

RADIO

Ultra-Short Radio Waves Sent Around Curvature of Earth

Marconi Again Achieves "Impossible" in Transmission With Two-Foot Waves Over Distance of 94 Miles

GUGLIELMO Marconi has again confounded the prophets. He has shown that his ultra-short radio waves are able to pass through mountains and even curve around the surfaces of the earth to receiving stations far below the horizon.

History repeats itself again. For in 1901 Prof. H. M. Poincaré, distinguished French mathematician, predicted that communication with electrical waves would be limited to about 165 miles. In that same year Marconi demonstrated that electrical waves could be sent and received across the Atlantic.

Modern theorists had predicted that the ultra-short waves would act like light waves from a searchlight and would not be detectable beyond the horizon. Messages have now been sent from the inventor's yacht to an experimental station 94 miles away in inland Italy, more than three times the predicted distance.

The explanation for this property of the waves to bend about the earth and to curve around objects is not known. Theorists have attacked the problem by treating the radio waves as light waves and have extended the diffraction theory which explains the microscopic bending of light around corners to the ultra-short radio waves, but without marked success.

Vast Transmission Field

The success of Marchese Marconi in perfecting the transmission and reception of these ultra-short radio waves opens up a vast field in the modern science of the transmission of information.

Marconi's new waves are only two feet long as compared to the ordinary radio waves of about 900 feet. Their most distinctive feature is that they are almost like light waves and can be focussed upon a receiver, thus allowing private communication. It is thought that they can not be reflected back from the ionized layers of the upper atmosphere, which act as huge reflectors to ordinary radio waves. A beam of the

ultra-short waves directed upwards would pass through this region which is about 200 miles above the earth and shoot off into interplanetary space.

Marconi and other Europeans, as well as investigators in this country, are using the ultra-short waves much like a searchlight. Since the waves are not much longer than light waves they may be focussed and projected by parabolic reflectors and antennae similar to a section of an automobile headlight. These "quasi-optical" waves are thus not adapted to long distance communication but may readily be developed for private communication between stations where telegraphy or telephony is impracticable.

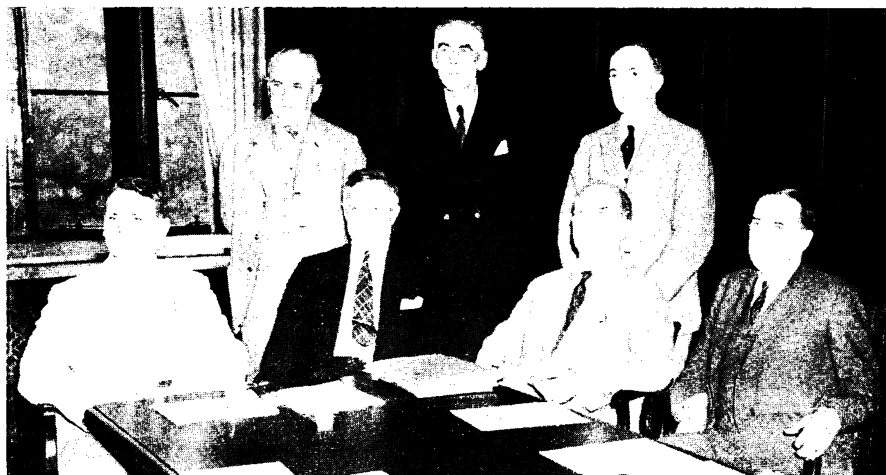
In contrast to long radio waves, the Marconi waves have the advantages of being efficiently projected in small directive beams, requiring minute amounts

of power, of not being affected by atmospheric disturbances, and of allowing secrecy of communication.

The renewed interest in these short waves brings up the question of allocation of wave lengths to various types of broadcasting. In the earlier days of radio the commercial broadcasting stations received the then popular band of wave lengths from about 200 meters to 550 meters. The amateur radio experimenters were given the then impractical short wave band from 5 meters to 100 meters. But time has shown that the latter band is extremely valuable and it has been encroached upon by the police, air transport lines, and governmental services. The congestion that has arisen may be relieved by the growing use of the ultra-short waves from about 5 meters down to 5 centimeters or about 2 inches. Below this minimum wave length the waves are too greatly absorbed by the atmosphere to be valuable for communication purposes.

More Channels

Although the spread in wave length of these quasi-optical waves is very small, the frequency range is enormous. Carrier waves of commercial broadcasters have a range of frequency from 500 kilocycles to 1500 kilocycles and as each station needs about 10 kilo-



AT FIRST MEETING OF PRESIDENT'S BOARD

These scientists attended the first meeting of the Science Advisory Board of the National Research Council, recently named by President Roosevelt to aid the Government in coping with scientific problems. (SNL, Aug. 19, '33, p. 123), which was held in the National Academy of Sciences building in Washington August 21, 22, 23. Left to right—Isaiah Bowman, Chairman, National Research Council, and Director, American Geographical Society; R. A. Millikan, Director, Norman Bridge Laboratory of Physics, and Chairman of the Executive Council, California Institute of Technology; Karl T. Compton, Chairman of the Committee, and President, Massachusetts Institute of Technology; C. K. Leith, Professor of Geology, University of Wisconsin; W. W. Campbell, President, National Academy of Sciences; Frank B. Jewett, President, Bell Telephone Laboratories; and John C. Merriam, President, Carnegie Institution of Washington. The two members unable to attend this meeting were Gano Dunn, President, J. G. White Engineering Corp.; and Charles F. Kettering, President, General Motors Research Corp.

cycles for a channel there are only 100 frequency bands available. The ultra-short waves have a frequency range of from 60,000 kilocycles to 6,000,000 kilocycles. Thus there would be room for 594,000 channels if each station would still require a 10 kilocycle band.

Foreign countries have used the short waves between 1500 to 50,000 kilocycles for commercial broadcasting for many years. The new shorter waves will

find application in television and private broadcasting. They have already replaced optical or light signalling between coastal stations and between forts along a frontier. Marconi has expressed the opinion that they will be found advantageous in many cases where the erection and maintenance of an ordinary short distance telephone or cable circuit is difficult, or too expensive.

Science News Letter, September 2, 1933

PSYCHOLOGY

Individual Needs Considered In Re-employment Program

IF YOU SHOULD look for a job in one of the new U. S. Employment Service offices, you may be sure of receiving individual attention. The old method of crowded handling of masses of applicants is banned by a new guide or manual under which all public employment offices are expected to operate.

The manual, which is now being prepared under the direction of Dr. William H. Stead, new head of the Employment Service's division of standards, will state the standards which employment offices must meet, and will serve as a guide to officials operating such offices.

A personal interview with each applicant is one of the requirements of this new handbook. Other improved procedures are recommended. For example, instead of requiring the applicant to list on his record the last four jobs he has held, the new manual requires that he list his last job, the most important job he ever held—that is, the one in which he feels he was most effective—and the job that paid him the highest salary. This gives a much more accurate picture of what the person is capable of, especially at present when a great many have been forced out of their regular vocations and have had to take anything and everything that might be available.

The personnel of the offices receiving Uncle Sam's okay must be up to certain standards, too. Both experience in employment work and a certain minimum of training are required for these positions.

No attempt will be made, at present at least, to give the applicants vocational guidance. Each office will, however,

gather information on the labor market; what industries are expanding in the locality, which are running behind, where the greatest opportunities for employment and advancement may be found. All this information will be sent to the Washington office which will serve as a center for the latest employment information.

Plans are under way for the U. S. Employment Service to cooperate with national foundations in a research program with a view to improving the work of the employment offices as the central machinery in organizing the labor market. Two projects are being actively considered at the present time. The first is an application of the methods of simplified practice to employment. At present each industry has its own classification of multitudinous jobs, even the names of which are unknown outside that particular industry. Some of them are very simple operations, perhaps requiring the tossing of articles into a hopper or feeding them onto an endless belt. Others require strength and involve lifting of heavy weights. Still others are supervisory in nature, and so on. The projected research program plans a re-classification of jobs in all industries in terms of the human qualities required. Then the man who is qualified for a job in one industry will be able to secure employment at the same sort of work in another industry.

The second project will involve a thorough study of persons successfully employed in various types of work to determine what qualities lead to success in each occupation and how to measure those qualities in a given individual.

Science News Letter, September 2, 1933

PHYSICS

Physicist Reconciles Views Of Matter and Electricity

SCIENTISTS can at last reconcile the classical concepts of electricity with the ultra-modern view of matter and electricity, Prof. Max Born, theoretical physicist of the University of Göttingen, Germany, has announced in a communication to the Aug. 19 issue of *Nature*.

Many unsuccessful attempts have been made in the last few years by eminent theorists to combine the classical concepts of electricity first expressed in a mathematical form by Prof. Clark Maxwell in 1864 with the new quantum concepts of Profs. W. Pauli, Werner Heisenberg and P. A. M. Dirac. The failure of these attempts was not due to the quantum theory but rather to the classical concepts that did not take account of the size of the minute particle of electricity, the electron, but considered it as a mathematical point.

Prof. Born has deduced how the Maxwell equations must be changed. His treatment of the problem is based on a new method of considering the allowable states of an electrical field. The four dimensions, three of distance or space and one of time, are treated symmetrically and the principle of relativity is fulfilled.

With this new treatment Prof. Born states that there is no difficulty in calculating the properties of a moving electron on the basis of the classical theory, a feat that could not be accomplished previously.

Prof. P. A. M. Dirac, leading mathematical physicist in England, gave his opinion that this reconciliation is a major advance in the understanding of matter and electricity.

Science News Letter, September 2, 1933

CHEMISTRY

Ozone Most Abundant Eight Miles Above Earth

THE REALTOR'S slogan "Out of the smoke zone, into the ozone," based on dubious claims of the health-giving properties of ozone, would necessitate a trip to the stratosphere, for Drs. F. W. P. Götz of the Lichtklimatisches Observatorium, Arosa, Switzerland, G. M. B. Dobson and A. R. Meetham of Oxford, England, have announced in a communication to *Nature*, that ozone is