



**"HEARS" SPOKEN WORDS**—"Audrey," the electronic robot that "understands" and reacts to precisely enunciated numbers from one to ten by flashing an appropriate light, is shown here being put through paces by K. H. Davis, one of its designers at the Bell Telephone Laboratories.

## ELECTRONICS

## Telephonic Robot Device

Automatic digit recognizer "listens" to clearly enunciated digits, then matches the sound pattern electronically to standard referents stored in its "memory."

► AN ELECTRONIC device that can "understand" and recognize spoken numbers has been built at Bell Telephone Laboratories, New York.

The robot is named "Audrey," a contraction of "automatic digit recognizer." It has a special circuit to determine automatically which of ten numbers, from "1" through "0" has been spoken into an ordinary telephone, and responds by flashing an appropriate light.

The response mechanism, however, Bell engineers say, could equally well control other operations, such as dialing. Thus Audrey might be the forerunner of in-the-future devices that would allow putting phone calls through automatically, simply by speaking the desired phone number into the mouthpiece instead of dialing it.

It is hoped to extend the robot's vocabulary to include additional sounds, and words rather than numbers. The nerve system of the device uses the same sort of equipment as found in a telephone central office, particularly relays, the heart of the modern dial system.

It operates on the principle of memory and matching, first listening to the human voice, then sorting the speech sounds into electrical categories that conform to standard reference patterns already drawn electronically and stored in a memory cell.

When the device is adjusted for best performance with a particular speaker, it operates with remarkable accuracy, but it is not yet in a state to answer to a variety of voices reliably unless it is readjusted for each one.

Drs. K. H. Davis, R. Biddulph and S. Balashek of the Bell Laboratories point out, in describing the device in the *Journal of the Acoustical Society of America* (Nov., 1952), that voice-operated devices have been used for many years in transoceanic telephony. Some of these have proved useful in the suppression of electrical "echoes" that sometimes appear in very long telephone connections.

Until now, however, the devices have not had to distinguish between different words.

For many years scientists have been able to translate speech into visible form with

machines such as the sound spectrograph. From studies of the resultant patterns, the individual characteristics of speech components have been determined. These characteristics are relatively consistent, and fall into similar groups in their outlines.

From these studies has come the key which enables the recognizer to match essential elements in the spoken sound against a set of ten standards, then decide the best match.

The experimental equipment fits into a bay roughly the dimensions of a large console TV-radio-phonograph combination.

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## ICHTHYOLOGY

## 50 New Species of Fish Found in California Gulf

► PROVING THE old saying "there are still other fish in the sea," more than 50 new species have been found in the Gulf of California, ranging from tiny creatures no larger than a fingernail to large edible species of a bright crimson hue.

They were collected recently by Dr. Boyd Walker and Murray Newman, University of California at Los Angeles ichthyologists, who are helping to make a long-range classification of fauna found in southern California and Baja California waters. So far 585 species of fish have been identified in this region.

Among the edible fish found in the Gulf of California are several species that have long been sold in Mexican markets without ever having been officially identified by fish experts. Included in the collection are several rare species of sting rays, some of which grow to lengths of seven feet or more.

Science News Letter, January 24, 1953

## CHEMISTRY

## 2,000-Year-Old Iron Hints Tannates Stop Rust

► IRON RELICS 2,000 years old may yield to 20th Century scientists the secret of keeping underground water and gas pipes from corroding.

Discovered at Hungate, York, England, the iron articles ranged from hob nails to Roman knives and were buried in soil ordinarily most destructive to iron. Laboratory soil tests, however, showed tannates of a nearby medieval "shoe factory" had got into the ground and apparently had stopped the destructive action of sulfate-reducing bacteria on the iron objects.

Later work revealed that tannic acid in concentrations as weak as one one-hundredth of a percent will stop the bacteria from corroding iron.

Scientists working for the Department of Scientific and Industrial Research in London speculate this eventually will lead to a method of protecting water and gas pipes from corrosion.

Science News Letter, January 24, 1953