SCIENCE NEWS

RADIO AIDS TO NAVIGATION ON THE PACIFIC COAST

Science Service

THE Pacific coast is deficient in radio aids to navigation, officials of both the Navy Department and the Lighthouse Service agreed when questioned concerning possible causes for the recent wreck of seven U. S. destroyers and the Pacific Mail S. S. *Cuba* near Point Arguello, California.

Investigation has brought out the fact that neither radio beacons nor radio compass stations have been installed anywhere on the long stretch of dangerous coast between San Francisco and Pt. Arguello, along which the destroyers were traveling. There is a radio compass at Pt. Arguello lighthouse and another farther down the coast at Pt. Hueneme, but bearings from two stations are needed to give a navigator his position and only the first named station was available to those on the wrecked ships.

There are two types of radio aids to navigators, the radio compass, operated by the Navy Department, and the radio beacon, operated by the Lighthouse Service. The radio compass stations are equipped to give the commander of a vessel at sea his compass bearing from the station in question. If such bearings from two stations can be obtained the position of the vessel may be accurately ascertained. The bearing is worked out by the land operator.

The radio beacon operates on a different principle. Radio signals are sent out broadcast in all directions at frequent intervals. Vessels are equipped with radio "direction finders" which enable them to locate the bearing of the sending station. If the bearings of two stations can be had the ship's position can be worked out.

Each system has its advocates. The Navy Department favors the radio compass because it asserts that it is more accurate for the determination of bearings to be made by experts ashore who do nothing else, than by radio officers on shipboard who have many other distracting duties. Lighthouse officials favor the radio beacon with the direction finder on the ship, as they assert it is best to have the responsibility for the ship's position fixed on board the vessel and not by some one ashore. The direction finder for use in connection with radio beacons has already been adopted by many of the large transatlantic and eastern passenger lines, and by the Standard Oil Company for the equipment of its tank steamers.

Only two radio beacons are at present in operation on the Pacific Coast. These are on lightships off San Francisco and off the mouth of the Columbia River. Radio compass stations are more frequent but there are none between San Francisco and Pt. Arguello.

Little credence is given by government experts to the theory that the wrecks may have been caused by a current set up by an earthquake under the sea, or by the remoter ones in Japan. Such a thing is considered possible but unlikely. All unite, however, in the need of better radio protection to shipping along the western coast.

EARTHQUAKE-PROOF HOUSES

Science Service

MAN, and not nature, is to blame for the disastrous consequences of earthquakes in such localities as Japan, Chile or California, in the opinion of Dr. Bailey Willis, one of America's leading geologists, who has just returned from Chile where he traced the earthquake of last November to its lair high in the Andes.

Referring to his investigations in Chile as a representative of the Carnegie Institution of Washington, Dr. Willis said to *Science Service*: "When it came to the point of a verdict which should place the chief responsibility for the disaster upon the right shoulders, we could not convict the earthquakes. Where Nature gives warning after warning, but man remains heedless, he has but himself to blame for the consequences. So it was in Chile, so it is in Japan, and so it will be in California or wherever else earthquake risk is carelessly disregarded."

Dr. Willis is professor emeritus of geology at Stanford University and he declared that he is a good Californian except that he is inclined to take earthquakes seriously. Dr. Willis explains how earthquake-proof houses may be built and he also relates his experiences in addressing the population of the town of Vallenar in Chile, badly damaged by last year's earthquake. He said: The mayor of Vallenar invited me to meet a group of gentlemen in the Union Club to talk to them about earthquakes. The president of the local workingmen's union desired a more public discussion and the mayor yielded the point. The meeting was held in a temporary theater with a capacity for about 400 people and it was crowded. In front sat a group of officials, the priest, and the landowners. To the number of fifty they represented that portion of the audience which could read, write and cipher. The workmen were there in force, few of them wearing anything more than shirt and trousers. There were many women, their dark faces stamped with resignation and half hidden in the black mantillas. Young girls, youths and street urchins were scattered among their elders and some of the last looked down from perches in the rafters I have spoken to many audiences, but not to any that was more responsive or attentive. This was for them no academic discussion. The earthquake had been a terrible experience and before them was a man who was supposed to know how to guard against a repetition of disaster in Vallenar, or whether they must abandon their city and move to another site, as was proposed.

No one of any feeling could look into those dark, sad faces and not realize how urgent is the solution of the

problem of safeguarding the people of earthquake zones from danger. In the presence of that audience it became an immediate obligation to study the causes of failure of the houses as they had been built and to discover methods of building safely with the materials and workmanship at hand.

To construct a house that will withstand an earthquake is not difficult if you can command the right materials and good carpenters, but during three hundred years it has proved to be more than the unskilled artisans of Chile could do, handicapped, as they have been by poor wood, wretched mortar, and the evil inheritance of adobe buildings. They used to put together structures that were pinned with wooden pins and tied with rawhide, which were both strong and elastic. Some of them have passed through the earthquakes of the past century without serious damage. The introduction of iron nails, which are so easily driven, appear to hold so well, but in fact pull out with ease, has resulted in much weaker frames, that are quite unequal to the task of upholding the heavy walls and roofs of adobe. Back to the good old joinery should be the cry. Rawhide should be used if convenience and cheapness require, but galvanized fencewire is better when skillfully stretched or tied. And adobe should be used only to fill thin walls, never in heavy masses.

An American frame house, well mortised and pinned, is as safe as reinforced concrete, provided the lath is replaced by fence wire on both the inside and outside of the frame. The wire can be put on in either one of two ways, parallel with both diagonals or parallel with the beams and uprights, and it should be spaced from 3 to 6 inches apart, according to the size of the wall and the quality of the plaster. It must be stretched tightly to form a firm network to which the plaster can adhere and for this reason wire netting does not do as well, because it can not be drawn as tightly as a continuous strand, which is fastened by staples at every turn.

The difference between the diagonal arrangement and the horizontal-vertical one is important. The former makes a rigid house, the latter a flexible one, and the distinction is the same as that between a springless cart and a carriage. When the quake strikes the former you will feel like a man lying on the bottom of the cart while the team runs away across a rocky pasture, whereas in the flexible house you might think you were up a tree.

There is one thing about building to resist earthquakes that people seem to forget: an earthquake can exert no more force to wreck a building than is necessary to overcome the inertia of the structure, or of some part of it. A heavy mud-roof, such as is heaped on Chilian houses, will wrack and ruin the walls, where one of light shingles would sway with them.

Another point which has not been recognized generally by architects or engineers is that it is the earth which moves, while the house tries to stand still. If you could put a ball-bearing between your house and its foundations, instead of bolting it to them, you would not have to buy your wife a new dinner set. This idea is embodied in every instrument for recording earthquakes and was applied many years ago by Sir John Milne to the construction of a lighthouse in Japan. I have recently recommended its consideration by a firm which is contemplating the building of a warehouse on dangerous ground in Valparaiso, Chile, and I believe it can be introduced successfully in some combination of bearings, springs or shock absorbers. For the ordinary house a broad ditch packed with cobblestones on which there rests a well-braced frame of heavy beams would not be a bad substitute. It would allow the ground to slide under the house, which could be jacked back into position with reference to such unstable things as trees, garden walks and roads, at your convenience.

These ideas about building quake-proof houses grew by degrees as I studied not only the ruins, but also the surviving buildings. The evidence was a liberal education in how to build and how not to, and the conclusions will be published by the Carnegie Institution of Washington as a contribution to the safety of the Chilian people or of others who may be similarly circumstanced.

ZETA RAYS

Science Service

DISCOVERY of a new and rare sort of rays resulting from partial disintegration of atoms as a result of collisions with alpha particles, the nuclei of helium atoms, moving at a speed 30,000 times faster than a rifle bullet, was announced to the American Chemical Society meeting at Milwaukee on September 12 by Professor W. D. Harkins and R. W. Ryan, of the University of Chicago. The discovery was made as the result of 41,000 photographs of atomic collisions.

The new rays, which have been named "Zeta rays" by Professor Harkins, are very short and are thought to be due to electrons knocked out of atoms through which the flying alpha particle speeds. He also considers it possible that they may be due to electrons picked up by the alpha particle and then discharged from it. They move in parallel tracks and in a direction nearly opposite to that of the impinging alpha particle.

Professor Harkins's paper was illustrated with photographs and motion pictures of the atomic collisions. Although atoms are a thousand times too small to be seen by the highest powered microscopes and the electrons are many times smaller, it has been found that water vapor will condense on them and that these minute droplets may, if strongly illuminated, be made visible in the microscope. The moving nuclei and rays thus leave behind them a wake of light which appears in the pictures as a fine white line.

The alpha particles or helium nuclei with which the atoms of air were bombarded were obtained from disintegrating radium "C" which shoots them out with a velocity comparable to that of light. Each atom of air, like other atoms, consists of a nucleus and a surrounding system of electrons, similar to the sun and its planets. When a moving alpha particle passes through an atom, it may or may not come into collision with a central nucleus or one of the electrons. Collisions with electrons are relatively common; those with a nucleus are very

rare. When this happens the atom is smashed up beyond recovery. Many photographs of such crashes were shown by Dr. Harkins.

"What the importance of these rays may be, it is impossible to say," Dr. Harkins declared, "since they are so new that their characteristics are still unknown. "They should give some new light on the structure of atoms, the emission of electrons from them, and of the nature of the electromagnetic fields of force in the vicinity of the atom. A more thorough knowledge of these fields of force should lead to important discoveries and inventions in the fields of chemistry and of physics."

EVOLUTION AND DARWINISM

Science Service

DARWIN'S methods and general conclusions in the study of evolution were strongly defended by Dr. David Starr Jordan, chancellor emeritus of Stanford University, in a principal address on "Evolution and Darwinism" before the American Association for the Advancement of Science now assembled in Los Angeles for its fall meeting. Modern naturalists are forsaking the seas, the meadows and the forests to work in the greenhouse, Dr. Jordan declared, urging a broad and universal outlook upon all facts before making generalizations. "They will find their way back," he stated. "The apparent eclipse of Darwinism to-day is wholly transitory."

Dr. Jordan said in part: "Nothing we know of takes place without an adequate cause. Among the attempts to search for causes for phenomena in animal and plant life, the most notable have been those of Lamarck and Darwin. Lamarck noted the facts of use and disuse in the development and modification of the individual, and suggested that the higher groups must have originated in like fashion. Hence the theory of development through the inheritance of acquired characters, hereditary traits being modified from generation to generation through use and disuse of organs or through 'the slow willing of animals.'

"Darwin went much farther, stressing especially the sifting and splitting due to varying environment. These he summed up under the complex term of 'Natural Selection.' He conceived of a 'struggle for existence' with the continued survival of those which could maintain themselves, bequeathing their adaptive characters to their progeny.

"There is a recent tendency among biologists to ignore Darwin and his method of approach in favor of more metaphysical conceptions of evolution, as unconditioned by environment. The process of induction is slow and laborious, that of deduction may be speeded up as demanded. The basal fact remains, the method of Darwin of considering *all* relevant truths is the only way. Partial or deductive conclusions can only lead to the state of mind of unshaken belief in evolution and 'agnosticism' as to its 'causes.' But the causes are the matters really important."

After emphasizing that the descent of living forms from series now extinct is too obvious for any well-informed mind to question, Dr. Jordan continued:

"We would like to know how this came about. Darwin's work is like a great sketch map which his successors are filling in and in no vital respect will the final chart vary from the ascribed landmarks. Naturalists have found that they can produce in a few weeks by selection and segregation forms apparently as distinct as Nature can establish through similar means in a millennium. But Nature's species are of long endurance and the reason why this is so is a vital part of our problem.

"We know nothing of evolution in vacuo, of change in life unrelated to environment. All forms of life are split up into species with adaptation to external conditions visible in every structure. We know of no way in which organisms become adapted to special conditions except by the progressive failures of those which do not fit. No organism has escaped or can escape the grasp of selection.

"To admit these facts and yet say that selection and segregation are not factors in evolution would appear to make the matter a mere question of words. If by evolution we mean the theoretical progress of life, due solely to forces intrinsic in organisms, then outside influences are of course not factors in such evolution. If, however, we mean the actual movements of actual organisms on this actual earth, then extrinsic influences and obstacles are factors in continuous, diverging change."

ITEMS

Science Service

ONLY one commercial white bread and no whole wheat bread of many examined, according to Professor Worth Hale of the Harvard Medical School in an address to members of the American Chemical Society at Milwaukee, is adequate for the growth and maintenance of growing children. Experimental white breads made with the addition of the water extract of wheat embryo and with a small percentage of milk proved far superior to the average white or whole wheat bread. The consumption of wheat products in the United States was declared by Dr. Hale to have risen from 5.3 bushels *per capita* in 1915 to 5.8 bushels in 1920.

GERMS can now be dissected and handled under the microscope, according to a report sent to the American Medical Association by its Budapest correspondent. Dr. Tibor Peterfi of that city has demonstrated to a medical society a device with which an investigator can grasp bacilli and cut them with glass and platinum needles. This is expected to result in new physical and chemical investigations.

GREATER output of coal and less fatigue to miners is claimed as the result of a psychological investigation of the best way to use a pick recently made in Manchester, England.

A NEW insect pest, the Australian tomato weevil, has been recently discovered in the South and agricultural experts fear it may become of great importance in the United States unless promptly suppressed.

IN a recent free balloon race, the winning aeronauts kept track of the location of their competitors by means of radio reports received by apparatus installed in the basket of their balloon.