SCIENCE NEWS

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ATMOSPHERIC TEMPERATURE AND PRESSURE

AT the concluding meeting of the American Physical Society, recently held in Washington, Dr. E. O. Hulburt, of the Naval Research Laboratory, Washington, D. C., reported that the fleeting rays of the setting sun are being used to study the temperature of the atmosphere at heights far above any possible balloon ascension.

Direct measurement of the earth's atmospheric temperature and pressure have been obtained up to heights of 13.8 miles (the National Geographic Society-U. S. Army Air Corps) in manned balloon ascensions. Unmanned, smaller balloons have reached about 19 miles, said Dr. Hulburt. Searchlights have been used to probe the upper air and their rays have been detected, photographically at night, up to heights of 17 miles. However, Dr. Hulburt indicated, exact values of atmospheric density have not been obtained beyond a height of 14 miles by this searchlight method.

By the new system sunlight is used. "As the sun sets the earth's shadow above the observer moves upward and the region of the atmosphere illuminated by the direct rays of the sun moves to high levels." At dawn, the reverse sequence occurs and the sunlight starts from high altitudes and gradually works down to the surface of the earth. Both dawn and dusk measurements were employed in the research. The study involved the measurement of the brightness of the zenith sky for about an hour after sunset and an hour before sunrise. From these brightness studies, plus the known intensity of sunlight and the laws of scattering of light by air, the density (or pressure) and the temperature of the atmosphere was determined. The temperature came out to be between -50 and -80 degrees Fahrenheit, from 8 miles to about 35 miles above the earth's surface. No important changes in upper air temperature were noted in tests running from October to April. "It must be remembered," Dr. Hulburt concluded, "that the results refer only to the atmosphere during conditions of twilight in a temperate latitude (Washington, D. C.). One would expect that the upper air grew warmer during the day and cooler during the night. However, the day and night change may not be very great."—ROBERT D. POTTER.

A NEW X-RAY TUBE ARRANGEMENT

A NEW and simple arrangement of x-ray tubes, which may ultimately reduce the cost of x-ray treatment in cancer therapy, was reported to the meeting of the American Physical Society by Dr. G. Failla, chief radiologist of the Memorial Cancer Hospital, New York City. The chief merit of the new system is that it uses existing apparatus and yet eliminates certain parts so that the cost of a superior x-ray therapy installation is cut. Moreover, the "life" of the expensive x-ray tubes has been materially increased.

Dr. Failla, who has served on international committees on x-ray dosage standardization, stated that the key point in the new, cheap installation is the use of two x-ray tubes working on alternating current. Part of the past expense of x-ray treatment has been the necessity of using rectifying tubes which turn the alternating current from high-voltage transformers into direct current for use in the tubes. By the new Failla set-up alternating current is employed and each tube works on a "half-wave" of the cycle alternately. One tube is placed below the material, or patient, being radiated, and the other tube above so that double the intensity is obtained. In tests a radiation intensity of 7,000 roentgens per minute has been obtained, as compared with the 50 roentgens per minute output of standard equipment. "The surprising thing," according to Dr. Failla, "is that the tube life with this arrangement is longer than usual. In the case of two such machines used at Memorial Hospital for the routine treatment of patients, one of the tubes has been in actual operation for over 3,700 hours, and is still in good condition. This is an important item, considering that each tube costs about $450."—ROBERT D. POTTER.

THE STUDY OF ARTIFICIAL EARTHQUAKES

A NEW way of mapping the bottom of the ocean has been devised. An apparatus will create artificial earthquakes on the ocean floor and record the vibrations of the underlying strata as a clue to their make-up. Kites and balloons will be sent below the surface of the sea to guide equipment to the bottom and to return it automatically for inspection when its recording task is done.

A mile-long cable, to which are attached dynamite charges, microphones, recording equipment and clockwork control mechanism, will be strung out along the bottom of the sea, guided only by the kite. The cable serves as the kite's tail. An oil-filled balloon will float the apparatus, freed automatically of ballast, to the surface at the conclusion of the experiments. Dr. Maurice Ewing and Allyn Vine, of Lehigh University, who have already conducted experiments with earthquake-producing equipment moored to a surface craft by means of a long cable, described their new plans before the recent meeting of the American Geophysical Union. Credit for the idea of using the oil-filled balloon as a means of returning the valuable apparatus and the records is given by the two investigators to Auguste Piccard, who is now preparing for bathysphere exploration.

The kite-and-balloon scheme has been tested in the swimming pool at Lehigh University by means of scale models and is expected to be applicable to any depth required for the ocean-floor studies. A balloon six feet in diameter and displacing about 100 cubic feet of water will be used with the full-sized equipment. Not only does this means of placing the earthquake-producing charges and recording apparatus on the bottom save the cost of the extremely long cable ordinarily required, but since the apparatus rests on the bottom free of any connec-

tion with a surface ship, the test equipment is free of vibration from surface waves. The earthquake-producing equipment, which they used off Woods Hole, Mass., last summer, consists of three charges of dynamite, microphones to pick up the vibrations of the ocean floor when the dynamite is fired, batteries and clockwork controls. The dynamite fire is controlled by clockwork, as is a release device which drops the ballast required to drag the equipment to the bottom when the charges have been fired.

THE FLOW OF LAVA

VOLCANOES do not pour their rivers of lava down the luckless countryside in a clear hell-broth that runs like water over Niagara to waste forests and plantations with flame. "No thin broth, but a very thick porridge," was the simile used by Dr. T. A. Jaggar, volcanologist who lives in a house on the edge of Kilauea's crater, speaking before the Washington meeting of the American Geophysical Union. Rivers of lava do not run; they creep. A mile a day was the speed of the lava flow that threatened the town of Hilo some time ago and had to be stopped by airplane bombs.

The forward creep of one of these streams of thick lava is an impressive and very strange thing to watch. As it is extruded from the volcano—usually from a crack on its side rather than from the crater—it oozes forth in one big stream. This breaks up into a large number of smaller streams that flow in close ranks side by side, like a hank of rope. This ropy type of lava is called by a name that originated in Hawaii, pahoehoe. As each streamlet of the pahoehoe pushes itself forward, it roofs itself over with a thick, solid crust, so that the entire stream comes to flow in a tunnel of its own making. Even the forward end of the lava is covered with a thin crust or membrane, which it constantly breaks through and as constantly re-forms. The moving tip of a pahoehoe streamlet Dr. Jaggar likened to an elephant's toe.

Dr. Jaggar stated that the stopping of the recent flow that menaced Hilo was not a military man's idea, nor yet his own inspiration. At first the proposal was to pack a lot of dynamite to the critical point on muleback, but a planter pointed out that bombing planes could not only find the lava tunnels much more easily in the dense forest but could attack them more effectively when found. Neither was the bombing attack conducted against the moving front of the lava columns. That would not have stopped them. In true modern air-warfare style, the planes struck at the base of operations—the heads of the lava streams just as they emerged from the slope of Mauna Loa. With 600-pound bombs of TNT they blasted in the roofs of the tunnels. This permitted the escape of the gases that were the principal source of heat for the lava. With their power supply thus cut off the streams were stopped at their source.—FRANK THONE.

A NEW WASHING PROCESS

CHARGES of electricity are being used in industrial operations for "washing" undesirable constituents from certain materials and for drying clay for use in making chinaware, according to a report given at the Savannah convention of the Electrochemical Society.

Applications of the fact that tiny colloidal particles, of which such substances as clay are made up, carry electric charges, lie at the base of the new procedures reported by a Japanese investigator and by an Ohio ceramics chemist. Carl E. Curtis, of the Simonds Worden White Company, Dayton, Ohio, explained that water with which clay is mixed in order to wash out the sand accompanying it when it is mined can be removed by running the water-and-clay mixture through a special piece of electrical apparatus. Since clay particles suspended in water have a negative charge they are attracted to and "electroplated" to a positively charged pole and are thus separated from the water suspension. This process leaves a clay product containing only 35 per cent. water, which is easily removed. In use abroad, it is compared with the ordinary drying and filtering procedures in wide use in the United States.

That undesirable colloidal particles can be "electro-washed" from a variety of materials by taking advantage of this same fact, that colloidal particles carry an electric charge, was reported by Sakuji Komagata, a chemical engineer of the Japanese Government, Tokyo. Application of the proper electric charge to the material causes the undesired particles to migrate to an electrically-charged point and thus to be removed from the material. The process has been successfully used in the manufacture of vulcanized fiber, pulp for power cable paper and condenser paper and photographic films and plates.

ITEMS

ASTRONOMERS will pay little attention to the solar eclipse that will darken the South Atlantic on May 29 of this year, according to Dr. Harlow Shapley, director of the Harvard Observatory. Shadowing only the far South Atlantic, where the sun at noon is close to the horizon, the path of totality will cross only a few insignificant islands, of which South Georgia is the largest. With no proper facilities for landing the ponderous eclipse cameras, and only a faint chance that the mist-shroud of the island will break during the eclipse, astronomers do not feel justified in sending an expedition to South Georgia Island. Several months of preparation, and the expenditure of thousands of dollars, are hardly worth while when the chances of seeing the four-minute eclipse are less than one in a hundred. Astronomers are looking forward to 1940, however, when an eclipse of the sun on October 1 will be visible in a narrow band from Colombia, on the west coast of South America, to South Africa.

A GERMAN firm has succeeded in plating iron with acid-resisting chrome nickel or chrome-nickel-molybdenum steels, necessary alloy in the prevention of corrosion in acid tanks. Only 10 to 20 per cent. of the relatively expensive corrosion-proof alloy is used to cover the iron base. Tanks have previously had to be made entirely of acid-resisting alloys. The alloy coating is intimately fused with the base metal, it is stated, one material for all practical purposes resulting from the coating process.