SCIENCE NEWS

Science Service, Washington, D. C.

THE STUDY OF THE SUN

ON hot days this summer, when the sun beats down unmercifully, most of us are delighted when a cloud gives temporary respite. But at four locations at least in the United States, where astronomers are studying the sun with powerful new instruments, clouds are most unwelcome.

This summer's American observations are especially important for two reasons. Because of the war, work that has been done in France in recent years will probably be suspended. Also, the new equipment will be put to use before the sun's activity diminishes to too great an extent. This varies over a cycle of about eleven years, and, while the maximum has been passed, we are still near enough to it to have many solar disturbances.

These are chiefly in the form of spots, great whirlwinds in the sun's atmosphere, where the expansion of the gases cools them, reducing their temperature from about 11,000 degrees Fahrenheit to a mere 7,500 degrees. This cooling of 3,500 degrees is far better than anything air conditioning on the earth can accomplish. With the gases cooler, and less luminous, they appear dark by contrast with the brilliant background. Even the spot, however, is brighter than an arc light.

Large spots, many times bigger than the earth, will undoubtedly appear this summer, some perhaps even big enough to be seen with the naked eye. But be careful, do not try to look at them with the uuaided eye. Smoked glass, a dense photographic negative, or a pinhole in a card afford means for looking safely at the sun.

Associated with the spots are the prominences, great flame-like masses of hydrogen and other gases that have been observed to shoot out from the sun, with speeds as much as 452 miles per second, to heights of a million miles. And even farther out from the surface is the corona, the pearly glow which can be seen with the naked eye at total solar eclipses.

In the past few years, two methods have been developed for observing the corona without an eclipse. One, using television methods, was invented by Dr. A. M. Skellett, of the Bell Telephone Laboratories, and successfully tried out at the Cook Observatory, near Philadelphia. The other, which uses optical methods entirely, was devised by a French astronomer, Dr. Bernard Lyot, and used from an observatory on the Pic du Midi, high in the Pyrenees.

This summer the Lyot method will be used by Dr. Donald H. Menzel, of Harvard College Observatory, working at Fremont Pass, Climax, Colo., at an altitude of 11,318 feet. An innovation in Dr. Menzel's equipment is the treating of all the lens surfaces by a process to make them non-reflecting. This still further reduces the glare that ordinarily hides the corona entirely. Dr. Skellett's system is to be applied at McDonald Observatory of the Universities of Chicago and Texas on Mount Locke, Texas, 6,790 feet above sea-level. Drs. C. T. Elvey and E. T. Rogers are working on this problem, under the supervision of Dr. Otto Struve, director of the observatory.

In addition, other solar observations, particularly of the prominences, are being made at the McMath-Hulbert Observatory of the University of Michigan. This observatory is located at Lake Angelus, Mich. One specialty of these astronomers is in making motion pictures of the prominences, from which accurate knowledge of the speed and movements of the gases have been obtained.

Dr. Menzel also plans motion pictures with the Lyot camera. These have the advantage of showing more detail than is possible with the system used at Lake Angelus, which photographs in the light of a single glowing element. The latter, however, can be used under conditions impossible for the Lyot camera.

Another important center of solar research is the Mount Wilson Observatory in California, where telescopes built into towers, one 75 feet, the other 150 feet high, are especially made for the purpose. Here the magnetic disturbances associated with the spots are studied. This is important, because the sun spots often cause magnetic storms upon the earth, disrupting communications, as they did on Easter Sunday.

From these locations, and also from others where less elaborate equipment is in use, the sun will be carefully watched, so that nothing of interest during daylight hours is likely to escape scrutiny. And even at night, for us, the sun shines in Canberra, Australia, where another great solar observatory is watching. From all these observations, we may learn, a little better, what effects the sun has on the earth.—JAMES STOKLEY.

THE AMOUNT OF ELECTRICITY IN A LIGHTNING BOLT

A SINGLE bolt of lightning, crashing from cloud to earth for about a fiftieth of a second, may contain a quantity of electricity sufficient to operate a hundred watt lamp for nearly three minutes. This has been learned from studies made with a new device, the "magnetic surge integrator," which Charles F. Wagner, consulting transmission engineer for the Westinghouse Electric and Manufacturing Company, described at the meeting in Swampscott of the American Institute of Electrical Engineers. He also told of two other devices which he and an associate, Gilbert D. McCann, have devised in order to answer about lightning strokes the questions, "when, how, how fast, and how much."

The "fulchronograph," which tells "when and how," consists essentially of an aluminum disc a foot in diameter, around the edge of which are inserted 400 small steel fins, each about half the size of a nail file. Every 1/25,000th of a second a fin pases through a narrow coil, where the lightning surge magnetizes it. The disc is returned to the laboratory after operation, and the amount of magnetization of each fin is measured. From these data the build-up of the electrical wave is determined.

The magnetic surge integrator is somewhat similar, but is designed to magnetize the strips continually through the duration of the stroke, so they carry a record of the total amount of electricity. The third device, the "mag-

netic surge front recorder,'' answers ''how fast?'' Four coils, connected in parallel with the wires over which the surge is coming, magnetize two small strips of steel. The amount they are magnetized is dependent on the change in current in the coils, so the maximum lightning current may be found.

PREVENTION OF SPREAD THROUGH THE BODY OF THE GERMS OF CANCER

THE spread of cancer from one part of the body to another, which frequently makes it impossible to save the patient's life even by removing the original cancer, may be prevented as a result of a discovery announced by Dr. Oscar V. Batson, of the University of Pennsylvania Graduate School of Medicine, in the *Annals of Surgery*.

The discovery applies to the spread of germ diseases or infections. It is considered by medical authorities so important that the editors of the *Annals of Surgery* rushed Dr. Batson's technical report through the presses six months ahead of the usual schedule to make it available to the medical profession in the July issue.

The new route by which cancer and germs can spread through the body is along the ''vertebral veins,'' that is, the valveless veins about the vertebral column and their connections. The discovery was made by injecting opaque material used in x-ray diagnosis into the veins of cadavers and of living animals. The injections showed that blood, and with it cancers and germs, can spread along the body through the vertebral veins, by-passing the heart and lungs. This is particularly likely to happen in coughing and straining.

As a result, it is no longer felt that as long as the lungs remain clear, the possibility of general spread of cancer or infection is remote. This idea was based on the long-held view that the lungs are the filter for infections and tumors spreading in the body. According to this old view, cases of general spread without lung involvement were called ''paradoxical,'' although the paradoxes might occur in as many as 50 per cent. of the cases. ''Routine examinations of the lungs by x-ray is therefore not enough,'' according to Dr. Batson. ''The entire spine and adjacent parts must be routinely and repeatedly surveyed. The importance of early diagnosis and treatment becomes much more important. ''Straining and heavy work may have to be avoided and prophylactic irradiation (by x-rays or radium) of large areas, particularly in pelvic, breast and lung tumors, may have to be introduced.''

Dr. Batson explains his discovery as follows: ''Ordinarily, tumors and infections are supposed to travel by lymph vessels and veins to the heart. Secondary tumors and infections may appear along this pathway. Before being spread to the rest of the body this contaminated blood stream must go through the lung capillaries (tiny blood vessels). But many times no secondary lesions (tumors or germ injuries) are found in the lungs, 50 per cent. to 70 per cent. in some instances. ''These secondary lesions are especially numerous in the spine and skull. There has been no adequate explanation for this 'paradoxical' spread. An anatomic specimen injection into the veins would be expected to, and generally does, follow the big veins to the heart and lungs. However, injection of breast veins and small pelvic veins results in the injection mass filling the valveless vertebral veins and their connections. In the living monkey the usual course of injected material is into big veins. But when the pressure produced by straining or coughing is imitated, the flow is along the vertebral veins.''

CIVIL AVIATION

POSSIBILITY of passengers crossing the Atlantic, between London and New York or Montreal, in an overnight hop, in planes traveling three hundred miles an hour, is foreseen by Dr. H. Roxbee Cox, formerly chief technical officer of the Air Registration Board, in a recent address to the Royal Aeronautical Society, London.

''There can be no doubt that when a country is fighting for its life, its primary aim is to win the fight,'' Dr. Cox said, ''but it is generally agreed that we are fighting also for our civilization. It would seem axiomatic, then, that we must preserve the means of civilization, of which civil aviation is one.''

He suggested that safety requirements might be varied, depending on the route of the flight. Over cool flat countries, between sea level airports, planes could carry more passengers than when flying over mountains, between high altitude fields in the tropics. In recent years, the British practice has been to set minimum requirements to suit the worst conditions, but this is uneconomical.

He called attention to the present transatlantic schedule of Pan American Airways planes, which operate at a speed of 170 miles per hour, making the trip eastward in 29½ hours and westward in 24 hours, allowing for the time difference in England and the United States, and the prevailing westerly winds. He pointed out that, after this, the obvious big step forward would be to make the journey overnight. That we can not at present consider this is clear from the calculation which shows that, though a westbound speed of 240 miles per hour would be adequate, an eastbound speed of 486 miles per hour would be required. He stated: ''An approximation to the overnight ideal is possible at 300 miles per hour. This would allow arrival at Southampton at 10 A.M., if departure had been made from Montreal at 6 P.M. the previous day. I suggest, then, that the next big advance in operational speed will be 300 miles per hour. What degree of comfort should be supplied at this speed? The westbound passengers will be on board only thirteen, and the eastbound only eleven hours, and most of this time may be spent in bed. I suggest that weight and space might be more profitably expended in comfortable beds than in promenade decks and wine cellars.''

With a daily service it would probably not be necessary for some time to cater for more than 250 passengers and 20,000 pounds of mail per week. This would be about thirty-five passengers per day, but to deal with fluctuations in load, the aircraft would probably need to have room for fifty passengers. He also suggested that it would probably be necessary to make the direct North Atlantic route, now used only in summer, an all-year-round one. He concluded: ''There is, therefore, ahead of the operators a highly interesting and perhaps exciting period.''

RECENTLY GRANTED PATENTS

GASOLINE of high quality can be efficiently produced from paraffin wax, by a process invented by Ernest W. Thiele, of Chicago, who has just been granted U. S. Patent 2,205,607. "In the manufacture of lubricating oils and paraffin distillates more wax is produced than is required for known commercial uses," the inventor states. "In many parts of the world naturally-occurring waxes are plentiful, although there is an insufficient amount of petroleum to satisfy motor fuel requirements. Various synthetic processes, such for instance as the Fischer process for converting carbon monoxide and hydrogen into paraffinic compounds, yield large quantities of paraffin wax. The object of my invention is to convert this wax into high quality motor fuel. A further object of the invention is to produce a motor fuel with better anti-knock characteristics than can be obtained by the thermal or catalytic cracking of other charging stocks." The wax is converted to gasoline by the action of heat of 850 to 1,000 degrees Fahrenheit, and a catalyst, such as acid-treated clay of the type used for decolorizing lubricating oils. Then, by distillation, the reaction products are separated. The process yields a product of which 40 per cent. is a high-grade gasoline. This can then be further refined.

Dr. Charles G. Abbot, secretary of the Smithsonian Institution, was another inventor whose work has been recognized by the Patent Office. He received, on June 25, patent 2,205,378 for a device to generate steam by action of the sun's heat rays. An aluminum reflector, shaped to a parabolic curve, focusses the sun's ray on a boiler tube, enclosed within an evacuated glass chamber, on the thermos bottle principle, to avoid heat losses. The boiler tube is painted black, to absorb as much heat as possible. A boiler of ordinary type is not efficient for solar work, Dr. Abbot explains, because the sun is occasionally obscured by clouds at most locations. "When the sky is clear around the sun," he states, "much time is lost if a boiler of large heat capacity is utilized because it requires considerable time to raise steam to the required pressure." With the "flash" boiler, that he uses, the boiler itself has very little heat capacity, so it quickly comes to the required temperature. Limited amounts of water are injected, and are immediately converted into steam. By a special mechanism, incorporated into his invention, the supply of water is regulated automatically "to suit the brightness of the sun from moment to moment, so that the water supply to the heater shall at all times be turned entirely into steam at a nearly uniform pressure while flowing through the boiler, being neither too great nor too small in amount." Dr. Abbot states that from his numerous experiments he has come to prefer the type of apparatus in which the boiler tube is inclined to the north, parallel to the axis of the earth. To follow the sun's daily movement, the reflector is rotated around the tube daily from east to west.

Another patent is a "radio autograph." It is similar to the wire-connected device used in railway stations, banks and other places where the motion of a pencil at the transmitting station is reproduced at the receiving end to write a message, except that the only connection between sender and receiver is by radio waves. This was invented by Clarence H. Kehm, of Chicago, and was granted patent 2,205,531.

John L. Lochhead, of Springfield, Mass., was awarded patent 2,205,426 for a water-cooled machine gun. A pump, operated by the gases of the exploding charges, circulates the water, so that firing does not have to be stopped to change the cooling water, as with present water-cooled guns.

ITEMS

W. B. BERGEN and Lee Arnold, of the Glenn L. Martin Company of Baltimore, speaking before the Institute of Aeronautical Sciences meeting at the California Institute of Technology, reported that a set of mathematical curves replaces weeks of laborious mathematical computations to allow aviation engineers to tell whether an airplane will "flutter" itself to destruction. Development of a graphical solution of flutter instability in airplanes is expected to result in safer planes and more rapid design. Flutter is a vibration that builds up with increasing force until a wing, aileron or tail flies off and the airplane is lost. Many otherwise unexplained crashes have been traced to flutter. Three years ago Martin engineers developed a vibration-detecting device that gave warning of dangerous conditions building up in an airplane during flight. The new work will greatly simplify the computation of the critical conditions that warn when dangerous flutter is imminent.

"PURE" and applied science are no longer separated by such sharp distinctions as both become better science, according to Dr. Ernest R. Hilgard speaking at the opening of a new psychology building of the University of California in connection with the meeting of the Western Psychological Association. It has been difficult to bring the very significant problems of social behavior—of domestic, economic and political life—into the psychological laboratory. But an important start has been made in this direction. Laboratory studies under controlled scientific conditions are giving us new understanding of conflict and frustration, rationalization, repression and other Freudian mechanisms. Important advances in realizing the effects on the personality of different forms of government are resulting from the study under laboratory conditions of the effects of democratic and autocratic leadership.

TWO new antidotes for poisoning from the scorpion's sting are suggested by Dr. Ali Hassan and Ahmed Hassan Mohammed, of the Faculty of Medicine, Egyptian University, Cairo, in a report to the *Lancet*. Atropine, familiar to laymen chiefly as the drops put in one's eyes for examination for eyeglasses, and ergotoxin are the two drugs suggested as scorpion toxin antidotes. They could be used alone or with the specific antiserum to cure persons poisoned by a scorpion's bite, it is suggested. No human trials are reported but one injection of the two drugs simultaneously given within two hours of a fatal dose of scorpion toxin saved the life of a dog. Rats were saved by either drug alone.