SCIENCE NEWS

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RADIO BEACONS

RADIO beacons, marking the air routes of the nation, will soon make it possible for airplanes to fly safely in fog and passengers to rely on the time-tables of the airways, Dr. J. H. Dellinger, chief of the radio section of the U. S. Bureau of Standards predicted to the American Institute of Electrical Engineers recently.

Dr. Dellinger told of a practical test of the radio beacon developed in his laboratory. The day was misty and the weather charts read "low visibility." The pilot who had never flown the route was relieved of all his maps. His only instructions were to fly from Philadelphia to Washington using as his guide the radio beacon. The beacon-indicator led him accurately to the College Park field outside of Washington, the sudden deflection of his indicator told him his journey was ended and he landed safely on a field he had never seen.

"The directive radio beacon is a special kind of radio station, usually located at an airport, just off the landing field," said Dr. Dellinger. "Instead of having a single antenna like an ordinary radio station, it has two loop antennas at an angle with each other. Each of these emits a set of waves which is directive, that is, it is stronger in one direction than others. When an airplane flies along the line exactly equidistant from the two beams of radio waves, it receives signals of equal intensity from the two. If the airplane gets off the line it receives a stronger signal from one than the other.

"The indicator on the instrument board of the airplane shows when the signals from the two beams are received with equal intensity by means of two small vibrating reeds. When the beacon signal is received the two reeds vibrate. The tips of these reeds are white in a dark background so that when vibrating they appear as a vertical white line. The reed on the pilot's right is tuned to a frequency of 65 cycles and the one on the left to 85 cycles. It is only necessary for the pilot to watch the two white lines produced by the vibrating reeds. If they are equal in length, he is on his correct course. If the one on his right becomes longer than the other, the airplane has drifted off the course to the right. If he drifts off the course to the left, the white line on the left becomes longer. Thus if the pilot leaves the regular course either accidentally or to avoid stormy area, the radio beacon will show him the way back.

"The whole receiving system comprises a small indicator unit on the instrument board weighing one pound, a receiving set weighing less than 10 pounds and a 10-pound battery. The same receiving set can be used to receive radiotelephone messages by plugging in a pair of headphones. The receiving system is very little affected by interference, including static, other radio stations and airplane ignition interference, which has hitherto been the bar to satisfactory use of radio on airplanes.

"The beacon stations will probably be placed at airports in general averaging about 200 miles apart. The Airways Division of the Department of Commerce Aeronautics Branch has begun a program of installing them on the various airways. The directive beacons, with a straight airway between them, will be supplemented by small marker beacons at intervals (perhaps 20 miles) along the route. These are simply very low-power radio transmitting stations serving as mile-posts. A characteristic signal from a marker beacon will show on the visual indicator aboard the airplanes when that point is being flown over."

THE NEW GERMAN CRUISERS

THE cruiser debate now raging on Capitol Hill has had a new angle suddenly introduced by the disclosure of details concerning a new type of German fighting ship now building, which have just become known in Washington. The *Ersatz Preussen*, first of a group of four to be built, represents enormously more hitting power than has ever been crowded into a 10,000-ton ship by the naval architects of any other nation. It is not unlikely that a complete revision of the specifications of the 10,000-ton "treaty cruiser" type will have to be made in answer to this latest stroke of the German Admiralty.

The *Ersatz Preussen* will carry as her main battery six 11-inch guns in two three-gun turrets, supplemented by eight 5.9-inch guns to repel torpedo attacks and four 3.4-inch anti-aircraft guns. She also carries six 19.7-inch torpedo tubes on two triple mounts.

The appearance of a ship carrying guns as heavy as 11-inch, in a class where the conventional armament has been 8-inch or less, is a peculiar result of treaty restrictions. By the terms of the Versailles treaty Germany was forbidden to build any battleships or battle cruisers, and the size of such warships as she might construct was limited to 10,000 tons—less than a third of the displacement of modern capital ships. But nothing was said about the caliber of the guns such ships might mount. Their small displacement would of course preclude an armament of 14- or 16-inch pieces, such as post-war superdreadnaughts carry.

Then, at the Washington conference, the signatory powers agreed not to build any cruisers of more than 10,000 tons. They limited themselves also to guns of 8-inch caliber. These restrictions will remain in force until 1931.

The typical post-conference cruiser, as built by Britain, Japan and France, mounts eight 8-inch guns, though tentative plans for the American ships provided for in the 15-cruiser bill call for nine. By sacrificing armor, fuel or machinery, enough weight might be gained to raise the battery to ten 8-inch guns. But that would be about the limit for a 10,000-ton cruiser.

The new German ship will be able to throw from her six 11-inch guns a broadside totalling nearly 4,000 pounds, for each 11-inch shell weighs 662 pounds. Eight 8-inch guns, with shells weighing 260 pounds apiece, could

answer this with a broadside of not much over 2,000 pounds, and a ten-gun cruiser would have only a 2,600-pound broadside.

Thus, broadside for broadside, the German ships would have the post-conference cruisers outgunned nearly two to one. The 8-inch gun can be fired faster, thus cutting down the discrepancy somewhat; but against this must be balanced the long range of the German 11-inch gun, which is reported to have an extreme reach of 30,000 yards. The chances are that in an engagement between one ship of this new type and two post-conference cruisers the German could hammer her opponents to pieces while they were endeavoring to close in to a range where their own 8-inch guns would be effective.

The engineering features of the *Ersatz Preussen* are said to be as remarkable as the power of her battery. Weight was saved wherever possible by the use of light-metal alloys and the highest grade steels. This effected an economy of some 550 tons, a saving of 5 per cent. on the capital of 10,000 tons displacement. The new ship will be driven by internal combustion engines of a new and radical type, developing a unit of horsepower for every 17½ pounds in weight, as against one horsepower for every 55 pounds in the best type of internal combustion marine engines now commonly known. Details of the new type of engine have not yet been made public.

The speed of the *Ersatz Preussen* is to be 26 knots, and the German Admiralty states that she will carry enough fuel to make a continuous voyage of 10,000 miles at 20 knots. The most efficiently engined of present cruisers can travel that far, but only at the much lower speed of 13 knots. What the German ship could do at that speed is not known, but it has been estimated that she might cruise 18,000 miles, or almost three fourths of the circumference of the earth.

The naming of the new type of warship is presenting a puzzle. She is much too small to be called a battleship and too heavily gunned to be called a cruiser. The German Admiralty has called her simply an "armored ship," and let it go at that.

INSTRUMENT FOR MATCHING COLORS

A NEW instrumental "eye" that looks at a brilliant lacquered auto body and computes a number which allows a factory miles away to provide wheels exactly matching in color was demonstrated before the Society of Automotive Engineers meeting in Detroit, on January 16, by Professor Arthur C. Hardy, of the Massachusetts Institute of Technology.

The new color-measuring instrument is very rapid and precise. It analyzes the color and at the same time computes a number by which the color may be specified. The precision of this instrument is many times greater than that of the human eye, so that colors can be differentiated with it which are a satisfactory match visually.

"Although color has been used for decorative purposes since prehistoric times, there has never been a period when color has been employed so extensively as it is at present," Professor Hardy said. "This is due in part to advances in the art of the paint or lacquer manufacturer which have steadily increased the number of available colors.

"Modern methods of quantity production have introduced a problem of maintaining color standards which has not existed previously. For example, it may be desired to fabricate the hoods of an automobile in one plant and the bodies in another. Obviously, the two colors must match when a car is assembled, although the two factories may be many miles apart. Such problems as this require an accurate color-measuring instrument."

Previous color-measuring instruments may be divided into two general classes known as color analyzers, or spectrophotometers and colorimeters. The former analyzes the color, wave-length by wave-length, and expresses the result in the form of a curve. The colorimeter, on the other hand, attempts to give directly the three psychological attributes of the color sensation. Both instruments have had limitations which have prevented them from coming into universal use.

FORESTS AS NATURAL GAME FARMS

CUTTING down the forests and turning the land into farms for grain crops and meat cattle was the natural thing for our ancestors to do, but it was not always the wise thing. Much of our forest land is more profitable as nature made it, producing wood and game animals, and such areas should be encouraged to continue in their primeval business, Paul Redington, chief of the Bureau of Biological Survey, stated at the recent banquet of the Third New England Forestry Congress. There is also the possibility of increasing the profitability of such use through breeding wild plants and game animals for improvement, as we have for centuries bred our crop plants and stock animals, he continued, although at present almost nothing is being done in this direction.

Mr. Redington is also of the opinion that in the present era of agricultural depression through overproduction it is a mistake to increase the area of farm lands by draining and breaking up swamps and shallow lakes. Regarding this, he said:

"Too largely in the past such areas have been looked upon as something merely to be drained to get rid of the water and make the land available for the production of farm crops and livestock. In many instances this has reclaimed land that was utterly unsuited for such production, and at the same time it has destroyed it for uses to which it might have been more profitably devoted. So long as there is more land available than is needed for agricultural and livestock production, which is the case in the United States, extensive drainage projects are, in my opinion, misdirected effort. Instead, wet areas in their natural state should be utilized for the production of fishes, of such water-fowl as ducks and geese, and of such aquatic mammals as beavers and muskrats. Wet areas may also be made to produce vast quantities of food suitable for feeding and producing millions of ducks, geese and other water-fowl and certain fur animals, animal life that would add materially to our supplies of attractive food as well as afford recreation through hunting both with a camera and the gun and provide in

many instances a direct profit to the landowners through the leasing of fishing and shooting privileges.''

THE SAVING OF FARM SOIL

SOIL erosion work, on a rather extensive scale, characterized by H. H. Bennett, of the U. S. Bureau of Chemistry and Soils, as ''by far the biggest field for helping the farmer with the physical side of his agricultural operations that confronts the nation,'' will be begun at once by the Department of Agriculture, if an amendment to the Agricultural Appropriation Bill just passed by the Senate is accepted by the House.

According to the terms of this amendment $160,000 is to be appropriated for this work, $40,000 of which is to become immediately available.

When the bill was before the House Appropriations Committee, Bennett told committee members that millions of acres of previously good farming land had been laid waste, because no soil-erosion work had been done in this country to any extent, and prophesied that it would not be many years before we were reduced in this country to a peasant type of farming, if soil erosion continued at the rapid rate it is progressing to-day.

He said that an appropriation of $80,000 had been asked of the Bureau of the Budget for this work, half of which was to go to the Bureau of Public Roads and half to the Bureau of Chemistry and Soils. No increases were granted for the work by the Budget Bureau, however, he said, with the exception of a slight increase in the amount for the Bureau of Public Roads.

Work planned includes a fundamental study of the physical and chemical characteristics of the soil types subject to erosion; a study of the effectiveness of different physical and chemical treatments as applied to varying soils on which terraces are to be constructed; a study of terracing as a preventive of erosion and a study of cropping systems in relation to erosions.

HIGH BLOOD-PRESSURE

THE high pressure of modern civilization is being blamed for high blood-pressure. New evidence in support of this theory was found in a study of average blood-pressure rates among natives of Africa.

''I think almost everybody who has been closely associated with the African native will agree that he very rarely can be described as living a high-pressure existence,'' writes C. P. Donnison, late medical officer of the East African Medical Service, in *The Lancet*, British medical journal. Mr. Donnison compared the average blood-pressure of 1,000 healthy males, natives of East Africa, with the standard normal rates for white men at various age levels.

Up to the age of thirty years, the rates agree approximately. After that the rates for whites continue to go up, while those for the natives decline. Mr. Donnison found from hospital records that these natives had about the same ailments and diseases as white people, with the exception of those diseases associated with high blood-pressure.

Living conditions among the natives have undergone very little change within a number of generations, but such conditions among white peoples have been revolutionized within the last few generations. Mr. Donnison believes that adjustment to these changes is a factor in increased blood-pressure rates.

''I suggest that such differences in the evolution of the two races could be held responsible for the differences in their normal standards of blood-pressure; in other words, that the greater mental stress required by the ordinary European citizen in his everyday life, as a result of the tendencies of modern civilization, has had its effect upon the physiology as well as the pathology of the race.''

ITEMS

MERCURY in a new organic compound, ethyl mercury chloride, has been shown to be a good medicine for seeds threatened with fungus infection, the American Phytopathological Society was told by Dr. W. H. Tisdale and W. N. Cannon, of New York. Treatment with a one and one half per cent. solution of this compound has cleaned seed oats of both loose and covered smut, sorghum of covered smut and barley of strips and loose smut.

AT the meeting of the American Phytopathological Society in New York City, A. G. Newhall and Dr. J. D. Wilson, of the U. S. Department of Agriculture, told their colleagues of their success in preventing the development of leaf mould of tomatoes, a serious greenhouse plant disease, by the simple expedient of forced ventilation with hot air. This prevents the formation of dew on the leaves, which in unventilated greenhouses gives the spores of the fungus a chance to germinate and find a foothold. Although the method has been tried only for one disease of one vegetable, it is expected that its eventual application will be much wider.

THE amount of ultra-violet light in the country is half again as great as in the city. This has been known or suspected in a general way for some time, but now scientific proof of it has been made by J. H. Shrader, M. H. Coblentz and F. A. Korff, working at the Baltimore Department of Health. The figure reported is the result of actual measurements, based on chemical tests. They were made in the center of the city, in nearby suburbs located about three miles from the city's center, and in the country on farms ten miles from the municipal center. Measurements of the amount of dust polluting the air were made at the same spots. These showed that air pollution affects the amount of ultra-violet light. The pollution was heaviest in the city and diminished to a figure about one sixth as great in the country. The amount of dust settled on the top of sky-scrapers was less than the amount at the street level, and the amount of ultra-violet light on the top of the buildings was greater than that at street level. The kinds of dust polluting the air were examined. Carbon, in the form of tarry products, kept out more of the ultra-violet light than ordinary dust or street sweepings.