Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, for the U. S., Canada or Mexico.....$3 00
One copy, six months, for the U. S., Canada or Mexico..... 1 50
One copy, one year, to any foreign country belonging to Postal Union. 4 00
Remit by postal or express money order, or by bank draft or check.
MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct pape from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, for the U. S., Canada or Mexico. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country. See prospectus, last page.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S., Canada or Mexico, on receipt of *seven dollars*. To foreign countries within Postal Union, *nine dollars a year*.

Building Edition.

THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans, perspective views, and sheets of constructive details, pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety. To builders and all who contemplate building this work is invaluable. Has the largest circulation of any architectural publication in the world.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, $2.50 a year. To foreign Postal Union countries, $3.00 a year. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, $5.00 a year; combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, $9.00 a year. To foreign countries, $11.50 a year.

Spanish Edition of the Scientific American.

LA AMERICA CIENTIFICA E INDUSTRIAL (Spanish trade edition of the SCIENTIFIC AMERICAN) is published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number of *La America* is profusely illustrated. It is the finest scientific, industrial trade paper printed in the Spanish language. It circulates throughout Cuba, the West Indies, Mexico Central and South America, Spain and Spanish possessions—wherever the Spanish language is spoken. $3.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN & CO., Publishers,
361 Broadway, New York.

☞ The safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

☞ Readers are specially requested to notify the publishers in case of any failure delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, APRIL 30, 1892.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 852.

For the Week Ending April 30, 1892.

Price 10 cents. For sale by all newsdealers.

EXHIBITION OF THE NEW YORK MICROSCOPICAL SOCIETY.

The thirteenth annual exhibition of the New York Microscopical Society took place on the evening of the 22d of April, at the American Museum of Natural History, and, notwithstanding the pouring rain, the enthusiasm of the lovers of microscopy was not damped and the spacious halls were crowded almost to an uncomfortable degree.

Nearly one hundred microscopes were in place, each containing an attractive object. It is obviously impossible to go into the details of the several exhibits, or even to describe the most interesting ones. The display of the instruments themselves was hardly less attractive than the objects exhibited. Among accessory apparatus shown were several forms of microtome, photo-micrographic apparatus, illuminators, various chemicals, and some of the earlier microscopes and microscopical apparatus. While the general exhibition was in progress there were three exhibitions of thirty minutes each in the lecture room at the end of the large hall. These comprised an exhibtion of lantern slides of photomicrographs, an exhibition of lantern slides of diatoms, and a projection of miscellaneous microscopic objects.

Taken altogether, the exhibition proved a great success, and the officers and members of the society may well take pride in the results of their efforts.

ERICSSON'S DESTROYER AND ITS SUBMARINE GUN.

Some trials are to be made, during the latter part of April, of the Ericsson submarine gun, for the testing of which the Destroyer was built by the great inventor in 1878. The little vessel, now lying at the Navy Yard, is 130 feet long, 17 feet wide, and 11 feet deep, and adapted to use a submarine gun of 16 inch caliber and 30 feet long, the muzzle projecting through an opening in the stem, near the bottom. The vessel is designed to be almost totally submerged and have great speed, so that she could approach a hostile vessel with but little danger, discharging her torpedo at a distance of not more than 200 yards from an opponent, at such a depth below the surface of the water that it would not be stopped by the ordinary nettings and would reach the weakest part of the enemy's hull.

Some trials of the gun have been made within a few weeks past at the Erie Basin, but a lighter torpedo was employed than is required for use in actual service, that it might come to the surface at the end of its range and be recovered. The next trials, however, are to be made with torpedoes of the actual service weight, and under such conditions that the line of their passage through the water will be accurately marked. For this purpose the vessel has been brought to the Navy Yard, and the torpedoes will be discharged into the basin of the great timber dry dock, the vessel being stationed a few yards in front of the open gateway of the dock. Nettings are to be stretched across within the dock, at spaced intervals, through which the torpedo will pass, thus marking its path, the pumping out of the dock permitting the recovery of the torpedoes and the definition of the trajectory of each of them. The range at which the gun is designed to be serviceable is only about 200 yards, and it is the intention that the projectiles shall sink, and not rise to the surface, at the end of their course. The nets were constructed under the direction of Commander A. H. McCormack, the chief ordnance officer of the Brooklyn Navy Yard.

Some alterations have been made in the gun from the designs of Captain Ericsson, the principal change being one by which, when the torpedo is in position for firing, the explosive it contains will be entirely in the water section of the gun, beyond the gasket surrounding the torpedo and separating that portion from the inner section. This change has been made to prevent any possibility of a premature explosion as the torpedo leaves the gun. The weight of the projectile is designed to be 1,525 pounds; its length, 27 feet 4 inches; diameter, 16 inches; explosive charge, 300 pounds; propelling charge, 40 pounds. The weight and the balancing of the torpedo have to be carefully looked to in charging it, that it shall have the specific gravity of sea water and may be kept to a true course. The arrangements for the trial have been made by the Ericsson Coast Defense Company, under a contract with the government, and the experiments will be conducted under the supervision of the Naval Torpedo Board, of which Commander G. A. Converse is president.

POSITION OF THE PLANETS IN MAY.

VENUS

is evening star. Even more in May than in April is she first among the planets for her marvelous beauty and brilliancy. She is now retracing her steps toward the great central luminary. Her progress at first only slowly reduces the apparent length of the chain that binds her to the sun. Seen through a telescope at the beginning of the month, she presents the appearance of the moon when one-half of its illuminated surface is turned toward us. At the end of the month she is of a crescent shape like that of the moon when two days past its third quarter. Venus is now moving rapidly toward the earth. This is a more important factor in determining her apparent brilliancy than the diminution of her phase. On the 2d of June she will appear at her brightest. The light number of Venus on May 1st is 142, on May 31st it is 184.

Those who may wish to see Venus with the naked eye in broad daylight should look for her as following the course of the sun and about three hours behind it. When Venus crosses the meridian, which takes place about 3 P. M. throughout the month, she has a high altitude and may be found at about one-sixth of the distance from the zenith toward the horizon.

The conjunction of the moon with Venus takes place at 2 h. 15 m. A. M., May 29th, below the horizon. Venus crosses the meridian about half an hour after the moon on May 28th and about half an hour before the moon on May 29th. On each day at that time she is only about 8 degrees from the moon, mainly in right ascension. As she will then be practically at her brightest, the position of the moon will enable the observer to find Venus readily in daylight. On the evening of the 28th, Venus and the three days' old moon with the bright stars in their neighborhood will form a charming picture.

The right ascension of Venus on the 1st is 5 h. 48 m., her declination is 26° 50′ north, her diameter is 24″.4, and she is in the constellation Gemini, whose length she very nearly traverses during the ensuing month. Venus sets on the 1st at 10 h. 46 m. P. M. On the 31st she sets at 10 h. 21 m. P. M.

SATURN

is evening star. He crosses the meridian the first of the month at about 9 o'clock, at the end of the month at about 7 o'clock. Taken in connection with his more brilliant rival Venus, he will serve to mark the course of the ecliptic among the stars, that path from which the sun and all the planets can only slightly deviate. The motion of Saturn in the ecliptic is very slow. Owing to his great distance from the sun, he passes through but one sign of the zodiac in the course of a year. Since the middle of January he has been retrograding; during May his position will be almost stationary. He may be recognized by the time he crosses the meridian and by his steady red light. The system of rings and eight satellites about Saturn make him the most wonderful member of the solar system. Just now the plane of his rings passes in the neighborhood of the earth, so that the telescope reveals the rings only as a line of light.

The moon, five days before the full, is in conjunction with Saturn on the 6th, at 6 h. 47 m. P. M., being 2° 2′ north.

The right ascension of Saturn on the 1st is 11 h. 41 m., his declination is 4° 43′ north, his diameter is 17″.8, and he is in the constellation Virgo.

Saturn sets on the 1st at 3 h. 12 m. A. M. On the 31st he sets at 1 h. 12 m. A. M.

URANUS

is evening star. He crosses the meridian on the 1st at 11 h. 20 m., on the 31st at 9 h. 18 m.

Uranus is a star of the sixth magnitude and not easily recognizable under ordinary conditions.

The moon occults Uranus on the morning of May 10, being in grocentric conjunction at 4 h. 32 m. A. M. But this occultation will not be visible in New York, as moon and planet will be below the western horizon. Nor will the approach of the moon to the planet present any special interest, on account of the low altitude and the near approach of daylight.

The right ascension of Uranus on the 1st is 14 h. 7 m., his declination is 12° 16′ south, his diameter is 3″.8, and he is in the constellation Virgo.

Uranus sets on the 1st at 4 h. 37 m. A. M. On the 31st he sets at 2 h. 39 m. A. M.

NEPTUNE

is first evening star and then morning star. He is lost throughout the latter part of the month in the sun's light. He is in conjunction with the sun on the 29th at about 1 P. M., at which time his role of evening star changes to that of morning star. His right ascension on the 1st is 4 h. 25 m., his declination is 20° 7′ north, his diameter is 2″.5, and he is in the constellation Taurus.

Neptune sets on the 1st at 8 h. 47 m. P. M. On the 31st he rises at 4 h. 29 m. A. M.

MARS

is morning star. There is little of interest in his May course. He rises the earliest of the morning stars. His distance from the earth and his low altitude prevent his being of value for purposes of observation.

The moon is in conjunction with Mars on the 17th at 1 h. 37 m. P. M., being 3° 5′ south.

The right ascension of Mars on the 1st is 19 h. 59 m., his declination is 22° 8′ south, his diameter is 11″.5, and he is in the constellation Capricornus.

Mars rises on the 1st at 12 h. 37 m. A. M. On the 31st he rises at 11 h. 26 m. P. M.

JUPITER

is morning star. He is now so far away from the sun

that he may be seen in the early dawn. He rises in advance of the sun about one hour the first of the month and about two hours the last of the month. He is at nearly his average distance from the earth, but monthly coming nearer.

The moon is in conjunction with Jupiter on the 22d at 2 h. 45 m. P. M., being 1° 48′ south.

The right ascension of Jupiter on the 1st is 0 h. 40 m., his declination is 3° 10′ north, his diameter is 32″.4, and he is in the constellation Pisces.

Jupiter rises on the 1st at 3 h. 47 m. A. M. On the 31st he rises at 2 h. 4 m. A. M.

MERCURY

is morning star. The position of this rapidly moving planet, interior to all so far known, confines it to the immediate neighborhood of the sun. On the 31st of March Mercury was at its greatest eastern elongation of 19° 3′. On May 17 it will be at its greatest western elongation of 25° 39′. It will not be visible this month, as its light number is small and its low declination, compared with the sun, will permit it to rise but an hour in advance.

The moon is in conjunction with Mercury on the 24th, at 8 h. 36 m. A. M., being 2° 42′ north.

The right ascension of Mercury on the 1st is 1 h. 32 m., his declination is 7° 49′ north, his diameter is 10″.8, and he traverses during the month the constellation Aries.

Mercury rises on the 1st at 4 h. 21 m. A. M. On the 31st he rises at 3 h. 33 m. A. M.

A PARTIAL ECLIPSE OF THE MOON

will take place on May 11, of which the end, but not the beginning, can be seen in the eastern section of the country, the moon rising eclipsed. The middle of the eclipse is at 5 h. 53 m. P. M., when ninety-six one-hundredths of the moon's diameter is in shadow. The eclipse will be mainly over when the moon rises in New York, at about seven o'clock, although the moon does not leave the earth's shadow until 7 h. 37 m. P. M. The moon leaves the penumbra at 8 h. 53 m. P. M. The line of demarkation to be seen in an eclipse of the moon is not so sharp as is seen in an eclipse of the sun, nor is the moon ever wholly invisible when eclipsed, because it is never entirely free from the sunlight refracted to it by the earth's atmosphere.

"Poisoned" American Apples.

BY C. V. RILEY.

Since Miss Eleanor Ormerod's success in convincing English horticulturists of the value of spraying with arsenicals against the Codling moth, and of its harmlessness when properly done, opposition to the use of Paris green has taken a new form in England. It is now contended that American apples are unsafe to use because, in the language of one English journal, "arsenic . . . is used upon the fruit itself until it is completely saturated, . . . and what is not absorbed by the skin remains on it, forming a fine coating, which must evidently be detrimental to health, especially where the fruit is consumed to any extent."

I have seen no such disparaging statements concerning English apples, though, as they are now beginning to spray English orchards after the American fashion, it would seem that the native fruit must soon be as dangerous as the American product. The report is most likely to have been started by importers interested in retaining for Australian and Tasmanian apples the market now so largely occupied by American fruit. Any lingering doubts as to the safety of using Paris green in water suspension were so long ago dispelled from the American mind that the revival, at this late date, of this absurd scare has something childish in it.

In spraying for the Codling moth the proportions usually observed are one pound of the poison, either Paris green or London purple, to 150 gallons of water. It is difficult to arrive at any exact estimate of the amount of arsenic deposited on a tree when sprayed with this mixture, but if five gallons of the wash are used upon an ordinary tree (and this is an outside estimate of the amount required), $\frac{1}{30}$ of a pound, or say 0·53 of an ounce, of the poison will be left upon it, of which perhaps one-fifth will go upon the young apples themselves, the foliage and limbs receiving the rest.

We should therefore have a fraction more than one-tenth of an ounce of poison left upon the *fruit* of an apple tree when five gallons of spray are used. In circular No. 1 of the Division of Entomology, I have recommended that the first spraying be done on the falling of the blossoms, the apples being about the size of peas, and that a second application be made about a week or ten days later. These two sprayings, at the rate of five gallons of wash per tree each time, will therefore put a little more than one-fifth of an ounce of poison on the *apples*, each apple presumably receiving an equal share of the amount. The quantity of poison upon each apple is therefore very minute to begin with. But between the last spraying and the gathering of the crop three cleansing influences are at work—rain, heavy dew, and the natural growth of the apple, each of which removes a part of the very small quantity originally sprayed upon it.

If, however, the garnered apple be supposed to have retained a part of its small share of the poison originally sprayed upon it, such poison can have remained in only two places—the calyx and stem ends. Elsewhere it must have been blown off by the wind upon the drying of the spray, washed off by the rain, or rubbed off in handling. If the apple be eaten raw, the calyx and stem ends are precisely the parts which are almost invariably thrown away with the "core," and this is equally true of the fruit if cooked. So that of the minute quantity of arsenic sprayed upon each apple in spring, only an infinitesimal portion, if any, can possibly remain upon it in the autumn, and that upon the very parts which are not eaten.

The statement quoted above that the fruit is "completely saturated" with arsenic is no less absurd than the rest of the article. Arsenic, in the form in which it is used, is a mineral poison not soluble in water, and as sprayed upon trees is simply *suspended*, and undergoes no chemical change. It can no more be "absorbed" through the skin of the apple than any other finely divided mineral substance. For example, where an apple tree is exposed to the dust of a road-side, it could hardly be claimed that its dusty fruit would be gritty or of earthy taste *inside* the skin.

In a recent lecture at the Lowell Institute in Boston, in touching incidentally upon this subject, I made the statement that a man would have to eat many barrels of apples in order to get enough arsenic to poison him. I reiterate that statement here, and as no specific case of poisoning from eating the American apple has yet been recorded, we may dismiss the case against it until the indictment is more closely drawn.

Destruction of Locusts in Tunis.

No. 5, vol. ii., of the *Indian Museum Notes* contains a reprint of an interesting report by Mr. R. Drummond-Hay, British Consul-General to Tunis, on the methods of destroying the locusts which invaded that country in 1891. They made their first appearance in February of that year, and Mr. Drummond-Hay formulates the following rules to be observed on the first appearance of flying locusts:

1. To carefully observe the flights and mark the ground selected for hatching purposes.
2. To employ watchmen to give notice when the hatching days commence.
3. To organize in the meantime gangs of laborers.
4. To destroy the eggs either by gathering them or by plowing up the hatching grounds.
5. To collect the necessary fuel around the contaminated spots.
6. After hatching, to take advantage of the first five days to destroy the young locusts before they form into columns.

Enormous quantities of the eggs were gathered, over 60,000 kilogrammes having been collected in the "kaidats," or districts, of Susa, Djemel, and Mehedia; 76,000 dekaliters at Medenine, 6,800 dekaliters around Gabes, and 2,700 around Gafsa.

Migration commences on the sixth or seventh day after hatching, and the infested country is then divided into sections, with a civil or military officer at the head of each section, and a certain number of soldiers and native laborers are placed under his command. The Zaghouan and Fahs districts, for example, were divided into five sections, with a captain and five lieutenants in charge of the work, and a force of 720 men, with a reserve of 220 men for special service. The line of defense extended over 35 miles along the cultivated plains, and in the early part of July, when the migration was at its height, 25 miles of screens of the Cyprian pattern were in position, and the sections were supplied with 500 yards of zinc for traps and 40 barrels of asphyxiating oil. Oil of creosote 40 parts to water 60 parts was found the best application for killing the trapped locusts, the creosote having some deodorizing properties and diminishing the stench from the dead insects. Carbolic acid in the proportion of 20 parts of the acid to 80 of water was also used with success, and is somewhat cheaper than the creosote oil.

The method of using the screens is the same as that in Cyprus, a column of marching locusts being headed off by the erection of screens with openings of five yards, across which semicircular ditches are dug. The edges of the trenches are covered with projecting strips of zinc, to prevent the insects from crawling out, and the process of asphyxiation by the application of the chemicals mentioned is very rapid. The campaign at Zaghouan and Fahs is considered to have been successful, and it has been calculated that 600 cubic meters of locusts were destroyed by traps in those sections.

The Banana Trade.

Among the most attractive features to those passing along the lower portion of New York City's water front are the East River piers occupied by tropical fruiters, where the steamers lie discharging cargoes of delicious bananas. From one side of a steamer gangs of men carry the bananas to the waiting truckmen on the pier, while on the opposite side of the fruiter lies a large float, on the deck of which, receiving their loads, are railroad cars especially constructed for carrying bananas in good condition to different parts of the United States. While this is almost a daily occurrence, Sundays excepted, there are probably but few who are familiar with the manner in which the banana is cultivated and of the extensive proportions this productive industry has assumed during the past few years. In the first stage of cultivation the "suckers," as they are termed, are planted, and in one year after the tree bears fruit; each sucker produces from two to four trees, each of which bears one bunch of bananas yearly.

Four years ago H. Dumois & Co. purchased thirty-five square miles of land in Banes, Cuba, which at that time was a dense forest, and there were only ten inhabitants in the whole district. Through indomitable energy and enterprise and a sufficient amount of capital, they began the arduous work of clearing away the forest and putting the land in a proper state for agricultural purposes and making improvements. Level roads, ranging from 60 to 100 feet in width, have been laid out so that carriages can be driven over the entire plantation. The company has built a three foot gauge railroad ten miles long and an extension of eight miles is now in progress. They have also built a pier 300 feet long from the hard native woods, and have a saw mill and water works. E. George & Co., of New York, received the contract and furnished the materials. In making these improvements the company adopted the most modern means and spared no expense in not only furthering the growth of Banes, but in order to make it a credit to the island of Cuba. One thousand five hundred men are employed on the plantation during crop time, and Banes has at present a population of 3,500, which shows the rapid progress that has been made, and it bids fair to be one of the finest and most thrifty ports in Cuba, besides the most important fruit center in the world. Banes is a beautiful port, favorably situated on the Bay of Banes, which is six miles wide and eight miles long. The entrance to the port is three miles long but very narrow, being at some points only 150 feet wide, but having 16 to 20 fathoms of water at the narrowest points.

The company has about one-half the entire land cleared and 9,600 acres planted with bananas—2,400,000 fruit-bearing trees. There are twenty-six steamers in the banana trade plying between Cuba and New York all the year round. H. Dumois & Co. control nine large, stanch, and commodious steamers especially constructed for their trade, and they run from Banes to Pier 13 East River, which pier the company has leased. Between the months of April and July a steamer arrives at New York almost daily, and during the busy season each steamer will discharge her cargo, which averages 12,000 bunches, and depart the same day in ballast. The demand for bananas has reached such large proportions that H. Dumois & Co., who control the entire banana crop of Banes, will this year export from Banes to the United States about 1,500,000 bunches. The steamers of this company are each of about 700 tons and bear the following names: Alfred Dumois, Simon Dumois, George Dumois, Hipolyte Dumois, Banes, Henry Dumois, Albert Dumois, Gurly, and Holquin. The four last mentioned are the latest addition to the fleet. The Henry Dumois and the Albert Dumois are 12½ knot boats and the Gurly and Holquin are twin screw steamers of the latest type.

When it is taken into consideration the brief period (only four years) since H. Dumois & Co. commenced clearing away the wilderness, it may be said, and not only tilling the land but building an entire town, streets, stores, dwellings, and a railroad, and giving employment to the inhabitants in cultivating enough bananas to keep nine steamers running the year round, in supplying the demands for that nutritious fruit, it is wonderful to contemplate, and it is an accomplishment that has probably never been excelled. —*Am. Ship Builder.*

The Stealing of Electricity Theft.

The Engineering News says that according to a St. Louis decision the stealing of electricity is a misdemeanor in the eyes of the law. A hardware dealer with some knowledge of electricity placed a fine wire across the connections to his meter and caused it to register in a certain time about 320 amperes less than was actually used. When brought to trial, his lawyer interposed the ingenious defense that as at common law electricity was unknown, and could not, under the code, be made a subject of larceny, and as no statutory law had been passed making it a felony or misdemeanor to steal electricity, for the reason that its character was not known, and that it was not subject to asportation as personal property, his client could not be convicted of larceny. It was, however, shown by the prosecution that gas, also unknown at common law, was nevertheless something whose larceny was recognized by the law as a misdemeanor. When the attorney for the defense interposed the plea that the act in question was fraud or deception instead of a larceny, the judge took advantage of the Missouri statute, which makes fraud perpetrated with a view to theft a felony, and set the defendant's bail at $5,000.