T. A. EDISON.
Speaking Machine.

No. 201,760. Patented March 26, 1878

Fig. 1.

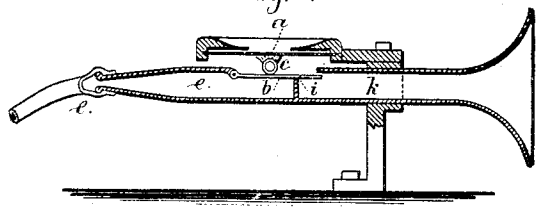


Fig. 2.

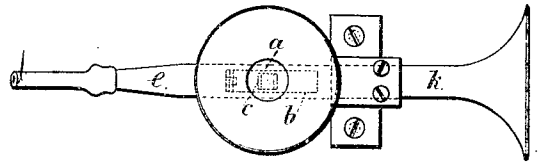
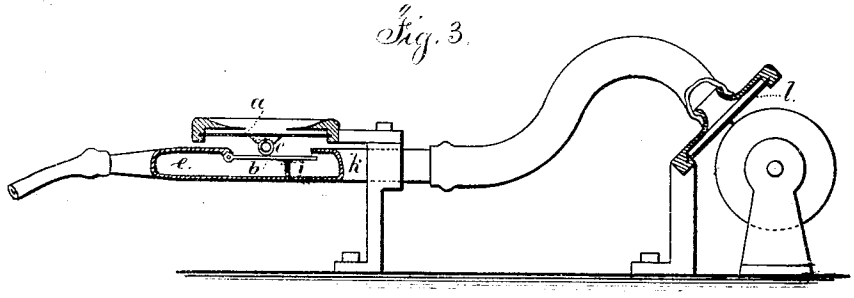


Fig. 3.



Case 153.

Witnesses
Chas. F. Smith
Geo. S. Pinckney

Inventor
Thos. A. Edison.
per Lemuel W. Serrell
Atty

UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF MENLO PARK, NEW JERSEY.

IMPROVEMENT IN SPEAKING-MACHINES.

Specification forming part of Letters Patent No. **201,760**, dated March 26, 1878; application filed March 4, 1878.

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented an Improvement in Speaking-Machines, (Case 153,) which I term the "Aerophone," and of which the following is a specification:

The object of this invention is to reproduce the human voice or other sounds with greatly-increased volume or force.

Articulation produces certain atmospheric sound waves or vibrations in a given relation to each other in respect to volume or character. The sound-waves of words uttered in a whisper correspond generally to those uttered in the loudest tones, except in the volume.

In my phonograph, heretofore secured by me, (Case No. 149,) the sound produced by the instrument corresponds to the sound acting upon the diaphragm, only less in volume.

The object of the present invention is to reverse the action of the phonograph, and cause the human voice or other source of sound to reproduce that sound in tones that are louder than the original utterances, thereby enabling a feeble voice to be heard distinctly to any desired extent within the capacity of the instrument.

I make use of a diaphragm, against which the sound-vibrations are directed from the voice or other primary source of sound, and this diaphragm or other body moved by such sound-vibrations is made to control the exit of air, steam, or other fluid under pressure, and so set in motion secondary sound-vibrations, the same as the primary sound-vibrations, except of greater volume. The relative volumes of the sound-vibrations will depend upon the pressure of the fluid and the opening for the escape of the same.

My invention is available for giving orders upon vessels, for signaling distant vessels, for military orders, for orders at fires, for communicating between engineers of passing locomotives, for station-signals, and for addressing large assemblies, or for giving audible utterances that are sufficiently powerful to be heard above surrounding noise or confusion.

In the drawings, Figure 1 is a section. Fig. 2 is a plan of the instrument as adapted to an organ-pipe or trumpet for direct action in increasing the volume of the sound; and Fig. 3 is a section of the instrument in connection with a phonograph, for increasing the amplitude of the vibration that makes the record.

The diaphragm *a* is acted upon by the human voice or other sound, and vibrated by the same. By the term "diaphragm" I mean any body capable of and adapted to respond to atmospheric sound-vibrations, so that the said vibrations shall be given to the diaphragm or its equivalent.

I make use of the vibrations of the diaphragm to operate a valve, *b*, that is connected with the diaphragm *a*, preferably by a section, *c*, of india-rubber tubing. The diaphragm is to be inclosed in a proper case, that directs the sound upon the diaphragm, and the valve is, by preference, balanced by being pivoted in the center, so that the pressure of the air, steam, or gas upon the valve does not interfere with its movement.

The air, gas, steam, or other fluid under pressure, is supplied from a suitable holder by the pipe *e*, and at *i* the valve allows or checks the escape of the said fluid into the pipe *k*. If the valve is covered with a sheet of india-rubber, secured at its edges and to the tubes *e* and *k*, leakage will be prevented, but the valve will be free to be moved by the diaphragm.

It will now be apparent that the valve will open more or less at *i*, according to the amplitude of vibration of the diaphragm, and hence that the air passing at this point will be a multiple of the sound-vibrations of the atmosphere acting upon the diaphragm; hence corresponding tones will issue from the tube or trumpet *k*, and by increasing the pressure of the fluid, so the volume of sound will be increased. My experiments and tests lead me to believe the apparatus capable of very great increase of the secondary sound over and above the primary controlling sound; and I remark that the apparatus employed may also be greatly varied, according to the object to be attained. Care is required to prevent interference with the clearness of the articulated sounds, in consequence of any musical resonance in any of the parts of the apparatus.

In Fig. 3 the parts before described are represented as combined with a receiving-diaphragm, *l*, that actuates a recording-point to

record the sound-vibrations, as in my aforesaid phonograph. In this case the indentations will be much greater, on account of the amplitude of the vibrations given to the disk.

It will be evident that the phonographic record may be employed instead of the diaphragm to operate the valve *b*, and thus allow the record to be made of the articulations, after which such articulations are reproduced in the same or in increased volume as the original utterances.

I claim as my invention—

1. The combination, with a diaphragm, or the record produced therefrom, of a valve and a supply of air, gas, steam, or other fluid under pressure, for reproducing sounds, substantially as set forth.

2. The method herein specified of producing sound, by causing primary sounds or articulations to act upon a diaphragm, and then controlling the exit of a fluid under pressure in harmony with the primary sounds, to produce secondary sounds corresponding with the primary sounds, but of different volume, substantially as set forth.

Signed by me this 28th day of February, A. D. 1878.

THOS. A. EDISON.

Witnesses:
GEO. T. PINCKNEY,
CHAS. H. SMITH.