

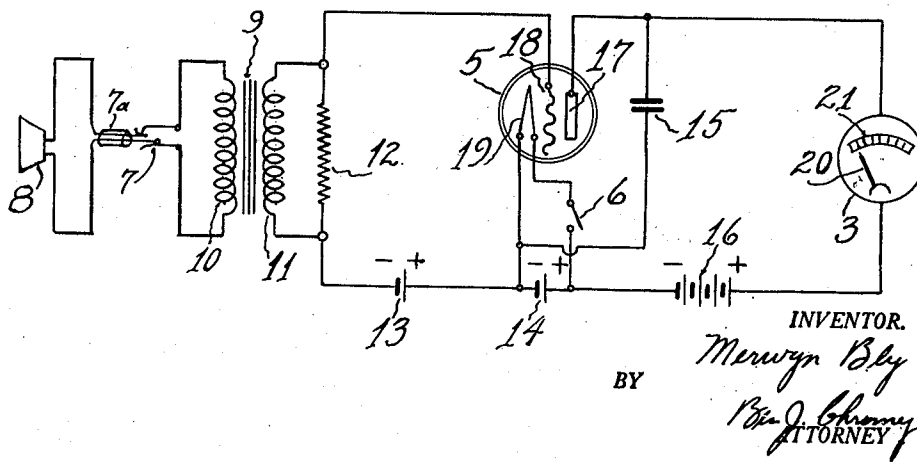
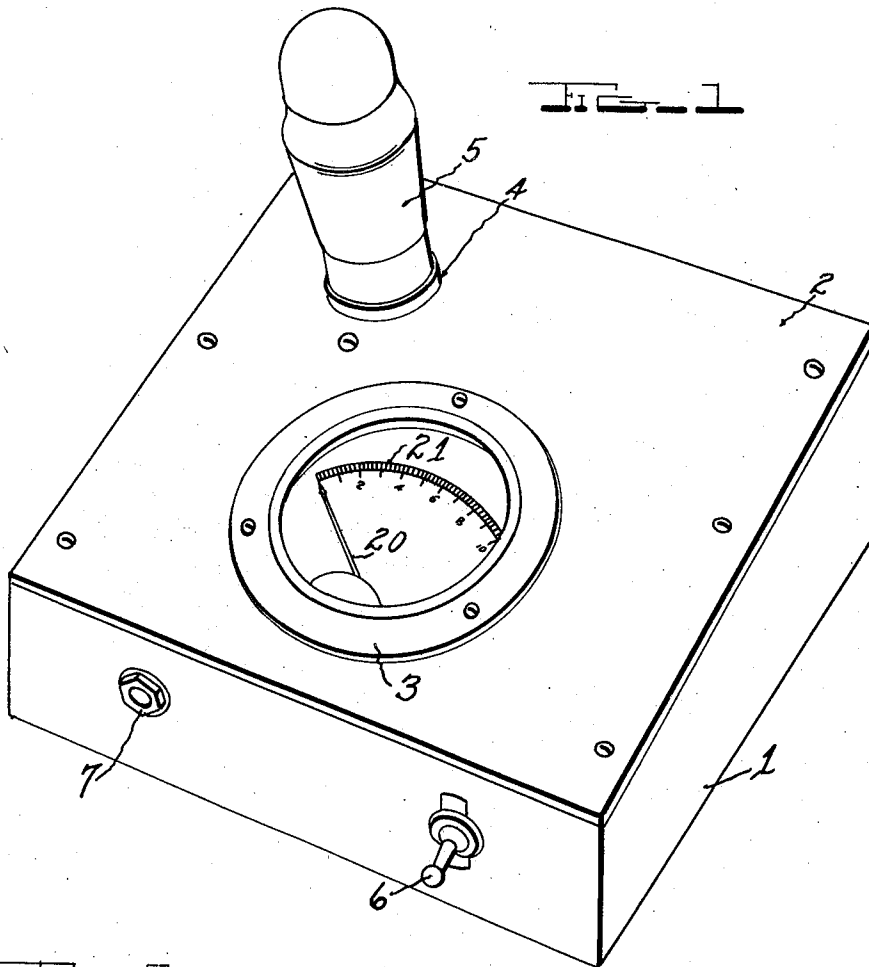
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M. BLY

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APPARATUS FOR TESTING AND IMPROVING ARTICULATION

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APPARATUS FOR TESTING AND IMPROVING
ARTICULATION

Merwyn Bly, Leesburg, Va.

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2 Claims. (Cl. 35—1)

My invention relates in general to speech instruction instruments and in particular to an apparatus for speech instruction employing electrical devices in a way heretofore not generally available to the public for a convenient and practical visual check of words and sounds as uttered.

This invention is designed to be of practical aid and value to public speakers, telephone users, schools of expression, classes of pronunciation, the deaf who wish to properly express the sounds or words, and particularly for those who wish to talk over public address systems or appear on radio programs.

My invention is simple; although it employs electrical apparatus it requires no technical knowledge to operate; it is easily portable; and is so designed as to be built at a comparatively low cost and thus be within the price range of the general public.

While the following general description covers one embodiment thereof the novelty lies in means for controlling and/or operating certain electrical circuits the user observing and analyzing the results obtained.

A form of the physical apparatus employed in accordance with my invention consists of a microphone, a microphone battery, microphone switch, microphone transformer, an amplifier tube and means for connecting these component parts into an operative speech input circuit. It consists further of a load resistor, a bias battery, a plate condenser, a plate battery, and a low reading milliammeter. The foregoing parts are arranged and connected in an operative circuit which may be designated as a "peak type vacuum tube voltmeter." The apparatus also includes a suitable housing for the speech input and amplifier tube circuit and this of course includes means for connecting a microphone to the device.

This embodiment has been chosen with the definite purpose of making the device most widely useful to the public and devoid so far as possible of complicated or expensive parts, keeping it portable for those who wish to rehearse in private or at some remote location, making it exceedingly simple to operate, and finally to incorporate an arrangement of circuit and parts that will cause its operation to closely approximate conditions customarily encountered in electrical communication circuits and sound systems.

In some instances, for example in cases where the apparatus is to be used in an office for the guidance of a person speaking over a telephone,

an amplifier energized from the 60 cycle 110 volt lighting circuit may be used.

In order to describe and illustrate features of my invention more clearly reference is made here to the six classes into which the fundamental speech sounds are divided, given in the following table:

- 1. Pure vowels—11
 - Long—ū (tool), ō (tone), ō (talk), a (far), ā (tape), ē (team)
 - Short—u (took), o (ton), a (tap), e (ten), i (tip)
- 2. Diphthongs—4
 - i' ou oi ew
- 3. Transitionals—3
 - w, y, h
- 4. Semi-vowels—5
 - l, r, m, n, ng
- 5. Fricative consonants—8

Voiced	Unvoiced
v	f
z	s
th (then)	th (thin)
zh (azure)	sh

- 6. Stop consonants—8

Voiced	Unvoiced
b	p
d	t
j	ch
g	k

The sounds l, r, m, n and ng are classified as semi-vowels since for these sounds the passage from the vocal cords to the outside air is partially blocked. In producing the sounds l and r the sound is allowed to flow around the tongue, however, to produce the sounds m, n and ng the air accompanying the sound is considered to flow through the nasal cavities. These latter sounds are therefore sometimes called nasalized stop consonants. The fricative consonants are characterized by the rushing round of the breath through the oral passage greatly narrowed.

I have found by the use of my invention most speakers can readily learn to satisfactorily enunciate the vowel sounds. While my invention may be of considerable assistance and practical value in assisting speakers to perfect their

enunciation of vowel sounds, nevertheless, the greatest practical benefit of my invention is in testing and improving articulation so far as it concerns the fricative and stop consonants. Heretofore no practical system to accomplish this purpose was offered to the public and placed into general use so far as I am aware.

Further details of my invention will be more fully set forth in the following specification and claims:

Referring to the drawing briefly, Fig. 1 illustrates a form of the apparatus employed in accordance with this invention and Fig. 2 illustrates schematically, the circuit employed on the apparatus shown in Fig. 1.

Reference numeral 1 designates the cabinet of wood, metal, plastics and the like employed for housing the electrical apparatus. The top 2 of the cabinet is slightly tilted with respect to the cabinet and thus supports the electric meter 3, which is preferably a simple type of meter employing a D'Arsonval type movement, may be conveniently observed by the user of this device. A vacuum tube socket 4 is also supported by the top of the cabinet and projects outward to receive the vacuum tube amplifier 5. A switch 6 which is mounted on the front side of the cabinet is employed to control the energization of the filament 19 from the battery 14 as shown in Fig. 2. A jack 7 adapted to receive the microphone plug 1a, is also supported by the front side of the cabinet.

The apparatus is connected as illustrated schematically in Fig. 2. A microphone 8 of any desired type is connected to the plug 1a and through this plug makes a contact with the terminals of the jack 7 which are connected with terminals of the primary 10 of the transformer 9. Where it is desired to check a student's progress over a period of time with the present apparatus, and suitable recordings are made of the student's speech at certain intervals these recordings may be compared with each other by using the apparatus of my invention. In that case the microphone 8 is replaced by a suitable sound record reproducing device which may be a light sensitive cell, a pick-up employing a stylus or any other sound reproducing devices depending upon the nature of the sound record.

The secondary 11 of the transformer is connected to the grid 18 and the cathode 19 of the vacuum tube 5. A resistance 12 is connected across the secondary and if desired this resistance may be variable. The batteries 13, 14 and 16 are connected into the grid, filament and plate circuits, respectively, as shown. The condenser 15 is connected across the plate 17 and the filament 19 and the small direct current milliammeter 3 is connected to the plate 17 and the positive terminal of the battery 16. This meter is provided with a pointer 20 and a scale 21 graduated evenly from 1 to 10.

When the filament switch 6 is closed and the vacuum tube 5 energized a small current will flow through the plate circuit of the tube and produce an indication on the meter 3. As a result the pointer 20 of this meter is moved to the first graduation or thereabout when the instrument is in operative condition even though no sound is being intercepted or picked-up by the device 8. This is a desirable feature inasmuch as this current normally flowing through the meter 3 produces a "cushioning" effect upon the needle when the needle is returning from a de-

flection of relatively large amplitude. For example, should the needle 20 be deflected to the eighth or ninth graduation by a sudden current impulse as when a word is loudly spoken into the microphone, when the needle is returning to zero after this sudden current impulse has died down, the normal current of small magnitude will tend to arrest the movement of the needle at the first graduation or thereabouts depending upon the magnitude of this normal current. This reduces the likelihood of the meter needle or pointer vibrating against the stops near the low reading end of the scale. When the switch 6 is turned on the amplifier tube 5 is energized and the device is ready for operation as soon as the plug 1a of the microphone 8 is inserted into the jack 7.

The peak type vacuum tube voltmeter employed in accordance with this invention affords a very practical degree of linearity within limits of the "grid voltage swing" when the proper type of input circuit, grid bias voltage, plate voltage and vacuum, of tube are selected.

In practice I have found a type 30 vacuum tube very satisfactory. The meter 3 is preferably an 0-1 milliamperes and the condenser 15 is preferably 0.001 microfarad. Of course these values may vary depending upon the amplifier tube selected. However very satisfactory results are obtained with this arrangement.

After the device is turned on by operating the switch 6, words or sounds are uttered into the microphone, causing instant changes in meter reading. By watching the meter pointer the operator can, for example, uttering the vowel "a" several times choose a tone of proper amplitude to give the meter pointer a top "swing" at any suitable reading on the dial. For illustration, the top swing for "a" may be chosen at a reading of 4 on the scale 21. The operator then utters the vowels "a", "e", "i", "o", and "u" in approximately the same tone as he originally uttered the "a", however, he will note that while "a", "o" and "u" will all give a swing of about 4 the "e" will give only a fractional reading and the "i" will produce a swing much higher, probably to 6 or higher. The "e" sound does not "modulate" sufficiently and the "i" sound is "overmodulating," or "blasting." It will be evident that variation in amplitude is necessary to keep the top swing of the meter pointer even for all the vowels. The user will then realize that the same holds true for words containing these sounds, and furthermore, that if he were talking over the telephone or over a public address system the "e" sounds would be lost to the audience and the "i" sounds would not be understood because of "blasting," until he had trained himself to allow for the differences in modulation produced by these sounds. By experimenting with words, having a final "ing" such as the word "broadcasting" he will note that unless very distinctly enunciated, the "g" sound will be lost entirely and hearers will get the impression he said "broadcastin." Improper pronunciation can be illustrated by the word "news." If slurred and pronounced something like "nooz" the meter swing will be very small even with comparatively loud speech while when properly pronounced in a normal tone as "n-e-w-s" with the "u" sound, the meter will show a good swing. Crisp speech will show a brisk meter movement and sluggish speech with a "hanging" movement.

This device also shows clearly which syllables or sound impulses do not reproduce sufficiently when sent through electrical circuits. Each syl-

lable or sound impulse uttered should produce a definite clear indication or pointer swing in the meter. From the above brief outline it is clear that my invention provides a novel means for

5 observing and correcting speech and volume of speech for understandability over telephones, public address systems or from platforms direct, and valuable in learning proper pronunciation and enunciation.

10 In the matter of those deaf it can readily be surmised that with the visual check my invention provides that matter of instruction of those so afflicted can be greatly simplified.

While the foregoing describes the general instruction features as based on one certain embodiment of my invention, in many instances even more satisfactory results may be secured from a somewhat different embodiment than the peak type voltmeter as described.

20 For example it has been found that a multiple-tube, high gain amplifier, with piezo-electric microphone and designed for A. C. operation of a built-in power supply, can operate on a slightly different principle and yet retain all the instructive value of my invention. In brief this particular embodiment has its indicating impulse based on voltage gain in the final amplifier tube instead of plate current change.

What I claim as my invention is as follows:

30 1. A sensitive amplifying apparatus for testing and improving articulation, comprising: a microphone adapted for producing electric current impulses corresponding to the syllables of words uttered, an amplifier including an amplifying tube having a grid, a cathode and an anode, means for biasing said grid with respect to said cathode to secure operation at the lower bend of the grid voltage-anode current characteristic, means for impressing said electric current impulses upon the grid and cathode of said amplifying tube, an indicating instrument connected to the output of said amplifier for producing indi-

cations of the peak values of said electric current impulses so that said indications of said indicating instrument may be observed and the relative amplitudes of the syllables uttered compared and the enunciation modified so that the indications produced by the indicating instrument bear substantially the same relation to each other as their relative importance in the word enunciated to give all of the syllables their proper emphasis, and impedance means connected to said indicating instrument proportioned to control the time response of said indicating instrument and to render said instrument responsive only to said word syllable impulses.

2. A sensitive amplifying apparatus for testing and improving articulation, comprising: a microphone adapted for producing electric current impulses corresponding to the syllables of words uttered, an amplifier including an amplifying tube having a grid, a cathode and an anode, means for biasing said grid with respect to said cathode to secure operation at the lower bend of the grid voltage-anode current characteristic, means for impressing said electric current impulses upon the grid and cathode of said amplifying tube, a sensitive D'Arsonval type indicating instrument connected to the output of said amplifier for producing indications of the peak values of said electric current impulses so that said indications of said indicating instrument may be observed and the relative amplitudes of the syllables uttered compared and the enunciation modified so that the indications produced by the indicating instrument bear substantially the same relation to each other as their relative importance in the word enunciated to give all of the syllables their proper emphasis, and a condenser connected to said indicating instrument proportioned to control the time response of said indicating instrument and to render said instrument responsive only to said word syllable impulses.

MERWYN BLY.