

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

CHEMISTRY

Dead Seas Hoard Minute Amounts of "Heavy" Water

Borax Beds, Dead Sea and Great Salt Lake Are Reservoirs; Excess Weight Proportioned Between Hydrogen and Oxygen



THEY STILL WHISTLE

Despite their age of almost one thousand years, these whistling jugs from ancient Peru still whistle when they are moved about. Change in water level within the jugs forces air through a whistling device. Dr. John Alden Mason, curator of the American division of the University of Pennsylvania Museum, is regarding his recent acquisitions.

most abundant in a layer about eight miles above sea level.

Ozone is a form of molecular oxygen that has three atoms of oxygen to each molecule instead of two as in the common oxygen necessary to support life. It has a peculiar sharp odor and is usually produced by high-voltage electrical discharges. Engineers in high-voltage generating plants often suffer from severe headaches supposed to be due to too great a concentration of ozone in the air.

Estimates of the height of this layer are based upon observations of the spectrum or color of the clear blue sky directly overhead when the sun is either rising or setting. The experimenters state that changes in meteorological conditions affecting the total supply of ozone take place at these great heights and not near the surface of the earth.

Previous estimates of the height of this layer were very unreliable and placed it at about 25 to 30 miles above sea level.

Science News Letter, September 2, 1933

THE NEW "heavy" water, science's latest strange addition to common chemical substances, has been found in detectable quantities in the salt deposits at the bottom of extinct stagnant seas.

Dr. E. B. Washburn, chief chemist of the Bureau of Standards, has announced that the richest natural source of this peculiar type of water is to be found in native borax, a salt that exists in the beds of dead seas. The water of crystallization of this native borax contains seven parts of heavy water in every million parts of ordinary water.

Samples taken from the largest existing bodies of stagnant water, the Dead Sea in Asia Minor and the Great Salt Lake in Utah, when purified showed an increased weight over pure ordinary water. The Dead Sea water was heavier by two parts in a million and the Great Salt Lake sample was three parts in a million in excess of standard light water.

These natural sources of heavy water do not begin to compare in concentration with those prepared in the laboratory by Prof. Gilbert N. Lewis, distinguished chemist at the University of California. Prof. Lewis has succeeded in preparing heavy water that is 35,000 parts per million heavier than ordinary water. Recently he has shown that pure heavy water will prevent the sprouting of tiny tobacco seeds and is determining now whether the seeds subjected to these tests were actually killed or only inhibited.

Dr. Washburn explained the presence of heavy water in stagnant seas as due to the faster evaporation of light water. The strange heavy component lags behind and in the course of thousands of years the remaining water becomes richer and richer in heavy water. The native borax that gave the highest concentration presumably came from a sea that was very old and had very few sources of fresh water.

Heavy water, like all water, has two atoms of hydrogen and one atom of oxygen. But either the hydrogen or the

oxygen atoms, or both, in the heavy water have heavier hearts or nuclei than the common hydrogen or oxygen nuclei present in ordinary water. These rare types of hydrogen and oxygen are known as hydrogen isotope of mass two and oxygen isotopes of masses eighteen and seventeen. Part of the increased weight of the heavy water is due to the heavy hydrogen atoms and part is due to the heavy oxygen. The discovery of heavy hydrogen was made only two years ago by Prof. H. C. Urey and Dr. G. M. Murphy of Columbia University and Dr. F. G. Brickwedde of the U. S. Bureau of Standards.

Just how much of the increased weight of heavy water is due to heavy-weight hydrogen and how much to heavy-weight oxygen has been shown by Prof. Gilbert N. Lewis of the University of California in a communication to the *Journal of the American Chemical Society*.

All water molecules are composed of two atoms of hydrogen and one atom of oxygen, H_2O . But there are two kinds of atoms of hydrogen and three kinds of atoms of oxygen. The different atoms of any one element have different weights because (Turn to Page 156)

ENGINEERING

Idle Boilers Protected From Rust With Ammonia

RUSTING of idle steam boilers may be overcome by the use of gaseous ammonia, is the statement of the Merseburg ammonia works of the large German dye manufacturing company I. G. Farbenindustrie.

Boilers that are to be shut down are blown dry with air as completely as possible and then filled with ammonia gas from a pressure container. The ammonia reacts with the remaining water in the boiler to form rust-proof surfaces. These compounds can be removed from the surface by flushing the boiler with water.

Science News Letter, September 2, 1933