SCIENCE NEWS

PHOTOGRAPHS OF ELECTRICAL DISTURBANCES

Science Service

ELECTRICAL disturbances lasting only a few billionths of a second can be made to record themselves on a photographic plate, without light, according to a discovery announced by J. F. Peters, electrical engineer of the Westinghouse Electric and Manufacturing Company. Mr. Peters believes that the application of this discovery will be of great importance to electric transmission engineers.

The instrument used to obtain the photographs consists of a suitable plate holder for receiving ordinary photographic plates, provided with suitable electrical connections so that electrical disturbances may be brought into contact with the sensitized side of the plate.

When surges occur in the transmission line they photograph themselves. The surges may last twenty billionths of a second, so that the photographic plate must register them in that minute space of time. Mr. Peters states that he has never yet detected visible light in the camera while photographing a surge and that therefore the impulses must contain some property in themselves that affects the plate. The prints obtained from such plate exposures show many geometrical figures of beautiful shapes and also take on certain definite forms according to the character of the voltage at the time the surge or impulse occurred. It is possible to tell from the developed plate whether the voltage at the time of the surge was positive or negative, whether it was alternating or unidirectional, and its direction and intensity.

Positive, negative and oscillatory surges produce figures having quite different configurations. The voltage is shown by the diameter of the figure photographed, and the time is indicated by its position on the sensitized chart that moves at known speed. The direction of the surge is shown by comparing the configurations of figures from two instruments, one connected from line to the ground, the other connected across an inductance that is in series with the line.

The photographs obtained are of great importance to transmission engineers, since the instrument for taking the photographs is the only practical device yet devised for obtaining data in regard to that type of line disturbances known as surges. Heretofore engineers have only known that surges occur, but where they occur and their nature has been largely guess work. The photographic plate now gives the characteristics of surges, thus giving the engineers data with which to devise line protection. The instrument will do much to enable the engineering profession to increase the reliability and continuity of service on existing power lines. The device is applicable to transmission lines of all kinds and is connected to them by means of an electrostatic potentiometer.

In early tests Mr. Peters used a condenser discharge to stimulate the condition that occurs during the period of a surge. From these discharges were obtained his first photographs of electrical impulses. Tests were made later with the instrument connected directly on a transmission line.

THE EXPLORATION OF THE ATMOSPHERE BY A FREE BALLOON

Science Service

THE first of fifteen flights in a free balloon which will ride the storms in an effort to learn more about them is about to be begun by Dr. C. LeRoy Meisinger, of the central office of the U. S. Weather Bureau. The flights are part of the most ambitious plan for scientific exploration of the atmosphere so far undertaken and they will be carried on through the cooperation of the Weather Bureau and the U. S. Air Service.

The flights will all start from Scott Field, Ill., not far from St. Louis. They will be made in a hydrogen-filled balloon, furnished and piloted by the Air Service, and equipped by the Weather Bureau with a full set of meteorological instruments. The first flight will begin about April 1. The balloon will be a large one, about 40 feet in diameter and holding 35,000 cubic feet of gas.

The main purpose of the flights is to study the motions of large masses of air with reference to the ground, when they are influenced by the great whirls in the atmosphere, hundreds of miles in diameter, which the meteorologists call cyclonic storms and which in their passage across the country give us most of the many varieties of our weather. The motion of the air with reference to the centers of these storms is fairly well known, but these centers are always themselves in motion and just what happens to the air in them or above them is not understood.

Dr. Meisinger proposes to find out by going up in a balloon in the storm to a height of 10,000 feet, and then sticking by it as long as it is possible to do so, mapping out his location from time to time, and at the end charting the whole voyage, which will give the track not only of the balloon, but also of the air in which it rode. He will take some trips in front of storms, some near their centers, others trailing behind them, and will study the behavior of the air in each case.

Observations will be made of the amount of dust in the atmosphere and of sky brightness, things of great practical importance to the aviator through their effects on visibility. An attempt will be made to measure the size of water drops when passing through the clouds.

Communication with the ground will be maintained during the flights by radio and carrier pigeons. The pigeons will carry messages from the balloon to the base at Scott Field, while incoming messages will be handled by a radio receiving set. Dr. Meisinger will receive weather bulletins twice a day from the central office of the bureau, arrangements having been made with fifteen broadcasting stations to broadcast the bulletins. The stations used will depend on where the storms happen to be carrying the balloon.

This is the first time that an attempt has been made to study the behavior of storms at first hand, and the information which Dr. Meisinger expects to get will be of great importance in the study of the causes of the formation and continuance of storms, and so of service in forecasting.

Although the flights will be made in a hydrogen-filled free balloon, Dr. Meisinger is looking forward to a pleasant series of trips in the air. He even considers the looking down on the top of a tornado from a safe distance as an interesting possibility. The only things he considers as really unsafe are thunderstorms, and the possibility of alighting in the water, but the flights are not sporting events and no risks will be taken.

BETELGEUZE

Science Service

No star in the heavens has been more before the public eye in the past few years than ruddy Betelgeuze in Orion, which now shines so brilliantly in the southwest in the early evening. Betelgeuze leaped into fame in the winter of 1920 when, chosen as the object of the first test in measuring the diameters of the stars with the Michelson interferometer attached to the 100-inch telescope of the Mt. Wilson Observatory, it was found to have a diameter of over two hundred million miles.

Betelgeuze is not only a giant, however. It is a most erratic giant. Later measurements with the interferometer showed variations in its diameter such as have not been found in the measurements of the diameters of other giant stars with the same instrument. This fact taken in connection with the fact that Betelgeuze has long been known as a star that varies irregularly in brightness makes it appear that it is irregularly contracting and expanding in size, pulsating, like some mighty heart of the heavens. The brightness apparently increases with contraction and decreases with expansion of the star.

Betelgeuze is now at its maximum brightness. It is more brilliant than Rigel, the bluish-white star in Orion diagonally opposite to it, toward the southwest, and it has been rivaling and at times surpassing Capella, the beautiful golden star in Auriga to the northwest of it. It is also much brighter at the present time than it was a year ago. When at its maximum brightness it is decidedly inferior to Aldebaran which is in the V of the Hyades in Taurus to the northwest of Orion and which to the ancients represented the baleful, red eye of Taurus the Bull. At maximum brightness Betelgeuze is over three and a half times more brilliant than it is at minimum brightness, and the change may take place within a year or less.

Aside from the fact that the diameter of the star is changing continually as a result of its irregular contraction and expansion, there is an additional uncertainty as to the actual size of Betelgeuze which results from the uncertainty as to its distance. To change the angular diameter, that is given by the interferometer, into miles it is necessary to know the parallax of the star which is simply the angular distance between earth and sun as viewed from the star. This value can be obtained in a variety of ways. According to the latest report from the Mt. Wilson Observatory, the best value of the parallax of Betelgeuze is seventeen thousandths of a second of arc. That is how far apart in angular measure the earth and sun would be at the distance of Betelgeuze. This value gives 190 light years as the distance of Betelgeuze from the earth and a diameter for the star of 245,000,000 miles.

Very recently the parallaxes of over one thousand stars have been determined at the Dominion Astrophysical Observatory at Victoria, B. C., with the 60-inch reflector by the spectroscopic method, and in this list we find for Betelgeuze a parallax of one hundredth of a second of arc, which would place Betelgeuze at a distance of about 325 light years and give the star a diameter of over 400,000,000 miles. It is possible, then, that Betelgeuze may be even larger and more distant than earlier estimates have made it. It is probable that its size has been underestimated rather than overestimated and it may closely rival if not surpass Antares which is estimated to have a diameter of about 400,000,000 miles.

With the value of the parallax found at the Dominion Astrophysical Observatory the actual brightness of Betelgeuze comes out about five thousand times that of the sun. If the sun and Betelgeuze were placed side by side at a distance of thirty-three light years from the earth the sun would appear as a faint star of the fifth magnitude but Betelgeuze would be as brilliant as Venus as it now appears in the western heavens.—*Isabel M. Lewis.*

THE BLUE COLOR OF THE ATMOSPHERE

Science Service

THE blue color of the atmosphere is caused by a stratum of frozen, crystalline nitrogen in extremely high altitudes, according to theories recently put forward by Dr. L. Vegard. The aurora borealis and zodiacal light are attributed by him to the same cause.

Dr. Vegard asserts that there is some point in the upper atmosphere where the temperature must fall as low as 350 degrees below zero Fahrenheit. If so, nitrogen, the main constituent of air, must freeze, even as snow is formed in an ordinary wintry atmosphere. The resulting nitrogen frost is likely to remain in a dispersed state. Dr. Vegard also assumes that it is electrically charged.

Inasmuch as the atmosphere is shallower near the poles than at the equator, the air-frost would approach the earth more closely in polar latitudes. More light disturbances would therefore occur in such regions.

The presence of nitrogen at such great altitudes as must be necessary to get temperatures as low as 350 degrees below zero is accounted for by Dr. Vegard by the repellent effect of the electrical charges which these particles are assumed by him to carry. Temperatures at the highest levels at which observations have been made, or about 12 miles, have seldom been found lower than 85 below zero, and the temperature shows no tendency to decline further beyond that point.

Dr. Vegard suggests that this outer shell of nitrogen

frost-cloud may act also as an envelope for the atmosphere and prevent it from diffusing into space.

TERRESTRIAL ELECTRICITY

Science Service

THE riddle of earth currents and their annoying habit of sometimes seriously disturbing and even interrupting telegraph communication is now being studied at Alfsjo, Sweden, which is the only country in the world where the government has undertaken a thorough and systematic investigation of the subject.

The experiment station at Alfsjo has been erected by the Swedish government Department of Telegraphs, according to the plans of Dr. David Stenquist, who has made an expert study of earth currents for many years. Two lines, placed at right angles, and 1.3 kilometers and 1.8 kilometers long, respectively, are in use. Dr. Stenquist states that, while the better understanding of the phenomena of earth currents is of great interest in the science of geophysics, it is also of very great practical importance since it may lead to improvement of the telegraph service which is now often interfered with for hours at a time.

The Carnegie Institution of Washington, through its Department of Terrestrial Magnetism, also is carrying on extensive and systematic researches on earth currents at its laboratory in Washington, and installed in 1923 at its Watheroo Observatory in Western Australia two overhead lines from south to north and from west to east, each 3.2 kilometers long, and two underground lines parallel to the overhead lines each 1.6 kilometers long. In the United States very extensive work on earth currents has been done for some time by the American Telephone and Telegraph Company, and is being investigated in its department of development and research.

AN AIRSHIP GAGE

Science Service

A NEW electric gage which makes possible the recording of sudden strains thrown on the girders of the metal framework of the giant rigid airships as it battles with the storm has been developed at the U. S. Bureau of Standards by Burton McCollum and O. S. Peters, electrical engineers. Sixty of these devices have been used in tests of the "Shenandoah" and the data secured are expected to prove of great value in the design of airships in the future. Such tests were in progress when the "Shenandoah" broke away from its mooring mast during a recent storm. The instrument is also said to solve for the first time the problem of successfully measuring the effect of the impact of motor cars and trains on bridges.

With these recording machines clamped to girders in widely separate parts of the airship and connected by wire to a central station, the operator can sit in comfort and observe the stresses taking place at many points in the framework at the same time, no matter how hard they are to reach.

The gage has two blocks which are clamped to the girder or other part of the structure to be measured. A change of load on the girder causes a minute change in the distance between these blocks. These changes are transmitted to a series of carbon disks under pressure, which form a device the resistance of which varies as the pressure is changed. These resistance changes bear a definite relation to the strain in the member under test. Efforts to make a reliable strain gage on this principle have hitherto failed due to the erratic performance of the carbon plates. It is claimed that these difficulties have been overcome in the new gage.

ITEMS

Science Service

DISCOVERY that an American drug, tryparsamide, developed in the Rockefeller Institute and used in the treatment of paresis, can be substituted temporarily for the German drug used in the treatment of African sleeping sickness has been announced in London, according to a report just received by the American Medical Association. The German drug is known as Bayer 205. Immense areas of central Africa have become unfit for human habitation because of the prevalence of the sleeping sickness which is caused by a parasite carried by the tsetse fly, and Bayer 205 is claimed by its inventors to be a specific cure for the disease. It was brought out in the discussion in London that while its exact composition is unknown it is known to be a complex organic anilin substance of which the nucleus is trypan blue. Some animals and men on whom Bayer 205 was used became drug fast, or resistant to the effects of the drug. Attempts to overcome this condition have resulted in the discovery that other remedies such as antimony tartrate or tryparsamide may be substituted temporarily for Bayer 205.

EXPERIMENTS on the propagation of sound, involving the use of large quantities of high explosives, are to be carried on in May by the French government. Three gigantic explosions, each of them using about 10 tons of explosives, will be set off at amy de la Courtine in the center of France. The explosions will take place several days apart under differing atmospheric conditions. The exact time will be noted, and numerous seismographs, and other forms of registering apparatus throughout France will record the direction, intensity and character of the sound.

POOR roads as compared with good ones impose a tax of 2.5 cents a mile upon owners of Ford cars who use them, according to cost figures prepared by J. T. Madison, assistant engineer of the Kentucky highway department. The figures were based upon the performances of 36 Ford cars operating over good roads, and 26 such cars operating over poor, unimproved roads. The average cost per mile for the cars running on good roads was 4.22 cents; for those operating on the poor roads it was 6.72 cents. These figures included the cost of gasoline, oil and grease, tires and repairs, but it did not include storage and depreciation. The cost per mile for gasoline on poor roads was 2.3 cents, and on good roads 1.7 cents. Repairs cost 1.8 cents for every mile of good road travelled, while for every mile of poor road the repair bill amounted to 2.9 cents.