

A Telephone Transmitter Without a Mouthpiece

By H. R. Van Deventer

UNTIL the presentation of Prof. Whitehead's paper on the oscillations of a telephone diaphragm at the annual meeting of the A. I. E. E. at Boston last year, but little was understood regarding this important detail, and therefore practically all the commercial types of instruments have employed the same type of diaphragm as found in the very first instruments designed. The attention of most inventors has been directed toward refining and perfecting the structural details, and especially the resistance cell. Although this is a very important part, it is no more so than the diaphragm. Tyndall has found that the points of greatest vibration in a circular diaphragm clamped at its periphery are at a point midway between the center and the edge. Whitehead found that the diaphragm had two distinct motions, one superimposed on the other, one consisting of circular nodes and the other of oblique or diameter nodes.

A new transmitter is illustrated herewith which is the result of over five years of careful investigation of the properties of vibrating diaphragms. Instead of employing a loose diaphragm made of some dead metal, such as aluminium, which is commonly employed for the purpose, phosphor bronze is employed, which is rolled to produce an initial tension. The diaphragm is then formed, without drawing the temper, into a pan-shaped disk, the projecting edge of which is securely clamped, leaving the central portion free to vibrate like a drum head.

A resistance cell of the ordinary type is connected to the center of the diaphragm by means of a spider-shaped member having a plurality of feet which are soldered to the inner surface of the diaphragm. These feet, being equidistant from the center, pick up the sound vibrations at the maximum point, and it will be noted that this method of connection is entirely different from the ordinary method wherein the cell is connected to the diaphragm at the center. The cell with the diaphragm is placed in a back casing, the various parts being illustrated in the accompanying photograph. A connection is made between the front electrode of the cell and an insulated terminal carried on the casing in such a manner that the circuit is confined to the electrodes and granular carbon, so that no part of the casing or diaphragm is in circuit. Certain other details of construction, all very simple and easy of manufacture, result in an instrument which is absolutely water-tight, as it may be immersed in water for hours or even days without any damage whatsoever. The casing being of brass and the diaphragm of phosphor bronze, there is no corrosion such as commonly occurs in transmitters where aluminium diaphragms are employed.

As the sensibility of the instrument is considerably increased by the improved diaphragm construction, it is possible to dispense with the usual mouthpiece as commonly employed. Telephone companies figure, especially in the case of desk sets, that the annual maintenance cost for mouthpiece replacement is as high as 50 cents per telephone. The new instrument eliminates this charge, as the mouthpiece consists of a fiat perforated metal guard which is practically indestructible.

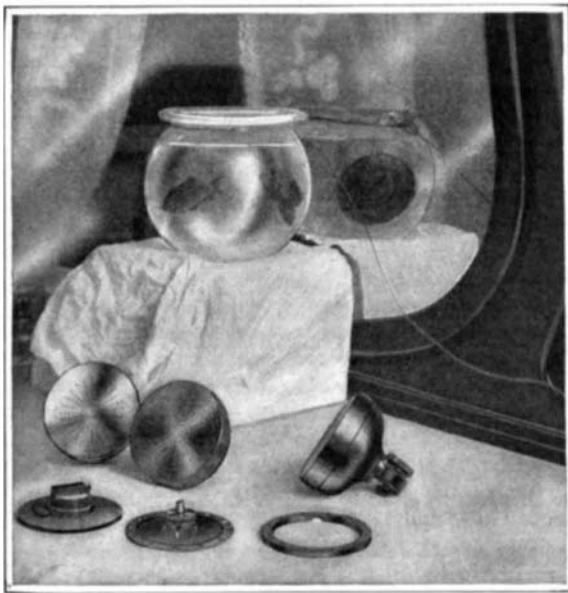
Being water-proof, this transmitter offers a perfect solution for the troubles met with in mine and railroad telephones, police boxes, testing sets, and instruments used in other exposed locations. It can be used in the operating rooms of hospitals, as it can be flooded or immersed in a sterilizing solution without injury. The cell, being in an air and water tight chamber, cannot deteriorate, and being directly surrounded by the metal casing, interior air spaces being reduced to a minimum, the heat due to the passage of current through the carbon is rapidly dissipated.

The sanitary features of this new instrument should be evident; the mouthpiece can be thoroughly cleansed, and as it is fiat, it will be often wiped off, which is not the case with the usual funnel-shaped mouthpiece. From tests made in several of the university laboratories and by the writer, the instrument, in its commercial form, was found to average from three to seven miles better in terms of standard cable than transmitters of ordinary construction.

The accompanying photograph represents the transmitter without guard or back shell, submerged in a fish globe filled with water. The looking glass, behind the globe, reflects the rear casing and attached wires. This exhibit was shown at the meeting of the National Independent Telephone Association at Chicago, Ill. The transmitter was connected with a testing set, adjusted

for use on a long distance telephone line and operated by two sets of fifteen dry cells, each set in series, and both sets connected in multiple. The room at the hotel was fitted with the usual telephone subscriber set, and the submerged transmitter, through the testing set, was connected with the city telephone line. The Chicago operator was requested to connect with a certain office in New York and the following tests were made:

Talking in an ordinary tone, six inches away from the fish globe, against the submerged transmitter, a conversation was carried on for over five minutes and New York reported that the transmission was perfectly distinct, and that the voice was heard in natural tones.



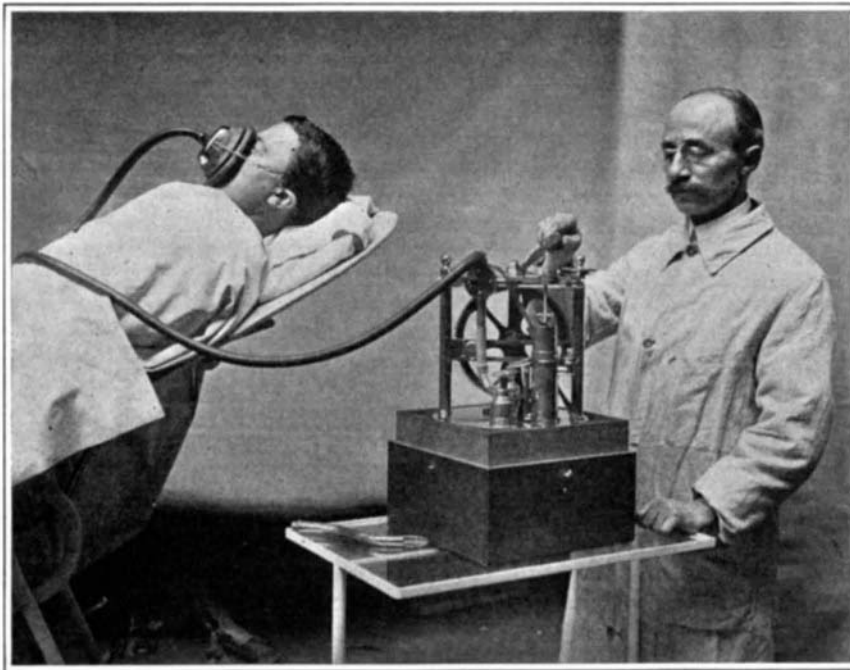
Telephoning from Chicago to New York with a submerged transmitter.

Following the conversation a repeating watch was held against the side of the globe and the striking of the hours and quarters was distinctly heard in New York. The transmitter was submerged from 3 P. M. Monday, February 17th, until the close of the convention, Thursday, February 20th, 6 P. M., or 75 hours. Then it was taken back to New York and again submerged in a globe of water, giving perfect transmission.

The Anesthetizing Machine of Prof. Dubois

By Jacques Boyer

IN a recent communication to the Academy of Sciences of Paris, Prof. Raphael Dubois opposes the method of producing anesthesia by way of the alimentary canal, which has lately been proposed by various writers, and shows that his anesthetizing machine, herewith



The anesthetizing machine invented by Prof. Raphael Dubois of Lyons, France.

illustrated, offers the most certain and most uniform means of administering chloroform.

The apparatus comprises a pump, an automatic device for introducing a measured quantity of the anesthetic, and a chamber in which the dose is evaporated. The pump has a piston of peculiar construction which is moved by turning a handle. At the end of each stroke of the piston a definite volume of air enters the pump barrel, carrying with it the vapor of the measured quantity of anesthetic that has been automatically poured into the evaporating chamber by the descent of a plunger into the vessel containing the liquid

anesthetic. In the return stroke of the piston the mixture of air and vapor is expelled from the pump and replaced by an equal quantity of a precisely similar mixture. In this way a continuous flow of the standardized mixture can be maintained.

The mask with valves, which is commonly used when the anesthetic mixture is drawn from a gasometer, and which may cause accident through derangement of the valves, has been replaced by a valveless mask, which allows the patient to breathe, without annoyance, in a current of air containing a known and constant proportion of anesthetic. In this method no danger attends an excessive rapidity of administration of the mixture, and the only inconvenience caused by supplying it too slowly is the possibility that the patient may be roused from the anesthesia by the inspiration of fresh air.

At the beginning of the operation the plunger is raised to the top of its course, the liquid anesthetic (chloroform or ether) is poured into its container and the handle is turned until the lower face of the plunger touches the liquid. The operator then applies the inhaling mask to the face of the patient and turns the handle until the dose of anesthetic has been expelled into the evaporating chamber.

After anesthesia has been produced a buccal or nasal tube, or the tracheal cannula which the photograph shows lying on the glass table of the apparatus, may be substituted for the mask, if an operation is to be performed on the face.

The advantages of the method of Prof. Dubois are manifold. In the first place, the surgeon knows exactly how much anesthetic is being administered, which is not the case when the liquid is introduced by manual methods, even when it is applied in drops with a registering pipette. In the second place, anesthesia is produced in a regular and continuous manner. This arrangement is particularly important for the prevention of vomiting, which is a symptom of return to consciousness. Finally, the excitement attending the initial stage of anesthesia is entirely eliminated, or, at least, greatly shortened and diminished, even with alcoholic patients. The applications of the machine which have already been made have proved the correctness of previously published appreciations of the production of anesthesia by mechanically compounded mixtures, and it is possible that the majority of surgeons will decide to employ this thoroughly scientific apparatus.

A New Theory of Sleep

THAT we sleep, not because we are exhausted, but in order to avoid being exhausted, is the way in which the Geneva physiologist, Claparède, formulates a new theory. According to this conception, which has been further elaborated by Trömmner, sleep is not the result of fatigue, but an impulsive self-disinfection process, which the body from time to time conducts against itself, so to speak, in order to get rid of waste products before they have a chance to become injurious. This view is expounded in an article by Dr. Adolf Koelsch in *Die Woche*.

He draws attention to the fact that just as combustion of fuel for the production of heat and energy is always attended by ashes and slag, so the slow combustion which produces heat and energy in the body by means of metabolic changes, is likewise attended by waste.

We read: "Since the senses never come to rest voluntarily or shut themselves off from the outer world, a point would eventually be reached when the organism would perish as a victim of general nerve exhaustion."

"In order to hinder this, Nature arranges betimes, i. e., before exhaustion can seriously injure the organism, to set in motion that opposition current which we term sleep."

Again, "The sight-endowed animal tends to take its sleep at night, since the stimuli which govern the animal's vital activities are then cut off."

For animals endowed with other special senses, but not with sight, the night is not so great a factor. "These can only blockade stimuli to the senses either by creeping into some secluded spot or by the action of Nature in causing an opportune production of a substance (a sort of hormone) which acts as an obstacle by entering the nerve path and deadening sensibility. There are numerous indications that the latter is what actually takes place."

It is believed that a sufficient degree of satiation is one of the influences which create such an obstruction, but the whole subject is still in need of extended investigation. Koelsch has also studied insects with confirmatory results.