

The terrestrial fly-wheel is perpetually retarded in its rotation, by a brake perpetually applied, and its energy of rotation is perpetually diminished. The action of the tides is always in one direction; they constantly retard the earth's rotation, tho by an excessively small amount."

Professor Holden now bids us look backward into time, to a point where we find the earth revolving faster and faster. Ages ago, he tells us, long before geology begins, the earth was rotating in a day of five or six hours in length, while in the remotest past the day was only five hours long. The globe could revolve no faster than this and remain a single unbroken mass. It was at this time that the moon was born—separated from the parent mass of the earth, which was then a molten fluid sphere. The tides, which now are superficial and local, were then universal and immense, and occurred at short intervals. The whole surface of our globe was affected, and the corresponding tides in the fluid molten moon were greater still. To quote again:

"Our day is now twenty-four hours; the distance of the moon is now 240,000 miles. When our day was about five hours long, the moon was in contact with the earth's surface. It had just broken away from its parent mass. As the length of the terrestrial day increased, so did the distance of the moon. The two quantities are connected by inexorable equations. If one varies, so must the other. Whenever the rotation time of a planet is shorter than the period of revolution of its satellite, the effect of their mutual action is to accelerate the motion of the satellite and to force it to move in a larger orbit—to increase its distance, therefore.

"The day of the earth is now shorter than the month—the period of evolution—of the moon. The moon is therefore slowly receding from us, and it has been receding for thousands of centuries. But the day of the earth is, as we have seen, slowly growing longer. The finger of the tides is always pressing upon the rim of our huge fly-wheel, and slowly but surely lessening the speed of its rotation. So long as the terrestrial day is shorter than the lunar month, the moon will continue to recede from us.

"There will come a time in the remote future when the terrestrial day will have lengthened, by slow steps, to fifty-seven of our present days. And at that distant epoch the moon will revolve about the earth in the same period of fifty-seven days. The earth-moon system will then resemble a huge dumbbell with two unequal ends. The mass of the earth at one end and the mass of the moon at the other will perpetually face each other. The two ends of the dumbbell will revolve face to face precisely as if they were connected by a rigid rod. The moon will hang over the sky of a single region of our globe forever. This we may truly call the epoch of the death of our moon. The mark of life is change; and in that distant future there will be no more change of motion.

"Change in the topography of the moon has long since ceased. . . . The active agents of terrestrial change are not present on the moon—water, frost, air. The moon has been dead to topographical change for millions of years. When Tidal Evolution shall have brought the earth-moon system to a state so stable that no change in motions can ever again occur, then, indeed, we may say that death has come."

Molasses as Food for Cattle.—In German sugar refineries molasses is being used in the preparation of food for cattle. According to information furnished by M. Vigér by the refinery at Tournay and reported by him to the Société d'Agriculture, the molasses is first "heated to 90° and then introduced in a steady stream into a mechanical mixer. At the same time the forage with which the molasses is to be incorporated is also fed into the machine. There issues from the mixer a warm, moist, coarse-grained mass, which is left in a pile for several hours with certain precautions. In a short time there is thus obtained a homogeneous dry product that can be easily transported and preserved. The materials employed are of many kinds, including wheat, chaff, cut straw, turf, sesame, peanuts, rice, corn, etc. According to their nature, these are previously crushed, ground, or flattened by machines similar to those used on farms. The whole plant for the preparation of the food, except the boiler for working the molasses-pump and the vats for heating the molasses, are placed in a corner of the refinery. It occupies little space and can be quickly taken down and removed. The ex-

pense is slight and the production is 30,000 to 40,000 kilograms [33 to 44 tons] of forage daily. Thus has been solved simply and economically the problem of the utilization of molasses." —*Translation made for THE LITERARY DIGEST.*

BREEDING BUTTERFLIES.

BRILLIANT butterflies are now bred in London for beautifying the parks of that city, if we may believe the English correspondent of the *Springfield Republican*. He says (September 1):

"It was a famous book publisher, C. J. Longmans, who thought of this queer 'butterfly scheme,' as it is called. It occurred to him one day a few months ago how immensely it would add to the picturesqueness of London's breathing spaces if here and there blithe, joyous butterflies could be seen flopping along over the grass. He confided his idea to the London county council, and that progressive municipal body promptly instructed its committee on parks to bestir itself and see what could be done toward carrying out Mr. Longmans's idea.

"After consulting with a well-known scientific man, the committee decided that the best way to get butterflies for its parks would be to raise them and turn them loose there. They promptly appropriated about \$500 as a starter, to get a lot of caterpillars and provide quarters for them, and the result is the only municipal butterfly-raising plant in the world, so far as known. The project has been begun in a modest way, but if the preliminary experiment, which at present calls for the production of only about 8,000 butterflies, is the success it now promises to be, this novel branch of the park committee's labors will assume imposing dimensions, for arrangements will be made at once for cultivating butterflies enough to populate all the 4,000 acres of London's parks.

"Battersea Park, which lies along the Thames 'up Chelsea way,' is the scene of London's first attempt at butterfly culture, and here in one of the most sunny corners of the botanical gardens there now rises a little glass house which looks much like a miniature conservatory, but which is at present the local habitation of London's caterpillars. It was expected at first that the city would have to buy its caterpillars and pay for them, just as it does for its other supplies, but the scientist under whose direction the council placed the undertaking has made arrangements with some of his entomological friends to supply them free of charge for the present. Most of the caterpillars are picked up by the railway men along the Devonshire lines and sent on to London by post.

"At present only three varieties of butterfly are being bred for the London parks: The Red Admiral, the Peacock, and the Tortoise Shell. They are all natives of England and common enough in the country districts, having been selected mainly on account of their brilliant colors and also for the reason that none of them does any harm to foliage. This nice discrimination on the part of the committee makes it necessary that all the caterpillars sent in shall be carefully inspected by Professor Furneaux, head master in the municipal butterfly asylum, lest any undesirable interlopers with a taste for tender young buds should have crept in uninvited. As soon as every lot of caterpillar recruits has thus passed the preliminary inspection, they are placed in the incubating-house, some of them turned loose to take care of themselves, and others being placed in long bags of transparent gauze, the better to observe their little idiosyncrasies. The favorite diet of these breeds of caterpillars is the common nettle, and several beds of these have been planted in the culture-house for the delectation of the free caterpillars, while the prisoners in the gauze bags are served with a liberal supply every day.

"This is practically all the attention the insect guests of the committee require. As soon as they arrive in the incubating-house they begin to eat. Eating is the particular branch of industry in which the caterpillar can give cards and spades to every other creature known to science. In a month one of them will dispose of 600 times its own weight of food, and in three weeks will have increased its avoirdupois to over 11,000 times its original figure, the record for insects in this respect being held by the 'great moth,' which grows over 70,000 times heavier."

There seems to be some doubt whether it will be possible to

keep butterflies in the parks, owing to the voracity of the sparrows, who are their chief enemies. If the scheme succeeds, it may be the means of preserving some rare species of English butterflies and also of introducing into the country many beautiful varieties from other lands.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

THIS year's meeting of this representative scientific body, which has already been noticed in these columns, was noteworthy as being the first to be held in the great West. *Science*, which is the official organ of the association, informs us in its account of the proceedings that the registration reached 311, and that the number of representative men of science present was proportionally very large. The attendance of members living west of the Mississippi was 162. Several important changes of policy were either adopted or proposed, of which the most noteworthy contemplates the change of the time of meeting from summer to winter, it being proposed to hold the 1903 meeting at Washington on or about New Year's Day. It is possible that two meetings a year may be held.

The presiding officer at this meeting was Prof. Charles S. Minot, of Harvard, but the chief address was delivered, according to custom, by the retiring president, Prof. R. S. Woodward, of Columbia University. The following officers were elected for the next meeting, which is to be held in Pittsburgh, Pa., from June 28 to July 3, inclusive, 1902:

President—Asaph Hall, U. S. N., retired.

Permanent Secretary—L. O. Howard, chief entomologist, Agricultural Department, Washington.

Assistant Permanent Secretary—Richard Clifton, Agricultural Department, Washington.

General Secretary—D. T. MacDougal, director of the laboratories, New York Botanical Gardens.

Secretary of Council—Prof. H. B. Ward, of the University of Nebraska.

Treasurer—Prof. R. S. Woodward, Columbia University.

Professor Hall is well known for his long connection with the Naval Observatory at Washington, and his discovery of the moons of Mars has given him world-wide fame. Of the other officers perhaps the best known is Dr. Howard, whose lectures and investigations on mosquitoes have brought him before the public eye during the last year or two.

SCIENCE BREVITIES.

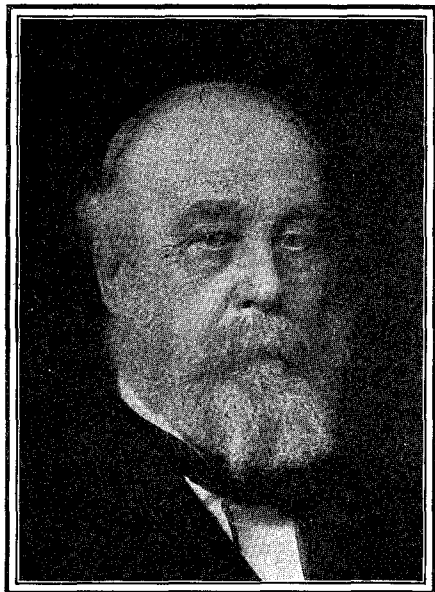
ACCORDING to *L'Électricien* the Marconi company is now proposing to establish a wireless telegraph service between England and Australia.

"Marconi has perfected his apparatus to such a degree, we are assured, that a perfect connection will be secured if stations are established at the following points: the English coast, Cape Finisterre, Gibraltar, Malta, Algiers, Sardinia, Sicily, Cape Malea (Greece), Alexandria, Aden, Socotra, Colombo, Sumatra, Perth, Albany, Adelaide, and Melbourne. The same company is hoping to be able to organize a service between Europe and America. We shall see!"—*Translation made for THE LITERARY DIGEST.*

WHAT are probably the largest bluestone sidewalk slabs in the world are now being laid in front of the Prudential Insurance Building, Newark, N. J., according to *Engineering News*. "For the entire distance, 374 feet, only 35 stones will be used. The largest will be 12 feet wide and 21 feet 7 inches in length. The length of the longest stone will be 22 feet 1 inch, and the widest will be 12 feet in breadth. . . . As there has never before been a call for stones of such large dimensions, it was necessary to build a 35 ton machine for the purpose of planing down the huge blocks and putting them into shape for use as paving stones. This planer is said to be the largest in existence, and is capable of handling a block 25 feet long and 14 feet wide. Seventeen stones have thus far been received from the quarry, and 14 of these have been dressed for use."

"THE failure of a trestle bridge near Sabine Pass, Tex., on August 8, reveals what appears to have been the work of the teredo in fresh water," says *The Railway and Engineering Review*. "An officer of the road, the

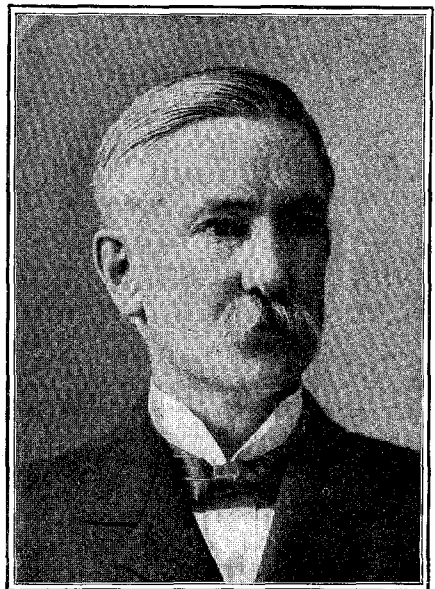
Southern Pacific, informs us that there are many trestle bridges over tributaries of the Sabine River in that region and that trouble from the teredo has hitherto been unknown, the water having always been fresh. Piles taken out after standing 18 years are found absolutely sound below the water-line. The piles of the bridge which failed proved, however, to have been badly eaten by the teredo about 18 inches below the low-water mark. The freshness of the water was looked upon as a certainty, and the piles of these bridges have not been regularly examined below the low-water mark. The bridge in question was subjected to the ordinary inspection about three months ago, and was then in perfect condition down to the line of low water."



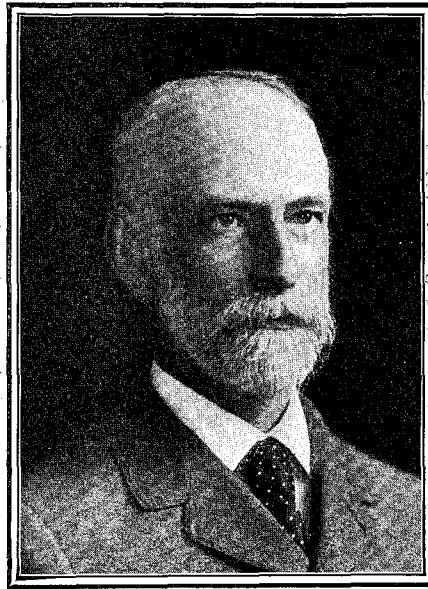
PROF. ASAPH HALL



PROF. L. O. HOWARD



PROF. R. S. WOODWARD.



PROF. CHARLES L. MINOT.