

THE GYPSY MOTH.

The attempt on the part of the State of Massachusetts to eradicate the gypsy moth has been generally considered as one of the most important attempts of modern economic entomology. The conditions involve the extermination of a highly prolific species, well established over an area of more than 200 square miles. Mr. E. H. Forbush, of Malden, Mass., Field Director of the Massachusetts Board of Agriculture, presented a review of the gypsy moth work and the results achieved, before the Association of Economic Entomologists at the Columbus meeting of the American Association for the Advancement of Science. The gypsy moth was introduced into America about 1869, but the insect is still confined to a limited area in Eastern Massachusetts, mainly comprising the towns lying north of Boston. The introduction of the gypsy moth was made by Professor L. Trouvelot, the French savant, who was interested in the matter of raising silk from native silk worms. The manner of their subsequent escape is not clearly known, but the result was most unfortunate. Twelve years from the time of its introduction, the moth became a serious nuisance in the neighborhood where it had escaped. It was vigorously fought by the citizens, but their efforts were useless, and in 1889 occurred the famous moth outbreak at Medford, Mass.

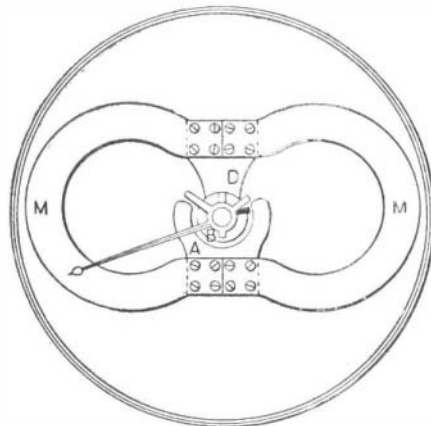
The armies of worms that suddenly appeared in June and July seemed about to destroy everything green. They gathered in masses sufficient to blacken houses and fences in certain districts and devastated all sorts of foliage over extensive tracts, killing many trees, and the dropping of the caterpillars on people and sidewalks was most disagreeable. The streets were filthy and in summer nights a sickening odor arose from the mass of caterpillars and pupæ. The destruction of the trees was greatest in those localities where the moth had been the longest. Frequently the trees sustained attacks for two or three years. The caterpillars destroyed not only the foliage and trees, but also fruit and vegetables. When the supply of leaves from the trees fell short, they attacked the gardens; many vegetables were ruined, flower gardens were destroyed and even greenhouses were invaded. Action was taken by the town of Malden in addition to the efforts of the citizens during the attack of 1889. It was soon seen that the nuisance was too widespread to be coped with by the local authorities, and the next year the legislature appropriated \$50,000 for the extermination of the pest. A year later the work was placed in the hands of the State Board of Agriculture and they were directed to secure the extermination of the gypsy moth in the Commonwealth. Dr. C. H. Fernald served as entomologist to the committee and Mr. E. H. Forbush as Field Director. At the close of the year 1899, the State of Massachusetts has expended in the annual appropriations for the gypsy moth work the sum of \$1,555,000.

The magnitude of the task can hardly be described. The first six weeks' work of 1891, from careful estimates, showed that the number of different classes of egg clusters destroyed was 757,760, and the eggs probably numbered from 3,000,000 to 5,000,000. Burlap bands were placed around the trees, and in 1899, 53 tons of burlap were purchased for the purpose of banding 2,500,000 trees. The number of caterpillars destroyed by hand beneath these bands amounted in 1895 to 2,164,458. In one small grove in Dorchester, where the trees were defoliated before the caterpillars were discovered, eighteen bushels were killed in a short time. In 1898 the number of tree inspected was over 12,000,000, and millions of eggs have been destroyed by cutting and burning infested trees and underbrush. Caterpillars have been killed en masse by spraying and burning and where such wholesale methods have been employed, no attempts have been made to even estimate the total of the various forms of the moth destroyed. In 1899 at height of the larval season 570 men were employed. The spraying with lead arsenate in the rainless months of May and June was most effective, nearly, if not quite, all of the caterpillars in the sprayed trees being destroyed. It is difficult, however, to find the gypsy moth in the infected region, except in a few localities where the work was not carried on owing to

a delay in making the appropriation. The gypsy moth is not exterminated, and during the past summer it appeared in two new places, Newton and Georgetown. The indications are, however, that the gypsy moth will be a rare insect in Massachusetts in the year 1900. We publish a most interesting paper by Mr. Forbush upon the gypsy moth in the current number of the SUPPLEMENT.

LONG-SCALE MEASURING INSTRUMENTS.

Mr. B. Davies has designed and constructed several instruments of the D'Arsonval type with a long and uniformly divided scale. They include, says The Philo-



LONG-SCALE MEASURING INSTRUMENTS.

Magazine, a voltmeter, an amperemeter, and a ballistic galvanometer. The latest type of magnetic circuit employed is shown in the diagram. *MM* are the magnets, *A* and *BD* the polepieces. On the soft-iron cylinder, *B*, is mounted the brass frame carrying the entire moving system. It is evident that any quantity of steel may be used. In the voltmeter the moving coil contains some 100 or 200 turns of the finest wire, while the amperemeter coil has some 20 turns of a moderately thick wire.

New Rifles for the Navy.

One thousand Krag-Jorgensen rifles have been supplied to the battleships "Kentucky" and "Kearsarge."

Both branches of the service will soon have small arms of the same caliber, thus greatly simplifying the problem of interchangeable supplies of ammunition when the army and navy are required to carry on joint operations. The Lee rifle will gradually be discarded and replaced by the other small caliber rifle. The army ordnance department will manufacture the Krag-Jorgensen rifle for the navy, but the ammunition will be manufactured by the ordnance department.

Annual Meeting of the Society of Naval Architects and Marine Engineers.

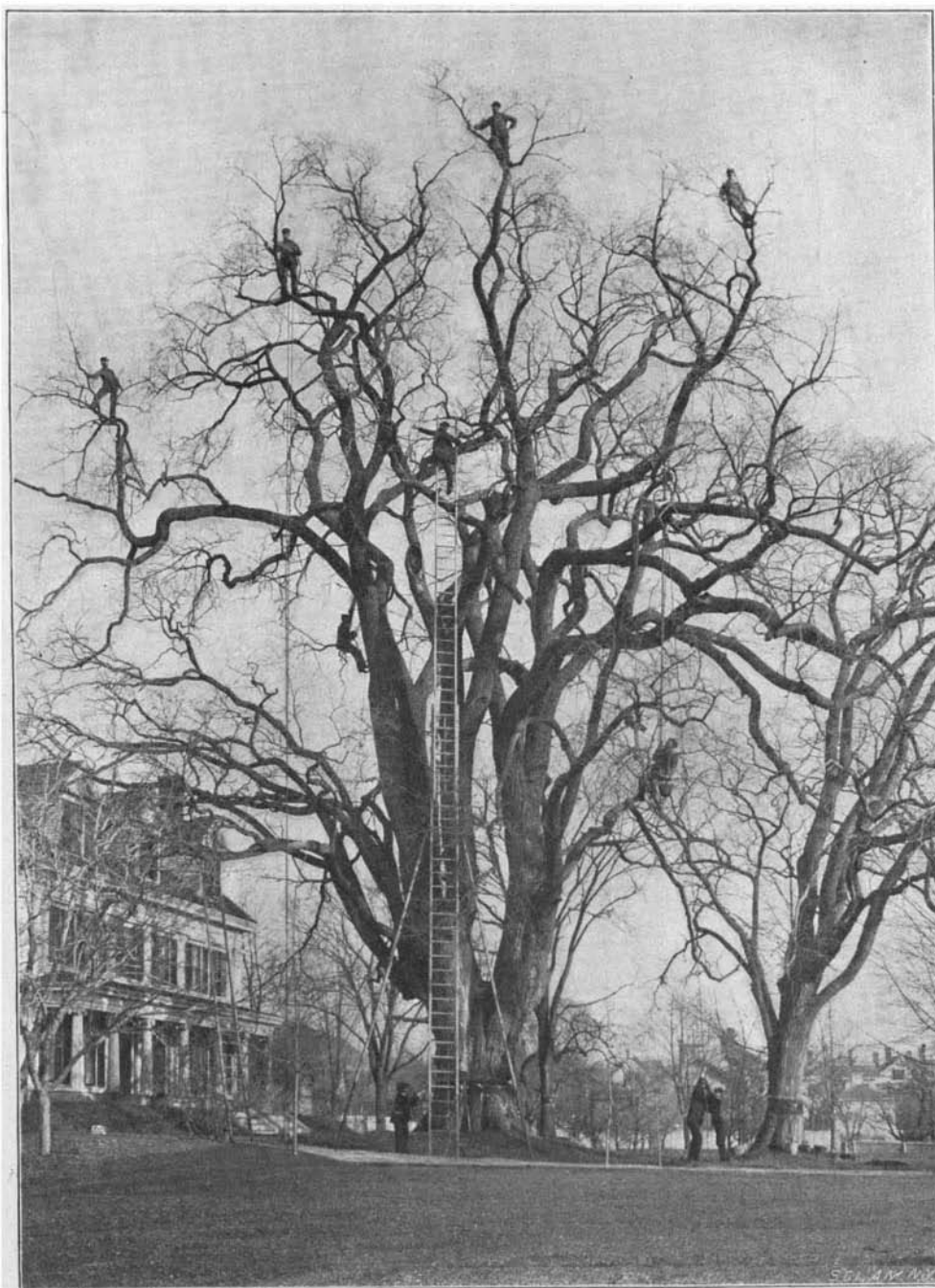
The seventh general meeting of the Society of Naval Architects and Marine Engineers took place at the rooms of the American Society of Mechanical Engineers, No. 12 West Thirty-first Street, New York city, on Thursday and Friday, November 16 and 17. Among the papers that were read were several of very special interest, which will be published in the next issue of the SCIENTIFIC AMERICAN SUPPLEMENT. Owing to the absence in England of the president, Clement A. Griscom, the annual address was read by Naval Constructor Bowles, the secretary of the society. The address mentioned with regret the death of the senior founder of the society, "that venerable dean of shipbuilding in this country, William H. Webb." Attention was drawn also to the fact that the policy of expansion had benefited the shipbuilders, inasmuch as the large number of vessels purchased for the use of the army and navy, coupled with the increasing use of steam vessels in the coasting trade, had produced the greatest activity ever seen in our coast shipyards, both on the Atlantic and Pacific. Rear-Admiral Sampson was chosen to fill the place of the late William H. Webb as first vice-president of the society.

Recording Meteor-Paths by Photography.

A long communication to the Photographische Mittheilungen, by Herr J. Rheden, shows how any careful amateur who has leisure time and good apparatus for ordinary work may make useful contributions to an important branch of photographic record; a branch of record which should ultimately lead to a considerable extension of our astronomical knowledge. It is pointed out that personal observations as to meteors are subject to so many sources of error as generally to be almost valueless, whereas photographic records made with such apparatus as is possessed by many amateurs may embody in themselves such data as shall make them of the utmost scientific importance. A finely constructed stand with driving clock is quite unnecessary, as star trails are quite as good datum marks as the point-images obtained when the camera is driven. In fine weather and with highly sensitive plates (25° to 26° Warnerke) an objective working at *f*/4 will give trails of stars at the equator down to the 7th magnitude. Although each magnitude gives 2.5 the amount of light of that magnitude standing below it in the series, it must not be assumed that the photographic relation will be strictly the same in all cases; still, an objective 2.5 times less intense may be considered to register one magnitude less. Further, it may be considered that a meteor of the first magnitude must travel at a speed of 244 times (or 2.5 to the sixth power) to produce a trail corresponding in intensity to a star of the seventh magnitude. Such considerations as the above, without those numerous details which concern the actual operator, will be quite enough to show how the starry heavens may not only form a datum chart as to position, but also a photometer for determining intensity, and obviously it is at the times of the periodic meteor showers that records are chiefly to be made.

A New Artificial Paving Stone.

A new artificial paving stone is made in Germany. It is composed of coal tar, sulphur and chlorate of lime. The tar is mixed with the sulphur and warmed thoroughly and the lime is added to the semi-liquid mass. After cooling this product is broken fine and is added with ground glass, or blast-furnace slag. The blocks are then subjected to a pressure of 3,000 pounds to the square inch.



KILLING EGGS OF THE GYPSY MOTH ON A LARGE ELM TREE AT MALDEN, MASS.