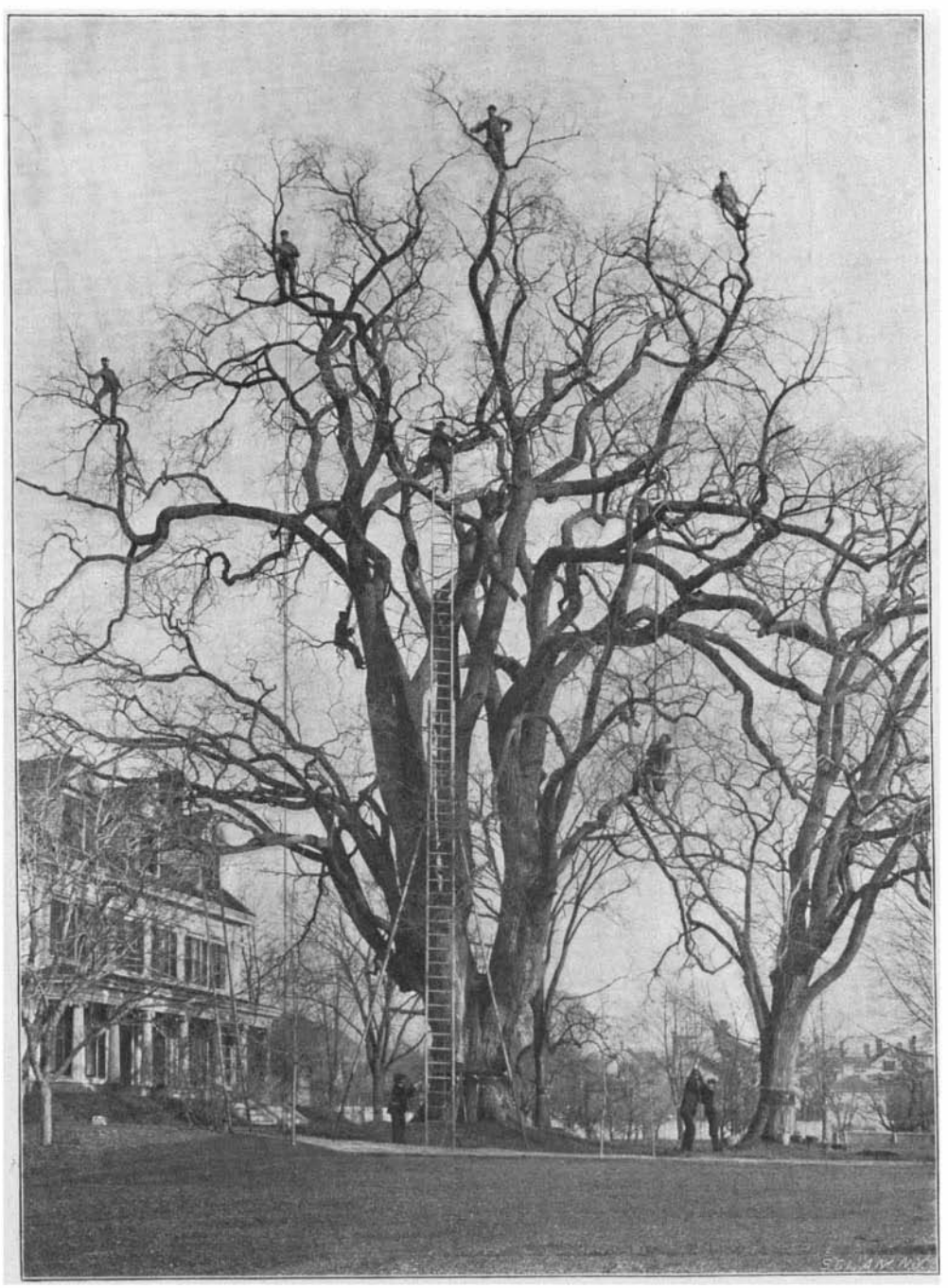
THE GYPSY MOTH.

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.

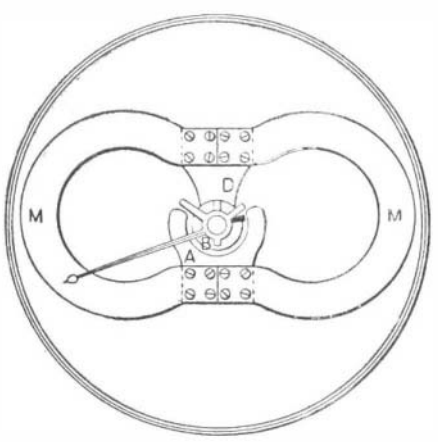
The magnitude of the task can hardly be described. The first six weeks' work of 1891, from careful estimates, showed that the number of different classes of egg clusters destroyed was 757,760, and the eggs probably numbered from 3,000,000 to 5,000,000. Burlap bands were placed around the trees, and in 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.



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

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. *M M* are the magnets, *A* and *B D* 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.

The Year's Progress in Agriculture.

The annual report of the Secretary of Agriculture, which will soon be ready for transmission to the President, will be looked for with interest. Under the present administration the highly important work of the department has been broadened, and there are many new fields which have never before been touched upon by the government departments or bureaus. We have already referred to the hybridization of the orange, which may be regarded as one of the most interesting and important of the experiments which have been carried on during the past year. The introduction of new seeds and plants to this country has been a strong feature of the year's work. Various crops, such as ginseng, chicory, and Bermuda lilies, which were formerly imported in large quantities, are now produced in the United States, and it is probable that in time the home demand will be covered.

Agents of the Department are engaged all over the world in gathering seeds and making examinations of the various plants and trees. For example, species of grass and forest plants have been found in Algeria which are proving of the greatest possible value to the southwestern part of the United States, where the soil and climatic conditions are similar to the arid conditions which obtain in Algeria. A new rice which will not break in the milling process has also been found, and will save large sums to the rice growers of the South. We have already described the fertilization of Smyrna figs, which operation is now being carried on in California in the same manner that is in use in Asia Minor. The report deals to a considerable extent with forestry, and the work of the new Forester of the Department shows that lumbermen can cut lumber as is their custom, but they can at the same time at a small expense leave the forests in such a condition as to be valuable for future timber instead of the present wasteful system, which bids fair to work serious injury to certain sections of our country.

We have also noted the interesting tobacco plant experiments which have been carried on by the Department. Irrigation investigations are treated in the report, and the problem is certainly a most important one, as it is said the recent rise in the price of beef was due, not only to an increased demand, but also to the diminished capacity of the Western grazing land, owing to an overstocking and killing out of the native grasses. The broadening of foreign markets is also dealt with. Cold storage shipments of butter are being made regularly, and other dairy products are fast becoming well known and liked in the markets of the world. A note of warning is sounded about our new possessions. The Secretary considers that an inspection law should be formulated and enforced, as when the Americans begin to settle in the islands they will undoubtedly import many new plants and seeds from all over the world. They will, perhaps, unwittingly introduce diseases and insect pests which may ruin the crops. This has been the history of the possessions of other countries. The attitude of the Department, as concerns our new island territory, is one of cordial cooperation.

Successful Trials of the Holland Submarine Boat.

The Naval Board appointed to inspect and report on the performance of the "Holland" submarine boat has reported that in the recent tests, held on November 6, in New York Harbor, she fulfilled all the requirements laid down by the Department. These requirements were that she should have three torpedoes in place in the boat, she should have all arrangements for charging torpedoes without delay, and that she should be prepared to fire a torpedo at full speed both when submerged and at the surface. Lastly, the "Holland" was to make a run for two miles under water, starting from one buoy, running submerged for a mile to a second buoy, rising to discharge a torpedo at a mark near the second buoy, and then after diving again return submerged to the starting point.

In his report Chief Engineer John Lowe, U. S. N., who was specially ordered to observe and report the preliminary trials, says:

"I report my belief, after full examination, that the "Holland" is a successful and veritable submarine torpedo boat, capable of making a veritable attack upon the enemy unseen and undetectable, and that, therefore, she is an engine of warfare of terrible potency which the government must necessarily adopt into its service."

He further says that "this government should at once purchase the 'Holland' and not let the secrets of the invention get out of the United States, and that the government ought to create a submarine torpedo boat station for the purpose of practice and drilling of crews, and that we need right off and right now fifty submarine torpedo vessels in Long Island Sound to protect New York, preserve the peace, and to give potency to our diplomacy."

While we cannot agree with Mr. Lowe in his opinion that we need and presumably should build a whole fleet of torpedo boats "right off and right now," we do think that the "Plunger," a larger boat of the "Holland" type now building for the government, should be immediately completed and further trials of the system carried out.

HAMILTON YOUNG CASTNER.

BY MARCUS BENJAMIN, PH.D.

In his address on "The Advances of Chemistry," which Sir Frederick A. Abel delivered before the British Association in 1890, are to be found the following words: "The success which has culminated in the admirable Castner process constitutes one of the most interesting of recent illustrations of the progress made in technical chemistry, consequent upon the happy blending of chemical with mechanical science, through the labors of the chemical engineer."

This tribute of praise to the young American chemical inventor, whose death occurred last week, makes it desirable that a brief notice of his career be given in these columns, and as it was my good fortune to be intimately acquainted with him during his early professional career, I am very glad of the opportunity to briefly tell the story of his short life.

Hamilton Young Castner was the second son of Samuel and Julia A. Castner, and was born in Brooklyn, N. Y., just forty years ago. After the usual common school education, during which he showed a predilection for scientific studies, he entered the Columbia College School of Mines with the class of 1879. He soon manifested such a marked preference for chemistry that he decided to devote himself exclusively to that study, completing the usual four years' course in three. It was in consequence of this that during the last two years of his laboratory work his desk was adjacent to the one where I was engaged and then began our friendship, which continued until his death. For his graduation thesis he made an exhaustive study of the water from the wells then still in use in the city,

HAMILTON YOUNG CASTNER.

and it was largely in consequence of the results obtained by him that the Board of Health, at that time under the direction of Professor Chandler, ordered all of these sources of disease to be abandoned.

Almost immediately after graduating he opened an analytical laboratory on Pine Street, and in consequence of his ability soon gathered around him a valuable following that accepted his advice on all chemical matters without question. Notwithstanding the fact that there were many competitors, he increased his business within a year so that larger quarters were necessary, and he then moved to Pearl Street, where he continued with his elder brother for several years. Meanwhile, however, his active mind sought for occupation in studying improvements on then existing chemical processes. The first important problem that he took up was a method by which carbon could be produced continuously. This he successfully accomplished, but was unable to find a market for the process owing to the depressed financial condition of the country at that time, and also from the fact that the larger firms engaged in that business consolidated and reduced the price below that on which his calculations were based. He then began the study of an improved process for the production of aluminium, and with his usual energy and ability devised a modification of great value on the then long and tedious process in existence, which received very great commendation from the leading chemists of the world. It was considered so valuable that he received favorable overtures to erect a plant in England, and in a short time the well-known works at Oldbury, near Birmingham, were built under his supervision. The electrolytic process soon after came into existence, and in consequence, for a time, the market for his aluminium was taken from him, but his resourceful mind soon saw the value of sodium peroxide, which was one of the products in his aluminium process, and he forthwith created a demand for that article and put it on the market, thus commanding success when failure seemed inevitable. Later he devoted his attention to an electrolytic method for the manufacture of bicarbonate of soda, which was successful and increased his reputation.

It is not possible to follow the development of the different processes of which he was the originator, but besides being connected with the Aluminium Company of Oldbury, he was also associated with the Castner-Kellner Company, the Mathiessen Alkali Company, the Rheinfelsen Company, and more recently with the Niagara Chemical Company, whose works are near Buffalo in this country.

In the exercise of his peculiar ability I know of no one his equal in this country. In considering an improvement for a chemical process he first carefully studied the subject from books, and then laid down a course of investigation which he continued until success crowned his efforts. His reputation will grow as the years pass by, and the science of the world has met with a serious loss in his untimely death.

"DON COYOTE."

BY PROF. CHAS. FREDK. HOLDER.

One of the interesting and typical animals of the far West is the American wild dog, lowland wolf or coyote, Canis latrans, it being known under these and other titles. While a very common animal, it is rarely well figured in the books, and is made to look more foxlike than wolfish. A wolf the coyote is, a lowland form, and every traveler through the West who has wandered from the beaten paths or visited small places knows it well.

The accompanying photograph gives a very correct idea of a young male two-thirds grown. In general appearance it resembles the typical wolf, the fur being a dull yellowish gray with dark, even black, clouded spots; beneath it is sometimes reddish and white.

The coyote is virtually a wild dog and breeds with the domestic dog, and dogs will often refuse to injure the female coyote. The writer observed this once on the mesa near Pasadena when in full chase after a coyote with a pack of grey and stag hounds. One of the dogs reached the game, but instead of seizing it as usual ran along by the side of the coyote, which was a female. Huxley contends that there is no material difference between the skull of a coyote and that of a dog, and a cross between a collie and an Eskimo dog produces a very fair coyote, so far as appearances go.

"Don Coyote" is essentially a night animal, and my observations of the living animal were made chiefly in the saddle in full chase after him in the dull early morning, and I can commend his speed, which is greater than that of the fox. When the sun goes down Don Coyote comes out of his haunts in the foothills and wanders down around or into the settlements. He lies in the spurs of the hills and mountains in Southern California, as in the San Gabriel Valley, in some safe and inaccessible point, and surveys the country, his vision perhaps directed to some henroost or the home of some fat turkey. At such times I have occasionally seen him, his fur an almost perfect protection in its resemblance to the rocks that surrounded him; and that he recognizes this was shown in one instance when I rode within thirty feet of one, pretending to look directly ahead, but watching him out of one corner of my eye. He crouched as I approached, and seemed confident that I did not see him imperceptibly moving, ever keeping his head pointed toward me; and few would have recognized in the gray rock a coyote.

On the outskirts of Pasadena, a city of fifteen thousand inhabitants, where my observations have been made, I often hear his weird ventriloquistic yelp in the deep-wooded Arroyo Seco, where the wildcat and lynx also roam. He comes boldly up the bordering streets, evading the dogs the best he can; now giving them a wild chase, then stopping in some vacant lot and defying the town, and with head aloft yelping to the moon. At such times, owing to the ventriloquistic qualities referred to, one coyote can create the impression in the mind of a householder or camper that he is surrounded by a pack; the yelps come in such quick succession that they fairly overrun one another and seem echoed back and repeated from every hill, rock, and bluff. In this way a single coyote will arouse the people as he sneaks along, every dog on the alert, yet on the morrow the remains of some plump turkey will be found in the road telling the story of this crafty foeman.

In such trips the coyote is generally alone, and I have met him on the outskirts of the town, slinking home in the early morning, perhaps under the protection of the heavy fog. Often there is a mirage, and at a distance of a few hundred feet Don Coyote looks as large as a sheep looming up in the mist. Generally he stops, turns, and stands a rigid picture for a moment, perhaps wondering what the moving object is, then convinced that it is an enemy, he turns and runs for the Puente Hills with marvelous speed. I give Don Coyote credit for much intelligence, as on one occasion at least he led hounds and horses out of the