ENGINEERING

Now a Machine That Talks With the Voice of Man

Voder Combines Electrical Currents to Produce Synthetic Speech; Converses at Signal From Keys

See Front Cover

NATURE took hundreds of thousands of years to teach man how to speak.

In two years, scientists have taught a machine how to talk, translating into real words and sentences signals punched into its controlling keyboard.

Controlled by a skilled operator who has learned how to mix the sounds the device's two electric discharge tubes produce, it combines varying electric currents that an amplifier turns into real speech. No phonograph records of any kind are ever used. It is the first device that actually creates human speech.

The name of this new robot is the Voder.

"Practice makes perfect," it told its first enthusiastic hearers at its debut before the Franklin Institute. It isn't perfect yet. But the Voder was good enough to convince its audience that the Fourth of July orators and, perhaps, even opera singers may some day have to look to their laurels.

This new synthetic orator will "lecture" with his "electrical accent" at the New York and San Francisco world fairs.

It is a compact machine resting on a small table, plus as many loudspeakers as are necessary to reach the audience. It has a pair of keyboard units, more than a dozen other controls and an electrical circuit featuring a vacuum tube and a gas-filled discharge tube.

It builds up speech from 22 fundamental sounds from which speech organs also create spoken words. The operator, in using the device, analyzes phonetically the words the machine is to speak, then duplicates the sounds, and therefore the words, by pressing the proper keys and controls.

The Voder proved itself to be quite an able talker at the hands of Mrs. Helen Harper of New York, first of 24 telephone operators to be trained in its use, and S. S. A. Watkins, Bell Telephone Laboratories scientist who taught it to speak. When members of the audience suggested even such difficult foreign phrases as "Hasenpfeffer" and "Comment allez-vous?" it repeated "Hasenpfeffer" and "Comment allez-vous?" with perfect aplomb.

The machine resulted from efforts of Bell scientists H. W. Dudley and R. R. Riesz in fundamental telephone research. They developed an electrical speech analyzer and a speech synthesizer, both of which were demonstrated at the Harvard Tercentenary. The former machine fed an electrical control pattern into the synthesizer. With the exception of the organ-like keyboard, all its parts are in regular telephone use.

When the subject of the Bell exhibit at the New York and San Francisco fairs came up, it was suggested that the machine that talked, when the analyzer fed it the proper pattern, would be a fit display—particularly if it could be made to speak when an operator punched a keyboard instead of merely seeing that the analyzer continued feeding it the proper signals.

Two fundamental types of sound are involved in human speech—the relatively musical note of the vocal cords, and a sibilant hiss which can be recognized most easily in a whisper. These sounds the machine imitates. The vocal sound comes from a vacuum tube, while the sibilant is produced in a gas-filled tube. The tubes themselves do not actually produce the sounds; what they do is produce an electric wave whose pattern corresponds to the sounds in question and which is converted into sound in an amplifier, just as occurs in a radio receiver.

These two fundamental sounds are given proper pitch by punching the right one or ones of 10 keys which control electric filters. Changes in intonation, as in asking a question, are made by raising or lowering a foot pedal. Three special tabs provide the "stop" consonants, "t", "p", etc.

The Voder is actually the superior of any human being alive in one respect, for it can speak in tones ranging from lowest bass to highest soprano, as determined by the flick of a knob. Ordinarily, however, it speaks in a firmly masculine baritone.

THE VODER

The young lady striking keys is creating a man-like voice. This and the cover picture are from the Bell Telephone Laboratories.

Mr. Riesz is also known for his work in connection with the development of the artificial larynx. He and his associates are accustomed to calling the Voder "Pedro" after the Brazilian emperor, Dom Pedro. Dom Pedro, when he listened to a demonstration telephone, then newly invented, at the Centennial Exposition in 1876, exclaimed, "My God! It talks!"

Heart of the device is a "relaxation oscillator," which produces a saw-toothed wave from the discharge tubes, instead of the rounded wave of a pure musical note. The machine has considerable difficulty with the so-called transitional consonants, such as "l" and "r", but otherwise its speech is clear.

Science News Letter, January 14, 1939

GEOLOGY—PHYSICS

Research By-Product Saved $500,000 During Depression

THERE is nothing much more fundamental than the constitution of the earth itself and the rocks that lie beneath our collective feet. In Washington there is a modest building full of laboratories where a handful of scientists are struggling with this problem.

During the World War the scientists at the Carnegie Institution's Geophysical Laboratory interrupted their program long enough to help create an American optical glass industry without which our