

## RADIO

# Long-Range Transmission

**Discovery of like-ionospheric characteristics on opposite sides of the earth will aid in predicting conditions for long-range radio transmission.**

► PREDICTING conditions for long-range radio transmission will be aided by recent findings at the National Bureau of Standards which makes possible a more complete picture of world-wide conditions of the ionosphere. This is the layer of electrically charged atmosphere high above the earth that reflects radio waves and makes long-distance radio transmission possible.

Important in the findings is that the ionospheric characteristics at any point on the earth are almost identical with those at a point on the other side of the earth directly opposite. Scientists call such positions antipodal points. Baton Rouge, La., and Watheroo, western Australia, are antipodal points at which testing stations are located. It has been found that Watheroo is as efficient for predicting Baton Rouge as it is for predicting Brisbane in eastern Australia.

For many years, much study has been given to the ionosphere, which scientists think is a series of ionized layers in the atmosphere some 50 to 250 miles above the earth. It is thought to be made electrically conducting through the action of ultraviolet light. Radio waves traveling in straight lines through the lower atmosphere are bent away from the vertical as they penetrate the ionosphere at an oblique angle. Certain frequencies are returned to the earth's surface, where they are reflected back toward the ionosphere. Were it not for these alternate reflections by the earth and ionosphere, it would be impossible to transmit any but purely local messages on high frequencies.

The ionosphere continually exhibits fluctuating characteristics because of changes in the amount of ultraviolet light it receives from the sun. The study of solar activity as evidenced by sunspots thus becomes a means of predicting ionospheric conditions. The earth's magnetic field also plays an important part in the distribution of ions. Other variations of the ionosphere with locality, season, and time of day or night constitute a complex geophysical phenomenon.

Daily "soundings" of the ionosphere are now being taken all over the world by an international network of 53 ionosphere stations, 14 of which are operated by the National Bureau of Standards. These stations collect data by emitting pulses of radio waves vertically upward and receiving their reflections with radar-like equipment.

In addition to other information, the daily soundings measure the heights of

the various layers in the ionosphere and indicate the degree of absorption of radio energy. This is related to the power required to transmit a given frequency over a particular distance. All the information obtained by the soundings is correlated with sunspot predictions to provide the working data used by the Bureau in predicting radio propagation conditions.

One over-all result of the work at the Bureau, which establishes the possibility of utilizing antipodal stations, is effectively to double the number of ionospheric sounding stations now available for prediction purposes. Gladys White and R. F. Potter of the Bureau staff are given credit for the achievement.

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## BOTANY

## Electricity May Help Insect-Catching Plant

► MEASUREMENTS showing a tiny electrical voltage from Venus' flytrap, a famed insect-catching plant, may help explain the operation of this strange death trap for flies, spiders and other insects.

Otto Stuhlman, Jr., of the University of North Carolina, told the American Physical Society in Cambridge, Mass., how the electrical measurements were made on the plant. The small voltages ranged from five-hundredths of a volt for summer growth plants down to one-hundredth in winter growth plants. The voltage changes moved from trigger hairs on the leaf across the leaf to the closure mechanism at a speed of about an inch a second.

Venus' flytrap has hinged leaves which operate on luckless insects in the manner of a common steel trap. The spike-like trigger hairs on the leaf start it closing.

The plant, found in some parts of North Carolina, was once called by Darwin, "the most wonderful plant in the world." Its diet includes at least as many spiders as flies, plus even such items as small toads.

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## ENGINEERING

## Ultrasonic Generator Utilizes Quartz Crystals

► WAFER-SHAPED quartz crystals, similar to those used to control radio wave frequency in transmitting stations, are employed in a new ultrasonic generator, a research device which emits sound waves

pitched above the range of human hearing.

Generators of ultrasonic waves have become more or less widely used in the past few years in laboratories, and practical applications are rapidly developing. These high frequency waves produce heat in objects in their path. They will kill insects, and also have killed white mice. Possible uses include the sterilization of foods, medical treatment, elimination of smoke, speeding up chemical reactions, homogenizing milk, and many other applications in biological, chemical and physical fields.

This new ultrasonic generator, which utilizes quartz crystals to produce the "silent" sound waves, is a product of General Electric. The crystals vibrate when electric voltages are applied across them. The wave frequency is dependent upon the size of the crystal, C. F. Falk, General Electric engineer, stated. They are roughly similar in size and shape to a hockey puck.

The new equipment is contained in a cabinet which resembles a small floor-model radio. Mounted on top is a transparent cylindrical case filled with oil within which the crystal is placed. The oil serves to insulate the high-frequency voltage across the crystal, and to transmit the sound waves to the test chamber directly above the crystal. Experiments with ultrasonics are conducted in the test chamber. A glass rod stuck into the chamber for a very short period becomes hot enough to burn holes in the paper.

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**SILENT SOUND GENERATOR—** Quartz crystal, contained in the translucent plastic case on top of the cabinet, generates high frequency sound waves pitched so high that the human ear cannot hear them. The new generator was developed by General Electric for research into the possibilities of putting the inaudible waves to work.