage threads upon the inner wall of the box. This diaphragm 15 is separated from the closed end of the box by an interspace, as shown, to permit the sound-waves which enter through the opening 12 to have the most efficient action upon the diaphragm to vibrate it.

The rear end of the box 10 is closed by what is almost a duplicate of the box, and consists of a ring 20, having exterior threads 21, which engage interior threads 22, carried by the box 10, and the rear end of the ring 20 is closed by a disk-shaped portion 24, which corresponds to the closure of the front end of the box 10, this portion 24 having also a central opening 25, which has a double function, as will be presently explained.

Within the ring 20 is a shoulder 26, and on this shoulder is disposed a diaphragm 27, which is also held in place by a clamping-ring 28, which is screwed thereagainst, the diaphragm having a binding 28' of rubber to insulate it from rings 28 and 20. The diaphragm 27 has a central opening which registers with a central opening in a block 29 of insulating material which is secured on the rear face of the diaphragm 27, the opening of this block of insulating material having threads for engagement by the stem 31 of one of the electrodes of the transmitter, and which electrode comprises also a cylindrical head 32, which is preferably formed integral with the stem, if the electrode be of metal, but consisting of a metal bolt or machine-screw engaged with a central axial perforation in the electrode when the latter is of carbon or other non-metallic material. The rear end of the stem 31 is slotted transversely for engagement by a screw-driver, whereby the stem may be rotated to adjust the head of the electrode toward and away from the diaphragm 15.

In the outer face of the head 32—that is, in the face which lies in the direction of the dia-

phragm 15—there is formed a curvilinear slot or groove 34, the cross-sections of which present converging lines, either in the form of straight lines lying at an angle to each other or in the form of a curve of constantly-changing radii, so that if a ball be rolled into the groove down one side of the groove the length of its arc of contact will vary as it moves into the groove and also as it moves out of the groove. It will of course be understood that this will occur so long as the cross-section of the groove is not rectangular or of constant radius.

Upon the inner face of the diaphragm 15 is secured a second electrode 40, having a groove in its rear face which corresponds to the groove in the first electrode, the two electrodes being disposed to lie close together, so that their grooves will cooperate to receive and retain additional electrodes in the form of carbon balls 41, as illustrated in Fig. 2 of the drawings. The second electrode is secured to the diaphragm 15 by means of a bolt 42, which is passed through an axial perforation therein and through an alining perforation in the diaphragm, and in order to adjust the electrodes so as to get the proper normal pressure between the balls and the electrodes upon the diaphragm it is only necessary to screw inwardly upon the stem 31, as will be understood, access to the stem being readily had through the opening 25 in the center of the portion 24.

After the parts are assembled in the manner shown and described a casing 45, of metal, is adjusted to receive the box 10 and ring 20 and is in the form of a cap, the rear end thereof having a closure 46, at the center of which is formed an opening 47, surrounded by a flange 48, which is interiorly threaded for engagement by a collar 48', having a flange 49 at its rear edge, and through the medium of which the collar is secured to the front of the usual magneto-box or other support for the transmitter. By this means the transmitter may be readily applied to or removed from the box or support by unscrewing it from this collar. Furthermore, the electrodes may be adjusted without taking the transmitter from its support, as will be readily seen.

It will be noted that the ring 16 is held in place by the screws 16', which latter also act to hold the casing 45, the ring 16 being held tight against the diaphragm 15, which carries the electrode 40, and hence the metallic casing is in electrical connection with the electrode. Therefore in making connection with the transmitter one wire may be connected with the flange 49, while the other wire is passed through the collar 48' and engaged under the set-nut upon the stem 31, the insulating-block 29 preventing all leakage or short-circuiting. Furthermore, in this construction I am enabled and I prefer to make all parts of metal of high conductivity with the exception of the electrodes and the insulating portions above referred to.

In practice after the parts have been as-

sembled and secured upon the transmitter-box or other suitable support by means of the flange 49 a screw-driver may be engaged with the stem 31, and it may be turned to adjust the electrodes to the proper points and while the operator is talking into the transmitter, thereby permitting an adjustment of extreme delicacy.

With this construction it will be seen that the balls that rest against the concave wall of the groove or outer wall thereof will when moved into the groove have longer arcs of contact, but with shorter radii, thus giving greater area of surface contact; also, the balls that rest against the cone will when moved into the groove have longer arcs of contact, but with greater radii. Thus all of the balls as they move inwardly increase the areas of surface contact and all of the balls as they move outwardly decrease their areas of surface contact, the result being a variation which is so great as to respond electrically to the slightest vibration of the moving diaphragm. In practice the balls may be held in contact with both walls of the groove, and when the balls are pressed they will wedge into the groove and when released will move outwardly thereof, rattling being thus prevented and a maximum of variation secured.

What is claimed is—

1. A telephone-transmitter comprising a diaphragm, an electrode operably connected with the diaphragm and a second electrode in operative relation to the first electrode to conduct current thereto, one of the electrodes having a curvilinear slot presenting a concave wall and a convex wall and in which slot the other electrode is engaged for movement over a wall thereof toward and away from the bottom of the slot, the second electrode having a curvilinear surface and the different arcs of contact between the electrodes having different radii whereby the second electrode may engage a convex and a concave wall when moved inwardly to its limit and may be forced therebetween with an increase in area of contact-surface.

2. A telephone-transmitter comprising a diaphragm, an electrode operably connected with the diaphragm and a second electrode in operative relation to the first electrode, one of the electrodes having an annular slot or groove which receives the second electrode, and the second electrode having a curvilinear surface, the arcs of contact between the electrodes varying in radii as the second electrode is moved into and out of the first electrode.

3. A telephone-transmitter comprising a diaphragm, an electrode operably connected with the diaphragm and having a plurality of electrodes in operative relation thereto to conduct current thereto, the first electrode having an annular groove with which the second electrodes are engaged, said groove being tapered inwardly and the plurality of electrodes being each spherical.

4. In a telephone-transmitter, an electrode

having an elongated groove each of whose sections in planes perpendicular to the direction of motion includes a plurality of arcs of different radii and whose radii gradually vary
 5 in the different planes perpendicular to the direction of motion, and an additional cooperating electrode having a curvilinear surface in contact with the walls of the groove and whose sections in the same planes are arcs
 10 of varying radii, the radii of the arcs of normal contact of the electrodes differing in value.

5. A telephone-transmitter comprising an electrode having a curved groove which is
 15 tapered inwardly, an additional electrode having a curvilinear face in contact with the walls of said groove, and a diaphragm in operative relation to the electrodes.

6. A telephone-transmitter comprising two
 20 electrodes each of which has an annular groove which is tapered rearwardly, a plurality of free electrodes engaging both grooves, said free electrodes having each a curvilinear surface and the arcs of normal contact of the

electrodes differing in value, and a sound-receiving diaphragm in operative relation to the electrodes. 25

7. A telephone-transmitter comprising two electrodes each of which has a curvilinear groove which is tapered inwardly, a plurality
 30 of free electrodes engaged with both grooves, said free electrodes having each a curvilinear surface, and the arcs of normal contact of the electrodes differing in value, and a diaphragm in operative relation to the electrodes to vary
 35 their areas of contact-surface.

8. A telephone-transmitter comprising two electrodes each of which has a curved groove which is tapered inwardly, a plurality of spherical electrodes engaged with both grooves and
 40 a diaphragm in operative relation to the electrodes.

In testimony whereof I hereunto set my hand in the presence of two witnesses.

CHAS. C. HUGHES.

Witnesses:

H. E. CHANDLER,
 R. A. SHEPARD.