

(No Model.)

W. H. FROST.
 RESONANT MUSICAL INSTRUMENT OR TOY.

No. 552,612.

Patented Jan. 7, 1896.

Fig. 1,

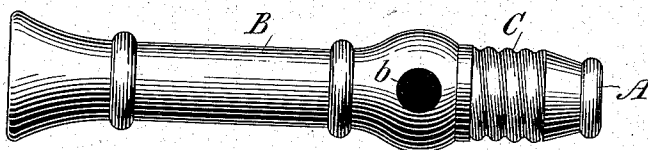


Fig. 2,

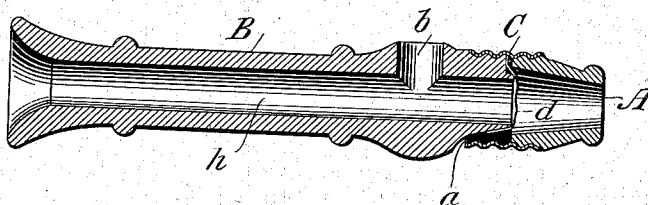


Fig. 3,

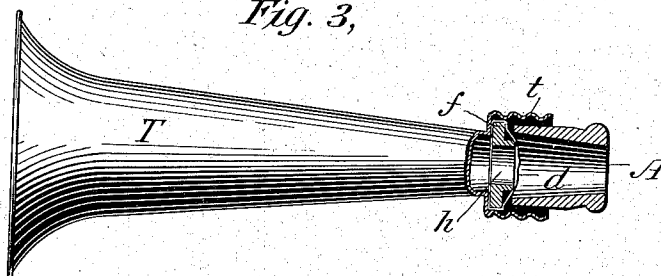


Fig. 4,

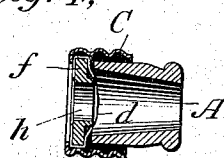


Fig. 5,

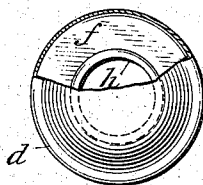
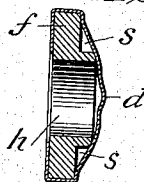


Fig. 6,



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UNITED STATES PATENT OFFICE.

WARREN H. FROST, OF CHICAGO, ILLINOIS.

RESONANT MUSICAL INSTRUMENT OR TOY.

SPECIFICATION forming part of Letters Patent No. 552,612, dated January 7, 1896.

Application filed April 6, 1895. Serial No. 544,712. (No model.)

To all whom it may concern:

Be it known that I, WARREN H. FROST, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have made certain new and useful Improvements in Resonant Musical Instruments or Toys, of which the following is a specification.

My invention embraces a tube or tubular passage having a loose flexible inelastic diaphragm, such as gold-beaters' skin, arranged across the opening or passage at a point intermediate the ends of the tube or passage, and the vibratory tone or musical sound is produced by applying the mouth of the operator to one end of the tube. The resonator thus reproduces, in its characteristic manner, the tones or notes uttered into it by the operator.

This instrument or device must be clearly distinguished from a reed or similar instrument which responds to a current of air from the lungs. A current of air would produce no result whatever in my apparatus. Air-vibrations, however, accompanied or not with a current of air, are reproduced and amplified and have a characteristic mechanical tone added to them which permits of mimicking or producing the sounds of wind and other musical instruments, and this is done by the operation of the lungs and vocal organs.

I prefer to employ a tube divided transversely into two relatively unequal sections, and the mouth of the operator is applied to the free end of the shorter section. I connect the two sections by a metal screw-coupling or other suitable means, and the diaphragm is placed across the opening in the tube at the junction of the two sections. It can thus be easily replaced, repaired, or examined, as may be required. I prefer to form the diaphragm of gold-beaters' skin or any very thin inelastic membrane. I may use parchment-paper or some other form of paper. Rubber will not perform the necessary functions because it is elastic. A metal plate or diaphragm is excluded from the scope of my improvement because it is not flexible. The characteristic features of the diaphragm must include a uniform flexibility, soft, loose, like the skin or paper as distinguished from metal, and the inelasticity of skin or paper as distinguished from the elasticity of thin sheet-

rubber. The diaphragm must be held in position firmly while it is loose or capable of assuming the condition of a filled sail. It results from this arrangement that a vibratory tone accompanied with an air-current of varying strength will be reproduced by my resonator with wider variations and greater fidelity to the initiating cause than in any instrument heretofore known. I find it of great benefit to arrange a vent, outlet, or aperture in the wall of the tube between the diaphragm and the end of the tube to which the mouth is applied. This is to allow for the escape of the air coming from the lungs of the operator.

I prefer to cement the diaphragm to a removable wooden ring or frame, and I supply these mounted diaphragms as a separate article of manufacture which are supplied in quantities and may be quickly substituted or applied to resonating devices of other specific forms. The ring or frame or support for the diaphragm is provided with means, such as a circumferential groove, over and across which the diaphragm is placed, and I provide a rim or projection upon the complementary contact-surface, which rim registers with the groove in the frame of the diaphragm, so that when the diaphragm is in position between the two sections of tube this rim or projection may be caused to tighten the diaphragm to a greater or less extent, according to the space separating the two sections, this being dependent upon the number of turns given to the coupling device employed. I prefer to perforate the longer tube-section through the side wall at a point near the diaphragm, so as to permit of the free distribution of the tones. The hole or aperture should be about the size of the main passage.

The accompanying drawings illustrate my invention.

Figure 1 is a view of an instrument embodying my improvements. Fig. 2 is a longitudinal section thereof. Fig. 3 is a modified instrument formed of metal. Fig. 4 shows the separable diaphragm with a section of tube attached. Figs. 5 and 6 are detail views showing the separable diaphragm as mounted for application to instruments of various patterns.

A and B, Figs. 1 and 2, are sections of tubing, and may be of wood or rubber, while in Fig. 3 the tube is of metal and trumpet-shaped. In Fig. 2 the hole, passage, or opening through the tube is of uniform diameter and preferably smooth. *b* is an outlet for the tone or sound, of about the same diameter as the main passage. *d* is a diaphragm of gold-beaters' skin cemented to the end of the tube-section B at the outer edge thereof. The skin is loosely supported and is by nature inelastic, but flexible and soft. There is a shoulder or projection on the end of the tube B, which provides a groove or depression like *s*, Fig. 6, and over this the diaphragm is placed. The end of the tube-section A is provided with a rim or projection registering with the groove *s* in B. C is a screw-coupling for uniting the parts A and B, and by varying the number of turns the parts A and B may be more or less closely united, so as to vary the degree of slack or looseness in the diaphragm *d*. The diaphragm is always loose, but the degree of slack is thus adjusted or regulated, a female voice requiring less slack in the diaphragm than in the case of a deep-toned or male voice. There is an aperture or passage *a* extending from a point between the end of the tube-section A and the diaphragm, so as to allow for the escape of the current of air coming from the lungs in using the voice. This aperture is necessary to produce uniform successful operation by an unskilled player, for while it is possible to part the lips or separate the lips at the point of contact with the mouthpiece, to allow the air from the lungs and the vocal vibrations to escape, this act requires skill and forethought, and by placing the opening *a* between the end of the mouthpiece and the diaphragm I provide for such escape and produce a certain and successful result in spite of the want of skill of the player. I prefer to make the section of tube A about one-sixth the length of the tube-section B, as I have found this proportion to yield approximately the best results in general use.

Instead of connecting the diaphragm to one end of the tube-section B I may employ a separate ring or frame *f*, Figs. 3, 4, 5, and 6. The frame has the groove *s* and the hole *h*, of suitable diameter. The diaphragm of gold-beaters' skin *d* is cemented to it loosely and the frame *f* is included between two tube-sections. I prepare diaphragms attached to frames in this way for use in connection with any pattern or style of tube and they form a separate article of manufacture and sale.

In Fig. 3, T is a trumpet-shaped tubular section terminating in a screw-thread terminal *t*. At the junction of T and *t* there is a

shoulder to receive the frame *f*, carrying a diaphragm *d*. The tube-section A screws down upon frame *f* to a greater or less extent to vary the adjustment of diaphragm *d* as described. The instrument shown in Fig. 3 is capable of wider utility and has a greater capacity but is more expensive to manufacture.

In Fig. 4 the frame *f* and diaphragm *d* are united to a short tube-section A by a screw-coupling C. This provides an instrument of limited utility but is least expensive to manufacture.

In using the apparatus the mouth is applied to the end A and the vocal organs are operated to simulate any music or musical instrument of which the human voice is capable. The result is a reproduction of the tones, notes or music with an added characteristic due to the resonance of the instrument, which affords a striking mimic reproduction of the music or instrument imitated.

I am aware of the United States patents of J. A. Maloney, No. 362,100, dated May 3, 1887, for an auriphone, and T. A. Edison, No. 394,106, dated December 4, 1888, for a phonograph-reproducer, and I do not claim anything therein shown or described. In both said patents a diaphragm is shown and described which is tightly stretched or taut. Such a diaphragm would be absolutely useless in my apparatus and I limit my claims to a combination, one element of which is a loose flexible inelastic diaphragm. By this limitation I also entirely exclude rubber and metal diaphragms from the scope of my claims.

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

1. In a musical instrument the combination of a tube or tubular passage, and a loose, flexible, inelastic diaphragm arranged across the opening at a point intermediate the ends thereof, said diaphragm being free and disconnected except at its edge or circumference, substantially as described.

2. In a musical instrument the combination of a tube or tubular passage, a loose, flexible, inelastic diaphragm arranged across the opening at a point intermediate the ends thereof, and a vent, outlet or aperture between the end applied to the mouth and said diaphragm, substantially as described.

3. In a musical instrument the combination of a tube, tubular passage or ring, and a loose, flexible, inelastic diaphragm arranged across the opening, said diaphragm being free and disconnected except at its edge or circumference, substantially as described.

WARREN H. FROST.

Witnesses:

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W. B. VANSIZE.