SCIENCE NEWS

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A VACUUM TUBE OF LONG LIFE

A VACUUM tube that will give nearly eleven and a half years of continuous service, night and day, has been developed by Dr. A. W. Hull, of the General Electric Company. The tube, setting a new high in length of life for vacuum tube devices, is a mercury vapor thyratron which is used to convert alternating current into direct current. Tubes of this type carry very large electrical currents and can be used as commutators for direct current motors such as in elevators. They also are employed in experimental methods of power transmission by direct current.

The new tubes exceed by 100 per cent., in their probable length of life, the famous 50,000-hour tubes which early this year gained public notice by investigations of the Temporary National Economic Committee in Washington. Dr. Frank B. Jewett, president of the Bell Telephone Laboratories, was questioned by the committee about the vacuum tubes, giving 50,000 hours of useful service, which were employed by the telephone company as "repeaters" on its long-distance telephone lines.

High-cost precision construction explained the long-life of the telephone tubes. It was disclosed that while they were adaptable to the average radio set they would outlast the set several times and that the set would be obsolete long before its tubes were worn out. Their higher cost rendered them economically impracticable for ordinary radio use.

Dr. Hull's new vacuum tube owes its long life, in contrast, to a new type of cathode which emits the electrons within the tube. Ordinary cause of tube failure, he explains, comes because the electron-emitting material on the cathode (barium oxide) is gradually used up and finally fails. In the new Hull-type of thyratron there is built inside the tube a reservoir of the active electron-emitting material. Known as a "dispenser cathode" this reservoir serves the dual function of a heater (to make the electrons go off) and as a dispenser of the coating. Some of the new type tubes have been in experimental service for 30,000 hours, or nearly three and a half years.

One tube, accidentally broken at about 20,000 hours, was examined. It was found that less than half of the barium oxide supply had left its container at that time and that half of this half was still within the cathode enclosure doing its job of emitting electrons. This means that 20,000 hours is probably less than a quarter of the life of the tube. This is the reasoning behind the statement that the tubes may last 100,000 hours or nearly eleven and a half years of continuous service, 24 hours a day.

The thyratrons under test are carrying very high currents, 175 amperes, but have not yet shown any deterioration of their vacuum. The new tube is described in the current issue of the *Physical Review*.

STAINLESS STEEL

THAT the Achilles heel of stainless steel—its inability to resist the corrosive action of sea water—may be protected by the addition of tiny traces of silver, has been discovered at the Massachusetts Institute of Technology.

The new discovery, which should have great importance in marine and naval construction, arose from observations that a salt of silver, silver chloride, is insoluble in sea water. Out of this knowledge Professor R. S. Williams and his associates have found that as little as 0.42 per cent. of silver will cut down stainless steel's salt water corrosion more than 80 per cent. Not only is corrosion resistance improved, but the heat conductivity of stainless steel—another weak point—is increased 26 per cent. by the addition of only .14 per cent. silver, according to the report of Arthur D. Little, Inc. Other advantages claimed for silver-steel is a greater ease of machining and an improved polish. A very uniform and highly polished surface in itself inhibits corrosion. The corrosion of stainless steel in sea water comes from tiny electrical batteries created on the surface of the steel plate by differences in oxygen concentration. A barnacle, on a ship's bottom, for example, might be the cause of this oxygen difference. In the myriad of tiny batteries created by this or a similar process, the formation of chloride compounds of the metals in the alloy is favored. These chlorides are soluble and wash away, leaving a pitted surface. As the pits deepen the difference in concentration of oxygen increases and the corrosion goes faster and faster until the entire plate of stainless steel becomes honeycombed. To the eye its surface may look unmarred but at the danger point it may suddenly collapse.

The function of the silver in the alloy is to make insoluble chlorides under the action of sea water which form a thin, guardian layer.

THE MATERNAL DEATH RATE

THE death rate from childbirth in the United States is falling spectacularly. While there is much that can and should be done to improve American obstetrics, the situation is by no means as unfavorable as both the public and the medical profession have been led to believe.

The *Journal* of the American Medical Association recently published "an obstetric audit" made by Dr. Scott C. Runnels, of Cleveland, secretary of the Hospital Obstetric Society of Ohio.

The black picture of the maternal death rate in the United States, exceeded only by that of Chile and Scotland, has been much publicized. Dr. Runnels's audit shows that the charge that American hospitals are unsafe places in which to have a baby certainly does not apply to all hospitals. It further shows that the charge that preventable sepsis is rampant is, to say the least, "a flagrant misrepresentation." While deaths from all causes declined between 1929 and 1937 by 7 per cent., the puerperal death rate declined 30 per cent. Hospitals and obstetricians have, therefore, made tremendous strides.

Dr. Runnels makes a careful distinction between the puerperal death rate and the obstetric death rate. In the former are included abortions and ectopic (tube) preg-

nancies. Neither of these situations can be charged against the obstetrician or the hospitals. Yet almost half of the deaths commonly classified as due to puerperal septicemia are due to abortion.

Localities show sharp variability in puerperal death rates. In 1938, for instance, the maternal mortality for the states ranged from a low of 25 per 10,000 births in Connecticut to a high of 92 in Nevada, a rate almost four times as great. Twelve states had a rate below 40; ten had a rate above 60. In cities the maternal death rate is higher than in rural areas. Dr. Runnels's audit attributes this fact to the influx of non-resident patients who are taken to city hospitals when serious conditions develop. The same explanation is given of the fact that the hospital puerperal death rate is higher than the home rate. When serious complications develop during labor at home, the patient is whisked off to the hospital.

In commenting on the decided and accelerated strides in the reduction of maternal mortality, Dr. Runnels concludes the following: "Supervision by the hospital of the character of obstetrics practiced within its walls and the enforcement of early consultation in the case of abnormal labor has become recognized as essential. As the births of the United States increasingly occur in well-organized hospitals and come increasingly under the supervision of trained obstetricians, maternal mortality and morbidity will continue to improve. If obstetric conditions were as favorable over the entire United States as are those existing to-day in a quarter of the country, there would be an annual saving of 2,500 lives."

THYROID GLANDS KEPT ARTIFICIALLY ALIVE

A NEW lead for an attack on the kind of goiter known as Graves's disease has been obtained from human thyroid glands kept alive on artificial medium outside the body for the first time for from three weeks to two months in the Lindbergh-Carrel heart apparatus. The studies may revolutionize the treatment of this kind of goiter, characterized by popping eyes. They are reported by Drs. N. Chandler Foot, Lillian E. Baker and Alexis Carrel, of the Rockefeller Institute for Medical Research and Cornell University Medical College and New York Hospital, in the current issue of the *Journal of Experimental Medicine*.

The thyroid glands were taken from patients operated on for Graves's disease. The glands were immediately placed in fruit jars, the covers were clamped on, the jars wrapped in sterile cotton, and then whisked from the hospital to the neighboring Rockefeller Institute. There the glands, after preliminary treatment, were placed in the apparatus designed for Dr. Carrel by Colonel Charles E. Lindbergh. They were nourished on solutions or media instead of blood. Different kinds of solutions were tried, but the glands, it was found, could be kept alive and healthy for weeks on a completely artificial, synthetic solution which contained only a tiny amount of blood serum, just enough to act as a solvent for vitamin A.

A remarkable cancer-like change occurred in one of the glands during the six to eight weeks that it remained in the apparatus. The change was great enough to deceive a competent thyroid surgeon who examined sections of this gland into thinking the sections were from cancer tissue. No reason for this change was found, and after about one month, the gland became more normal looking.

A hint that the serious thyroid gland disorder, Graves's disease, may be due to some condition quite outside the gland was found in studies of the human glands in the Lindbergh-Carrel apparatus. The changes in the gland that appear in Graves's disease were increased and intensified when small amounts of extracts from the cortex of the adrenal glands and from the pituitary gland were added to the nourishing solution on which the glands lived in the Lindbergh-Carrel heart. Thyroid gland hormone itself, female sex hormone material, adrenalin and insulin were also tried, but produced changes only in connection with the adrenal cortex hormone and the pituitary hormone.

Dr. Baker, in response to a Science Service inquiry, said that "It is too early to say whether Graves's disease is a matter of something other than the thyroid gland." At present she is more concerned with the fact that human organs can be kept alive for long periods in the apparatus.

One of the great advantages of the method is that the organs can be kept alive on artificial media for long periods, during which the effect of the continuous action of small amounts of gland extracts and other chemicals can be studied. "Such experiments are probably of the utmost importance," Drs. Baker and Carrel state, "since this may be the way that certain profound changes are produced within the body."—JANE STAFFORD.

A NEANDERTHAL SKULL FOUND IN CAVE NEAR ROME

FOLLOWING its discovery in a cave at Monte Circeo, a promontory on the Tyrrhenian Sea, fifty miles south of Rome, the world's most perfectly preserved specimen of a Neanderthal skull is being studied by Professor Sergio Sergi, head of the Institute of Anthropology at the Royal University of Rome, in an effort to uncover new racial characteristics of this early man.

Both Professor Sergi and Professor Alberto Carlo Blanc, who first identified the skull on the scene of discovery, say that it is in an almost perfect state of preservation except for a fracture in the right temporal area. This was caused by a series of blows on the head, probably during a battle with clubs, 70,000 or 80,000 years ago.

In addition to the anthropological importance of the skull, which is the third of its type found in Italy, fossilized bones of animals discovered in the cave give evidence of Neanderthal man's mode of life. The bones include fragments of those of prehistoric elephants, rhinoceri and giant horses, all showing evidence of fractures. The floor of the cave was literally paved with these bones.

Discovery of the cave was made by accident on the property of Antonio Guattari, owner of a small resort hotel at Monte Circeo. While digging foundations for enlarging the hotel, workmen found the entrance which had been sealed as the result of a landslip, believed to have occurred during the last glacial period, about 80,000 years ago. The skull was found in a large open space at the end of a passage in a crude circle of stones. It had lain there untouched for all these thousands of years. Guattari notified Professor Blanc, who completed the investigation, and brought the skull to Rome. Failure to find any bones of the skeleton leads to the belief that

the skull may have been brought to the cave and possibly used in a sacrificial ritual. Other bones found on the floor have been identified as those of bears, deer, panthers, goats and hyenas.

According to Professor Blanc, scores of caves and grottoes in the Monte Circeo area were formed when the sea was thirty to forty feet above the present level, and its action scooped out hollows in the soft rock. At the beginning of the last glacial period the formation of ice fields caused the sea-level to drop. It was then prehistoric man found the dry grottoes and began living in them. Slowly a new change of climate took place causing sudden rises and drops in temperature. Alternating periods of freezing caused splitting of rocks and landslips, burying the caves under masses of stone and earth. In the post glacial period, melting of ice caused the sea to rise again, washing away the earth in many of the grottoes, but failing to reach the height of the cave of the Neanderthal skull, leaving it sealed until the accidental discovery.

Following the finding of the skull, the cave was closed by the Italian Paleontological Society, but exploration will be continued in the fall after assembling and cataloguing the bones taken out during first excavations. Two other Neanderthal skulls have been found in Italy, one in 1929 and the other in 1935, both in the Sacopastore region, near Rome, but neither is as well preserved as the new discovery. However, the occipital opening at the base of one of the skulls was particularly well preserved, enabling Professor Sergi, of the Royal University, to establish for the first time that Neanderthal man walked erect, and not with an ape-like posture with head thrust forward as previously believed. The horizontal plane of the opening in the skull shows that the bones of the neck fit perpendicularly into the opening, causing posture to be erect, as in present-day man.

ITEMS

DISCOVERY of a comet by an amateur French observer named Rigollet was bulletined to American observatories by Harvard Observatory on the receipt of data from the International Astronomical Bureau of Copenhagen. It is eighth magnitude and located near the horns of the constellation Taurus at right ascension 4 hours, 54 minutes; north declination, 26 degrees. It is moving about four degrees northeast daily and can be seen in the eastern sky just before dawn with a small telescope.

THE Navy's study to determine if Anastasia Island, near St. Augustine off the Florida Coast, will be useful as a site for a new naval observatory has disclosed that it has already been used for astronomy on at least one previous historic occasion. On the top of old Fort Marion on the island is a plaque, showing that French army officers there observed a transit of Venus on December 6, 1882. Transits of Venus can occur only four times in 243 years, according to Captain J. F. Hellweg, superintendent of the U. S. Naval Observatory, who studied the old French marker.

ALASKAN Eskimos have already been set to work by the Division of Arts and Crafts of the Office of Indian Affairs making mukluks—reindeer fur boots—and parkas or fur hoods for members of the forthcoming U. S. Antarctic Expedition. Sailmakers in Boston are also at work on clothing made of tight-woven cotton airplane fabric which is both wind-resistant and light in weight. The Antarctic Service, which is organizing the expedition, reports that the Eskimos are being paid for their work out of funds for the expedition. The Indian Office regularly employs them in making similar garments. Other clothing for the expedition will come from War Department stocks or will be bought from the open market. Leather ski boots are to be used for traveling. The men will wear long flannel underwear during the entire year they are in the Antarctic.

THE Chinese Government is getting aid from the League of Nations in its fight against plague, cholera, malaria and other epidemic diseases, the League's Health Organization announces from Geneva. Experts in the fight against plague and cholera are now working in the northwest and center of China, according to Dr. M. D. Mackenzie, who has just returned from China where he has helped arrange for the assistance of the league to the Chinese Government. The league has established a transport service to provide these experts with the stores they need for the fight against plague and cholera. Health conditions on the road to Burma, China's life line at present, are under the supervision of a league expert who is serving as technical adviser to the Chinese Government. Malaria is particularly malignant in regions traversed by this road and constitutes a serious menace to the transport workers, the road menders and the regions to which the road leads. Much of the work of the medical and engineering experts has been concentrated on this road, at the request of the Chinese Government.

SPECIFIC chemical remedies, such as sulfanilamide, will be available in the future for practically all the common infections on germ diseases, was predicted by Dr. E. H. Northey, of the Calco Chemical Company, at a special research conference of chemists on Gibson Island, Md. Sulfanilamide itself and its derivatives have proved successful against a wide variety of diseases of bacterial origin, including blood poisoning, abscesses and sore throats where they are caused by streptococci; the venereal diseases, gonorrhea and chancroid; meningitis; erysipelas; and, most important from the viewpoint of mortality, pneumonia. Chemicals derived from sulfanilamide now under test show promise of value against tuberculosis and virus diseases, the latter being the group which includes infantile paralysis and influenza. Sulfanilamide derivatives reported by chemists working to produce new and better chemical remedies of this sort now number 778.

IDENTIFICATION of three previously undetected molecules of matter, which can probably soon be found in the sun, was announced to the conference on spectroscopy at the Massachusetts Institute of Technology by Dr. H. G. Howell, of University College, Southampton, England. They are the oxides of iron, nickel and cobalt, none of whose spectra has ever been reported heretofore. If found in the sun, these will bring to 30 the number of molecules known to exist there and in all probability in all stars of a similar type. Several other molecular combinations thought most likely to be present have not yet been found, partly due to lack of laboratory data concerning them and partly because the properties of these molecules make detection exceptionally difficult.