"Vaterland" also differs greatly from that of the "Imperator," the successive water planes aft being fuller than those of the earlier ship. We understand that the changes in her model, as compared with the "Imperator," had much to do with the high speed which she achieved on her trial. A feature which adds to the appearance of the ship is the absence of the monster eagle which is carried at the bow of the "Imperator." An eagle makes an appropriate figurehead on a clipper-bowed ship; but it is inappropriate and quite inharmonious when placed at the top of a straight stemhead such as characterizes the modern transatlantic liner. The shield and scroll work of the "Vaterland" are in better taste.

The "Vaterland" is constructed with both longitudinal and transverse bulkheads, the longitudinal bulkheads forming the inner walls of the coal bunkers, and serving as an inner skin. All the walls of the passenger decks have been coated with special fireproof material. The bulkheads are of unusual stiffness, and the openings in them, where they pass through the passenger accommodation, are closed by fireproof glass doors, thirty-nine in number, which will withstand a temperature of 1,000 degrees. The staircases are so encased with fireproof material that each forms a fireproof inclosure. A special fire department, composed of trained fire fighters, devotes its entire attention to fire protection. It occupies a special cabin, where all the fire alarm signaling devices are centered. There are more than 450 fire announcers throughout the ship, which would instantly indicate a dangerous rise of temperature. A complete system of automatic fire sprinklers, comprising 800 water jets, is distributed throughout the crew's quarters. A special fire fighting device employing chemicals in place of steam is operated by the firemen. There is also a complete system of fire hose and pumps. The fire fighting installation fulfills the strictest rules laid down by the German building and police authorities. The "Vaterland" carries eighty-four lifeboats, including two motor lifeboats, which more than accommodate all on board.

The several cabins of the "Vaterland" have been designed by the leading decorators of Europe; and the great liner with its paintings, sculptures, and decorations affords an interesting study of the decorative arts. The grand dining saloon, which seats 800 guests, is finished in white and gold, its ceiling being supported by Ionic columns. In contrast to this the Ritz Carlton is carried out in mahogany and walnut, decorated with heavy garlands in bronze. The smoking-room is paneled in Flemish oak in low tones, while the main lounge, which may be converted into a ballroom, is decorated in warm red tones. The art treasures include paintings by old Italian masters as well as work of many notable contemporary artists. On the main staircase hang two landscapes by the Venetian artist, Giovanna Battista Pittoni (1690-1767). Four large canvases by Lairesse adorn the main saloon; and a portrait of King Ludwig of Bavaria, by Baumgartner, will be found in the ladies' saloon. The smoking-room is enriched by two marine studies by Prof. Schnars-Alguist, while a great panoramic study, by Kolmsperger, adorns the cupola of the dining-room.

The Death of Paul Louis Heroult

A PRIVATE cable to students of the Massachusetts Institute of Technology announces the death in Paris on Saturday of Paul Louis Toussaint Heroult, whose name will ever be connected with aluminium and the electric furnace. The name is familiar in Boston in that his son Paul was a student at the Massachusetts Institute of Technology from 1910 till 1912, going home at the end of his sophomore year for his service in the army. He was particularly active in athletics, being on the tug-of war team, second in the pole vault and one of the wrestlers.

Heroult *pere* was born at Thury-Harcourt, and had his boyhood schooling about equally in England and France. He went to the Lyceum at Caen and later to St. Barbe, Paris. In 1882 he attended the School of Mines in Paris, and the next year took his military service in the army. On finishing this he went with a metallurgical firm, and giving his attention to aluminium, in 1886, two years thereafter, he obtained a patent for the production of this metal electrolytically. On his discoveries are based the improvements in methods that brought the price of the metal from $20 a pound in 1884 to about 50 cents in 1901.

The more recent achievements of Heroult have been in the line of the electric furnace for steel, aluminium and other metals. His principal work here was the introduction of two electrodes into the melting-pot, so that the ore received the full effect of the heat and the furnace was little more than a container. A later improvement consisted of a third electrode, which was in the nature of a starter and which burned away when the furnace rose to its proper heat. For his furnace he received in January, 1904, the medal of the French Society for the Encouragement of National Industries. The Heroult furnace is in extended use to-day in many places, while for Canada he made a special investigation with the nature of the local ores in view.

Do Plants Sleep?

By Maud DeWitt Pearl

WE ordinarily think of the ability to sleep as something belonging exclusively to the animal kingdom. Whether plants likewise enjoy a daily period of rest has recently been studied by a distinguished Indian botanist, Prof. Bose, of Presidency College, Calcutta, India. He worked with the sensitive plant, *Mimosa pudica.* An electrical apparatus was constructed, which, at regular intervals throughout the day and night, gave a slight but constant shock to the plant. When the plant responded to this stimulus it drooped its leaves and stems. Then, after a period of quiescence, it gradually returned to its original condition. The degree of response to the electric current and recovery to the normal condition were recorded upon a smoked glass plate by means of a tracer attached to the apparatus, so that an hourly record was obtained,

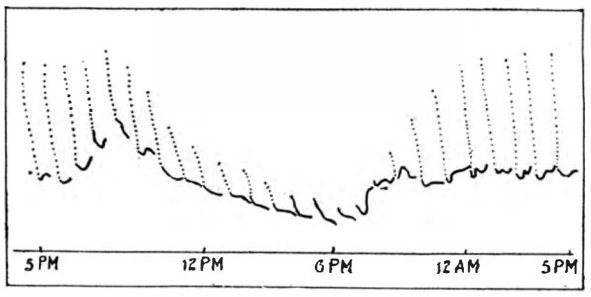

Fig. 1.—Diagram showing response of Mimosa to stimulation during a period of twenty-four hours.

for many days and nights, of the state of the "motor-excitability," as Prof. Bose terms it, of the plant. The results which were obtained show that Mimosa is in the Land of Nod, regularly, every day. What is true of Mimosa is undoubtedly true for plants in general.

If it had not been for Prof. Bose's experiments, however, no one would have suspected that plants are guilty of disobeying the old adage of "early to bed and early to rise," etc. But the experiments show Mimosa to be a very late sleeper. At nine o'clock in the morning the plant is practically unresponsive when stimulated by the electric current. From this time on, however, there is a gradual awakening until at noon the maximum response is reached. This continues until about five o'clock in the afternoon, when the fluctuation toward the opposite condition sets in. The motor-excitability gradually diminishes until the minimum state is reached at about nine o'clock the following morning.

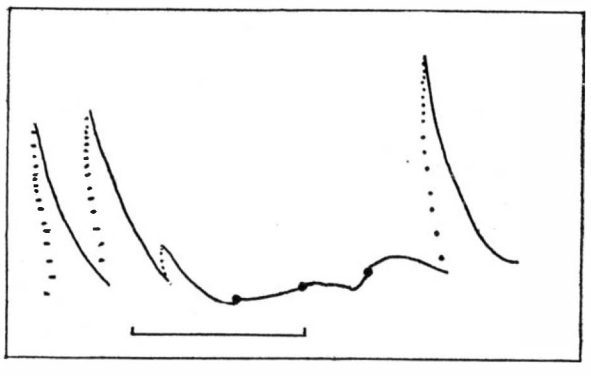

Fig. 2.—Response when subjected to sudden cold.

This variation of the motor-excitability of the plant is due to the combined effect of light, temperature, and moisture. During the night the temperature is lower, the stimulating effect of light is withdrawn, and the plant becomes more turgid, owing to its not giving off so much moisture. Since the effect of these factors upon the plant is cumulative and at the same time there is a lag in the response of the plant to them, we have the explanation of why Mimosa is in a state of lethargy so late in the morning. Likewise, why the plant is in the opposite condition late in the afternoon when night is fast approaching.

The accompanying drawing, Fig. 1, shows the state of excitability of Mimosa during a period of twenty-four hours when stimulated regularly by the electric current. The diagram is read from left to right. The uneven base line is due to the regular leaf movements which the plant exhibits daily and is not related to the response of Mimosa to the electric current. The downward curve represents the gradual recovery from the stimulus. It will be noted that the plant is markedly excitable from 12 A. M. up to about 9 P. M. From this time on there is a gradual decrease in response to stimulation until late in the morning, when the plant shows no excitability whatever. After this time the recovery is quite rapid up to 12 A. M., when the height of excitability is reached.

Fig. 2 shows the amount of response to the electric current when subjected to sudden cold. The dotted upward lines indicate the degree of response to the stimulus, the smooth downward lines, the recovery. It will be noticed that after the plant is exposed to sudden cold the first response to the current is much lessened, and the second and third stimulation produce no effect whatever. The ordinary temperature is then resumed, but the plant still exhibits the after-effects of the cold.

Setting a Watch

By Frederick E. Ward

THE accurate time signals sent out by wireless at noon and at 10 P. M. from the Government station at Radio, Va., have stimulated the interest of those who are equipped with receiving apparatus in keeping their watches closely regulated and set.

Watch movements as good as the 17 jewel grade, and costing about $15, may, by careful adjustment of the regulator, be made to keep time to within thirty seconds per month; so that, if a curve be plotted on cross-section paper showing the error of a watch, each time it is checked by the wireless signal, it is possible to estimate closely what the error should be at any given time.

Since, however, an exact adjustment of the regulator is impossible and the error gradually increases until it becomes inconveniently large, it is often desirable to reset the hands. The usual method of doing this, by stopping the balance wheel with a toothpick and letting it go at the right moment, is inconvenient unless there be another time-piece at hand and is also open to other objections.

The author has discovered a method of bringing the error back to zero, or of setting a watch accurately without disturbing it in any way. If the chain or fob be removed, and the watch be hung up by its bow on a hook or nail driven in the wall, so that it hangs free, it will be found to swing itself slightly, pendulum fashion, by reason of the motion of the parts of the escapement. The effect of this swinging on the running of the watch varies between individual watches and depends on the weight of the case and on its dimensions. As a rule, it will be found that a watch gains about two seconds per hour, though some of them show a loss, instead. The exact amount must be found by trial, say, by hanging up the watch for ten hours and checking it against the wireless signal. Once this value is known it is obvious how it may be used to advantage. If the watch *gains* when hung up, the regulator should be adjusted so as to make it run a trifle *slow.* Then when the accumulated error becomes inconveniently large, the watch may be hung up on the hook, say at night, for the right number of hours to bring its second-hand ahead to the correct position.

Should a watch be found of such weight and dimensions as to neither gain nor lose when hanging as described, it can be made to respond by hooking on a piece of metal at the base of the stem, thus raising the center of oscillation of the swinging mass. For the same reason a hunting-case watch has a different rate when hung with its case open from the one when the case is closed. It is an added convenience to know both these rates, since sometimes one is positive and the other negative, thus enabling one to set the watch either forward or backward at will.

Our Front-cover Illustration

AS evidence that the giant ocean liner is profitable, it should be noted that there are five vessels of 900 feet length and over building or under construction. These are the "Vaterland," 950 feet; "Imperator," 909 feet; a sister to the "Vaterland" building at Hamburg; the "Aquitania," 900 feet, which will reach New York in June; and the "Britannic," 900 feet, shown on our cover, due here next Autumn.

The Current Supplement

IN this week's issue, No. 2003, of the SCIENTIFIC AMERICAN SUPPLEMENT, E. R. Matthews contributes an illustrated article on the effects of wave-action upon harbor breakwaters and piers.—E. H. Ross writes on House-flies and Disease.—H. J. Spinden tells us the story of an interesting chapter of ancient American history.—Bashford Dean writes on the habits of fishes, as illustrated by exhibits in the American Museum of Natural History.—A paper read by W. A. Hargreaves before the Society of Chemical Industry on "Blasting Gelatines" is reported in full.—A timely topic discussed is that of disease danger in the invasion of Mexico.—The use of trees as windbreaks for farms is illustrated and described.—A chart prepared by C. H. Clark shows at a glance the strength of shafting needed to transmit a given horse-power at different speeds.