

A. LEECH.
MUSICAL INSTRUMENT.
APPLICATION FILED JULY 30, 1902.

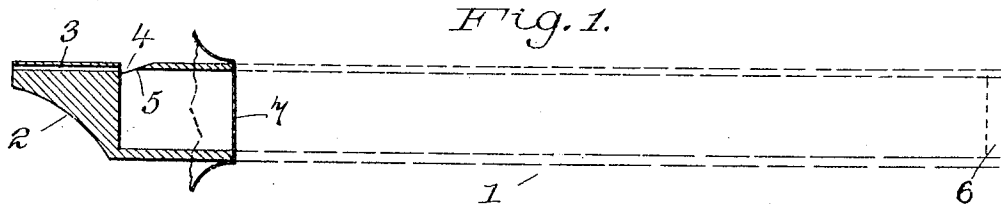


Fig. 1.

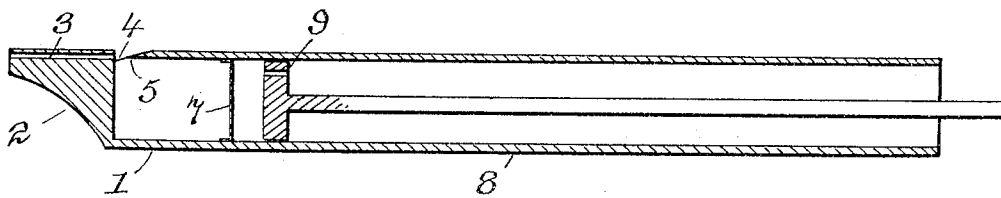


Fig. 2.

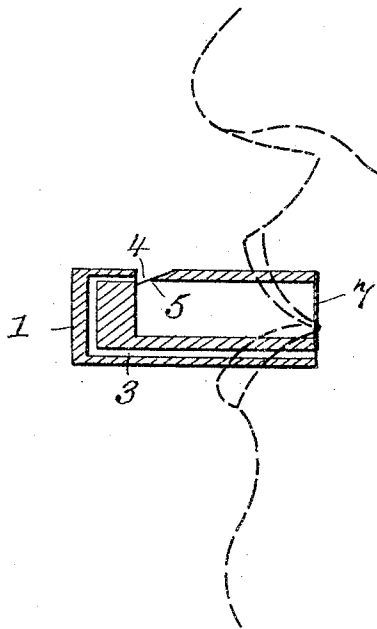


Fig. 3.

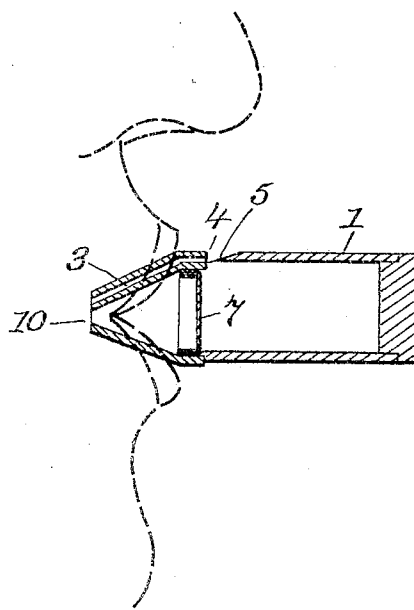


Fig. 4.

WITNESSES:

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UNITED STATES PATENT OFFICE.

ALBERT LEECH, OF ARLINGTON, NEW JERSEY.

MUSICAL INSTRUMENT.

SPECIFICATION forming part of Letters Patent No. 780,674, dated January 24, 1905.

Application filed July 30, 1902. Serial No. 117,698.

To all whom it may concern:

Be it known that I, ALBERT LEECH, a citizen of the United States, residing at Arlington, in the county of Hudson and State of New Jersey, have invented a new and useful Musical Instrument, of which the following is a specification.

My invention relates generally to musical instruments, and more particularly to the class in which the sound is produced by vibrating a column of air.

While my invention is not limited in its application to a particular type of musical instrument, I have for convenience in illustrating and describing the same shown it applied to a simple form of pipe or whistle.

The object of the invention as herein embodied is to improve the tone quality and convert a single-tone whistle into an instrument having a range of two or more octaves, and, furthermore, to construct the same so that it may be mastered by unskilled persons, without practice, to reproduce any familiar air or melody.

It is well known in acoustics that the pitch of a pipe may be lowered an octave by stopping its open end, and I have found by experiment that if a membrane or flexible diaphragm be substituted for the plug of solid material usually employed for this purpose a further reduction of the pitch may be obtained, and the pipe will then yield a tone about three octaves below that produced with the end open. I have also found that the tone quality of such an instrument may be greatly improved by the addition of a resonator, which may be in the form of a tube extending beyond the diaphragm as a continuation of the pipe and having its outer end either opened or closed, according to the length thereof, or the mouth-cavity of the player may be made to serve this purpose, as will be hereinafter more fully explained.

The present invention in its preferred form is preferably designed to utilize the mouth-cavity of the player as a resonator, for the reason, first, that a variation in the size of the resonator is essential to change the pitch of the tone produced, the extent of such variation determining the pitch by increasing or

decreasing the effective length of the column of air on one side of the diaphragm, and, second, for the reason that the effect of such variation would be obtained by the contraction and expansion of the mouth-cavity, which is fully understood and generally practiced in whistling, consequently being a perfectly natural action it requires neither skill nor instruction.

The accompanying drawings will serve to illustrate such devices as may be employed to carry my invention into effect. I wish it understood, however, that I do not limit myself to the particular apparatus shown, as it will be obvious that many other forms of instruments may be employed and substantially the same results obtained.

In the drawings, Figure 1 is a sectional view of an ordinary whistle, showing the manner of applying a diaphragm thereto. Fig. 2 is a view in elevation, showing a resonator combined with the whistle of Fig. 1. Fig. 3 is a sectional view of a form of whistle which in use utilizes the mouth-cavity of the player as a resonator, and Fig. 4 is a similar view of a preferred form of whistle of this type.

Referring to the drawings, 1 represents an ordinary form of whistle, the full length of which is indicated by dotted lines in Fig. 1. As shown, the whistle consists of a pipe open at one end and closed at the other, the closed end being beveled, as at 2, in the usual manner. Through the closed end a passage or windway 3 is provided, which terminates at the mouth 4 of the pipe, at which point a wind-cutter 5 is formed in a manner well known in the art. Such a whistle is capable of yielding a single tone of definite pitch, which may be lowered an octave by closing the open end of the pipe by a plug or other device, as indicated at 6 in Fig. 1. If instead of closing the pipe solidly a membrane or flexible diaphragm 7, of rubber or other suitable material, be substituted for the plug and properly adjusted at a point nearer the mouth of the pipe, as shown in full lines in Fig. 1, a further reduction in the pitch will result, and assuming the whistle with its end plugged to yield as its fundamental tone C above the staff, when closed by a flexible

diaphragm the tone will be reduced in pitch C below the staff, thus giving the pipe a range of two octaves. Obviously the same result would be obtained by applying the diaphragm to an organ-pipe. In order now to change the pitch note by note through two octaves or the range of the instrument, it is only necessary to control and regulate the vibratory action of the diaphragm, and this may be effected by stretching the membrane by hand to vary the tension thereof or by pressing the finger against the diaphragm as a damper, &c.; but in the present application of the invention I prefer to employ for this purpose a column of air coöperating with the diaphragm as a variable resistance. As shown in Fig. 2, the extension-pipe 8 would serve to inclose such a column of air and the movable piston as a means for varying the resistance or the effective length of the same. I have found that if a pipe, such as 8, closed at one end by a plug or piston 9 and open at the other, is properly proportioned to yield the tone of the whistle employing a flexible diaphragm, this same tone will be produced when the pipe and whistle are combined, as shown in Fig. 2; but the quality will be improved and there will be an increase in volume. The pipe 8 acts, therefore, as a resonator, and by adjusting the plug or piston the effective length of the column of air within the extension-pipe—that is to say, the resistance opposing the vibratory action of the diaphragm—may be varied and the pitch changed note by note throughout the range of the instrument. The adjustment of the piston in the manner suggested would obviously require skill and practice, and to avoid this I prefer to construct the whistle so as to utilize the mouth-cavity of the player as a resonator, which enables him to master the instrument at once, as a change of pitch under such conditions would mean simply a natural contraction or expansion of the mouth-cavity, as in whistling. Two forms of a whistle of this type are shown in Figs. 3 and 4. In Fig. 3 the diaphragm is arranged over the open

end of the pipe and a windway leads from the mouth-cavity to the wind-cutter formed adjacent to the closed end of the pipe. In the preferred form (shown in Fig. 4) I provide, for the convenience of the player, a conical-shaped mouthpiece 10, which may be readily held between the lips without discomfort or effort. A windway formed by a passage through the mouthpiece of the pipe leads to the wind-cutter adjacent to the diaphragm.

The operation, advantages, &c., will be apparent from the foregoing description.

Having therefore described my invention, I claim—

1. In a wind instrument, the combination of means for vibrating a column of air to produce a fundamental tone, and means responsive to the vibrations of said column of air adapted to lower the pitch of the tone produced.

2. In a wind instrument, the combination of means for vibrating a column of air to produce a fundamental tone and a vibratory diaphragm responsive to the vibrations of said column of air and adapted to coöperate with said means to lower the pitch of the tone produced.

3. In a wind instrument, the combination of means for vibrating a column of air to produce a fundamental tone, a resonator, and means responsive to the vibrations of said column of air adapted to lower the pitch of the tone produced.

4. In a wind instrument, the combination of means for vibrating a column of air to produce a tone, a vibratory diaphragm interposed at a point within the length of said column of air and adapted to transmit vibrations from one body of air to the other, and means for varying the effective length of the column of air on one side of the diaphragm.

In testimony whereof I affix my signature in the presence of two witnesses.

ALBERT LEECH.

Witnesses:

INGERSOLL LOCKWOOD,
EUGENE GEARY.