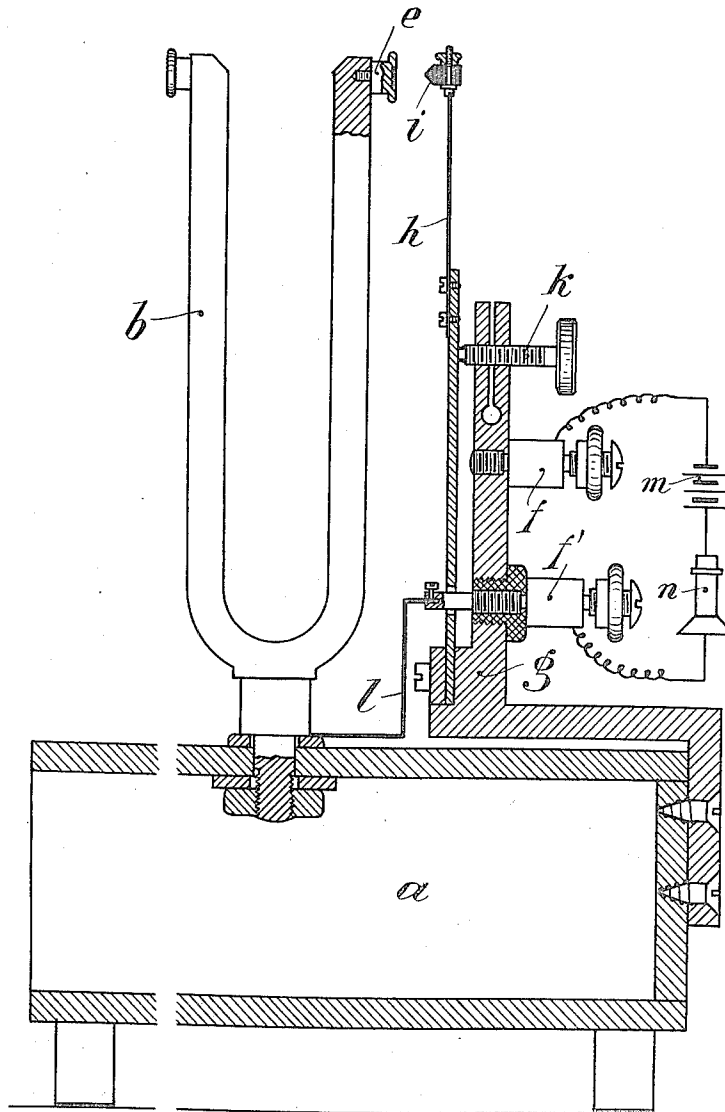


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 RESONATOR FOR EXAMINING THE HUMAN VOICE.
 APPLICATION FILED JULY 26, 1911.

1,028,165.

Patented June 4, 1912.



Witnesses:

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UNITED STATES PATENT OFFICE.

SUSANNE WEBER-BELL, OF PLANEGG, NEAR MUNICH, GERMANY.

RESONATOR FOR EXAMINING THE HUMAN VOICE.

1,028,165.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, SUSANNE WEBER-BELL, citizen of Germany, residing at Planegg, near Munich, Bavaria, Germany, have invented certain new and useful Improvements in Resonators for Examining the Human Voice; 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.

The tone of the human voice in singing consists of an accumulation of simple air-waves (sinus waves), as in all tones known to the science of acoustics. These simple waves are on the one hand the characteristic components of the vowels, on the other hand (and this is the more important point in singing) they consist of the following simple air waves: 1, a definite, especially intensive wave, of which the periods of oscillation are intended and defined in the notes of the music, and which gives the name to the note sung; physically this wave is called the fundamental tone. 2, Over this fundamental tone other waves are accumulated as further components, designated physically as the over-tones of the fundamental tone; these give the note its characteristic coloring, for instance, the note may be "sonorous," "soft," "thin," or "shrill," etc. Now it has been determined by the analysis of the tones that when the human voice contains that characteristic quality known as "fullness," the over-tones accompanying the fundamental tone stand in a definite relation to this overtone and consist of tones forming the natural sequence to this tone, that is to say, if the fundamental tone performs one vibration or wave in a certain unit of time, the next higher over-tone will perform two vibrations in the same time, the next four and so on. In other words, the overtones consist of waves having a periodicity which is the multiple of the periodicity of the fundamental tone, beginning with two. It must be remarked, that a fine, full voice contains only the lower over-tones, while the higher over-tones are suppressed; especially the first over-tone (octave) and the second (octave-fifth) are necessary and must be present in perfect pitch and intensity.

In order to insure a regular formation of

the voice it is necessary that singing master and pupil are personally able to examine their voices and to determine whether the tone given forth contains above all the first over-tone (octave) in sufficient power and of perfect pitch. This can only be attained with the help of physical accessory devices, since the ear cannot distinguish the over-tones, on account of the intensive sound of the characteristic tone.

The present invention relates to a device which makes it possible to form the vowel-tone according to the mathematical theory and to examine accurately its over-tones during singing and to ascertain whether the octave tone is present in the necessary fullness and strength.

The device consists of a special form of resonator or analysator in which a tuning-fork arranged on a sounding box and tuned to the same pitch is combined with a telephone receiver in such a manner, that the tuning-fork when vibrating periodically makes and breaks the circuit of the telephone receiver. The sounding-box is the analysator, of which the tone may be increased at will by the circuit of the telephone.

In the accompanying drawing a form of construction of the present invention is shown partly in section and partly in view.

On the resonator *a*, tuned to a certain pitch is arranged in perfect acoustic combination a tuning-fork *b*, tuned to the same pitch, of which the one arm is provided with a contact *e*. On one side of the sounding-box is arranged a support *g*, containing two terminal screws *f*, *f'*, insulated from each other, and a contact spring *h*, of which the contact piece *i* is opposite to the above-mentioned contact *e* of the tuning-fork *b*. The regulating-screw *k* completes the electrical connection between the spring *h* and the terminal screw *f*, while the terminal *f'* is connected to the tuning-fork by means of the wire *l*. To the terminals *f* and *f'* are further connected a battery *m* and a telephone receiver *n*.

The manner of working of the device is as follows: When a sound contains as a component that tone to which the resonator *a* and the tuning-fork *b* are tuned the latter will be caused to vibrate and will make contact between *e* and *i*, so that the person

examining the sound can hear said tone in the telephone, which is of especial importance in the case of the shrill higher tones.

What I claim as my invention and desire
5 to secure by Letters Patent is:

A device for analyzing the tones of the human voice comprising in combination, a sounding box, a tuning-fork mounted on said box provided with an electrical contact on one of its forked members, an electric circuit including a source of current
10 and an ear receiver with one line connected

with said fork, and a contact connected with the other line of said circuit and co-acting with the fork contact to make and
15 break circuits upon vibration of the fork, substantially as and for the purposes set forth.

In testimony whereof I hereunto affix my signature in the presence of two witnesses. 20

SUSANNE WEBER-BELL.

Witnesses:

ARTHUR V. W. COTTER,
MATHILDE K. HELD.