PHYSICS

All-Wavelength Broadcast to Probe Earth's Ionosphere

Unique Radio Station, Licensed to Operate on All Frequencies, Sends Regular Signals to Ionosphere

A UNIQUE radio station, which has the only permit ever granted by the Federal Communications Commission to broadcast continuously on all radio frequencies, is in operation at Kensington, Maryland.

The only comparable station in America is that of the National Bureau of Standards where the radio division operates a transmitter by special Presidential decree.

Known as Special Experimental Station, W3XFE, the all-wave transmitter broadcasts only to itself and enables the scientists of the department of terrestrial magnetism of the Carnegie Institution of Washington to bounce radio waves off the electrically-ionized layers scores and hundreds of miles above the earth's atmosphere. A study of these radio reflecting layers, or "mirrors" as they have aptly been called, is disclosing new facts about radio transmission, magnetic storms around the earth, particle emission from the sun and magnetic storms on the sun itself.

You Won't Hear Signals

Even if you own the most modern all-wave radio receiver don't sit up tonight trying to get W3XFE and its "click-click-click" signals. Radio engineers of the Carnegie Institution worked for six months with engineers of the FCC proving that although the Carnegie Institution station broadcasts on all frequencies of police, airplane, commercial and ordinary broadcast radio bands there is no interference with them. And what is just as important for research is the absence of interference of ordinary radio communication with those high-flung radio signals of science.

The Explanation

Why the Carnegie Institution station causes no interference when it is transmitting on a frequency of 660 kilocycles or 980 KC (assigned to stations WEAF in New York and KDKA Pittsburgh, respectively) is puzzling at first and the answer might be the reply to a seemingly meaningless question, "When is a radio signal not a radio signal?"

In the first place, explained Dr. L. V. Berkner, who installed the station, the radio pulses shot upward to the radio layers of the ionosphere come at the rate of only ten a second. Since this is 50 per cent below the lower limit of hearing, or frequencies which the ear detects as a low-pitched note, the signals —even when heard on the special receiver of the station—are only a series of clicks.

Moreover, the Carnegie station is continually changing frequency from short wave signals of 16,000 kilocycles to long waves with a frequency of 516 kilocycles and passes over its entire range every 15 minutes.

If this seems too involved, Dr. Berkner pointed out that on any radio channel to which you may tune your receiving set only five tiny clicks lasting a total time of one-half second will occur every 15 minutes.

In addition the special antenna used by the radio station is so designed that a great majority of the radio energy being liberated is going directly upward and even to a nearby receiver just outside the "shock" area of the station there is only an inappreciable signal. Even though such a receiver may be only a mile away from the station any signals it receives have gone upward to the reflecting layer and bounced back. The nearest layer is about 100 kilometers up so that the receiver is really removed an equivalent distance of twice that amount, or about 124 miles.

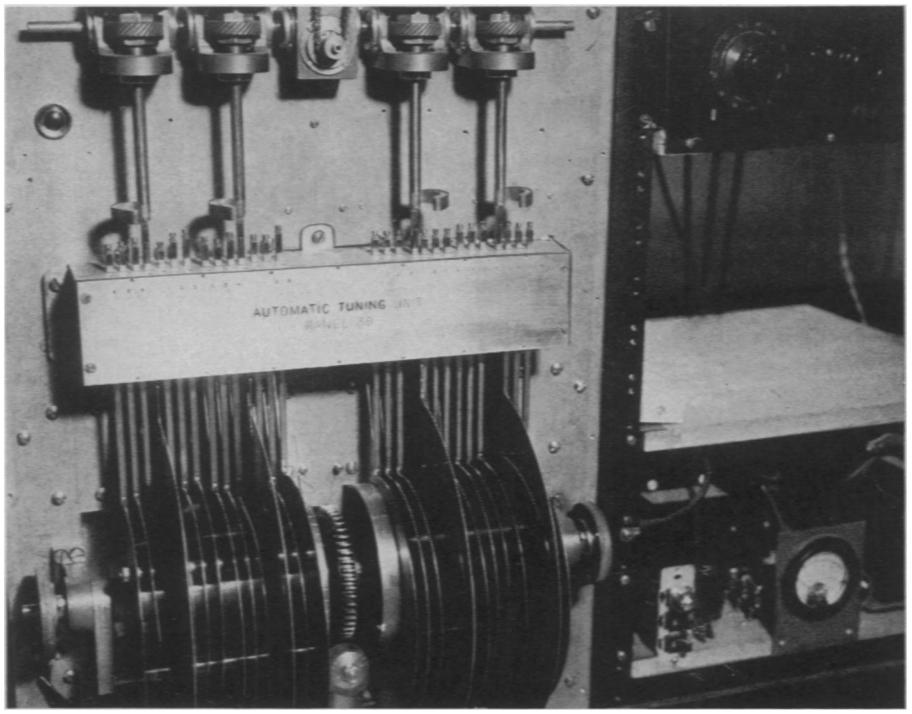
Receives Own Signals

As if these items were not enough, station W3XFE is so designed that its receiving set is electrically interlocked with the transmitter and continuously tunes itself to receive the ever-changing signals.

Those signals, moreover, are of a special kind, having what the radio engineers called decided sidebands. An ordinary radio receiver is designed to cut off such sideband characteristics while the Carnegie station receiver is built so that it is especially sensitive to

ON ALL FREQUENCIES

Dr. L. V. Berkner, Carnegie Institution scientist in charge of studies of radio reflection from the charged layers of the earth's atmosphere, adjusting transmitter of the unique radio station licensed to broadcast on all frequencies.



HEART OF UNIQUE RADIO STATION

Here is the automatic tuning panel of the radio transmitter which sends out, every 15 minutes, signals in frequencies varying from 516 to 16,000 kilocycles.

them. Thus W3XFE, while broadcasting continuously, lives in a radio world all its own.

No Loud Speaker

A visit to the station shows familiar control panels, but no loud speakers or the "da-da-dit-da" purr of a spark transmitter. All reception of the signals from far above the stratosphere is on a photographic recorder which makes a continuous and permanent record of the height at which any given frequency of signal is reflected.

A continuous probing of the radio reflecting layers, known technically as the E, F, F_1 and F_2 layers, has made possible a study of the changing daily pattern of these ionized regions above the earth. Seasonal patterns are also disclosed and the effect of increasing solar activity in the form of sunspots can be correlated with an increase or decrease in the effectiveness of radio transmission on earth.

The scientists of Carnegie Institution are not content to study such profound world-wide changes in the outer limits of the earth's ionized layers from a single station. Similar studies are being undertaken at Huancayo magnetic observatory high in the Andes Mountains of South America and at the Watheroo station, Australia.

To obtain better data and simplified operation of equipment the automatic radio transmitter just described has been built and successfully passed its tests. Installation of such transmitters is now under way at these widely spaced observatories with the hope that other independent and competent laboratories will take up the problem with similar apparatus.

Science News Letter, January 16, 1937

MEDICINE

Cancer Weapon From Normal Body Tissue

NORMAL, healthy tissue of the body itself may yield an effective weapon against cancer. This possibility appears from experiments reported by Dr. James B. Murphy of the Rockefeller Institute for Medical Research at the cancer symposium held by the American Association for the Advancement of Science.

Dr. Murphy has extracted from various kinds of body tissues a substance which checks the growth of cancers and another substance which stimulates their growth. The work is still in the laboratory stage and has not yet progressed to the development of anything like a practical means of curing cancer. But Dr. Murphy says of his studies:

"The results are definite and leave no doubt that normal tissue may yield a substance apparently harmless to normal cells which prevents or retards the growth of cancer cells."

From extracts of fowl tumors Dr. Murphy obtained a substance which, when concentrated, neutralized the filterable causative agent of the tumor and prevented the growth of a type of cancer in other animals besides fowl.

A similar cancer-growth-checking substance was found in several active normal tissues. Chief among these tissues are placenta, embryo, skin and prelactating mammary gland. Material from these tissues definitely checked the growth of transplanted cancers in laboratory animals and also checked the growth of new cancers that occurred naturally or spontaneously in such animals.

"In the case of one tissue, the prelactating mammary gland," Dr. Murphy reported, "it has been possible to separate out both an inhibiting (checking) and a stimulating factor for transplanted cancer."

Dr. Murphy's studies were undertaken on the theory that cancer is the result of a break in the supposed balancing mechanism of the cell which consists of a stimulating and retarding factor. The evidence obtained from his studies cannot, he said, "be considered adequate support for the general hypothesis that malignancy is a break in the internal control mechanism of the cell."

Science News Letter, January 16, 1937

TECHNOLOGY

Birdproof Windshield Sought by Scientists

SCIENTISTS at the National Bureau of Standards are searching for some new transparent plastic material which will be strong enough to serve as an airplane windshield for those accidents where a bird flies against it. Another need is for a drinking cup material for use in prisons so that lethal weapons cannot be easily obtained as with present heavy crockery.

Science News Letter, January 16, 1937

A dictionary of American English, dealing mainly with words that have originated in the United States, is being compiled.

A Japanese company is to market a new paint enamel made from urea resin which is designed to withstand heat without discoloring, even up to 150 degrees Centigrade.