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 paper 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 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.

NEW YORK, SATURDAY, AUGUST 9, 1890.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 762.

For the Week Ending August 9, 1890.

Price 10 cents. For sale by all newsdealers

FIRE ISLAND.

The name Fire Island, which is used to designate a locality off the southern shore of Long Island and about forty miles from New York, has become well known for the following reasons: It is generally the first land sighted by vessels from European ports steering for New York; it is the location of one of the principal lighthouses of the country, as well as the marine observation station of the Western Union Telegraph Co. and government life-saving station, and has been the scene of a number of noted shipwrecks. This locality is really a part of the beach which extends from Fire Island Inlet, which is about two miles west of the lighthouse, and extends the entire length of the Atlantic coast of Long Island. The Great South Bay, of varying width, separates the beach from the Long Island shore. In the bay and about a mile from the northern shore of the beach is a group of five islands. It is claimed by some that this group was originally called Five Islands, that Fire Island is a corruption of this name which is now applied to the locality about the lighthouse, the correct appellation of which is Fire Island beach. Nearly on a line with the lighthouse and on the Long Island shore is the village of Babylon, which is ten miles distant.

The fast European steamers direct their course for Fire Island light, and it is part of a system which is so arranged that coasting vessels may keep in sight of one of the revolving or flashing lights. Many incoming European steamers first sight Montauk Point lighthouse, the light of which is a revolving one; then about thirty miles west Quogue light is seen, which is a steady one; then comes the revolving light at Fire Island, and finally the Navesink light on the Jersey coast. Excepting there be dense fogs, a vessel approaching the port of New York is never out of sight of one of these lights, and is thus safely guided to its destination. Montauk Point light is white varied by a white flash every two minutes, is 169½ feet above the sea level, and the light can be seen 19¼ miles. Quogue light is a fixed white, 160 feet above sea level, and can be seen 18¾ miles. Fire Island has a flashing white light every minute, is 168 feet above the sea level, and can be seen 19¼ miles, while the Navesink light is 248 feet above the ocean, and the light can be seen for 22¼ miles.

The old Fire Island lighthouse which preceded the present structure was erected in 1826. It was octagonal in shape, built of stone and whitewashed. It stood about a hundred yards from the present structure and immediately upon the shore of the inlet, which is now more than two miles to the westward, the intervening space having been filled in with sand by the action of the sea, thus making a considerable extension of the beach. The present structure was completed in 1858, and is built of brick, laid on solid stone foundations, and the principle of construction is the same as that upon which Smeaton built the famous Eddystone light. The focal plane is 158 feet high. The light is a Fresnel of the first order. This is a combination of prisms and lenses by which the brilliancy of effect is so increased that compared to a simple reflection it is five to one. The axes of the reflectors are all parallel, and the number of reflectors used depends upon the desired interval between the flashes. The framework of the apparatus is revolved by clockwork, and the light which is concentrated and flashed out in this manner has been found to be much stronger than a fixed one. It is necessary to keep curtains before the lenses during the day, because they concentrate the rays of the sun to such an extent as to ignite the wicks of the burner. The heat thus concentrated is so powerful that it is impossible to occupy the space within the lantern for cleansing or repairs unless the curtains are drawn.

The thick lenses of the lantern are seen to be cracked and chipped off in places, and the keeper of the lighthouse states that this has been caused by ducks and geese in their migrations flying through the glass which covers the outside of the lantern, and which is an eighth of an inch thick, and striking the heavy lenses with their bills. He says that he has frequently come up to the lantern and found one or more ducks or geese flying around, wounded from the broken glass and spattering the machinery, lenses and floor with their blood. The large metal ball which surmounts the structure has been bent and nearly twisted from its position by flocks of brant, which is a species of wild goose, coming in contact with it. Sixty dead ducks have been picked up on the ground about the base of the lighthouse on a single morning, and at other times over a hundred birds of various kinds have been found. A large proportion of the very interesting information published by the United States Agricultural Department on the migration of birds is made up of facts obtained from the keepers of the various lighthouses. This light consumes 2,350 gallons of mineral oil each year.

A short distance to the eastward of the lighthouse is the marine observation station of the Western Union Telegraph Co. It is a wooden building about forty feet high and stands back from the surf nearly two hundred feet. Four large wire cables strengthen the building against the winter gales, which are very severe at this point. The building is connected by telegraph with New York, and the arrivals of ocean steamers are reported about six hours before they get to their docks at New York. This gives people who have friends on board time to prepare for their reception, and enables those who live as far distant as Albany or Philadelphia to reach New York before the passengers are landed. Observations were formerly made from the cupola of the Surf Hotel, a noted summer resort near by, but five years ago the present building was erected, which is specially adapted to the work of marine observation. Mr. Peter Keegan is in charge of this station, having previously performed a similar service on the New Jersey coast. He has been eighteen years in the service of the company, ten of which has been passed at this point. During the summer season the vicinity is much frequented by pleasure seekers, but at other times Mr. Keegan and his family only have for neighbors the lighthouse keeper and his family and the crew of the life-saving station, while communication with the mainland, except by telegraph, is not frequent. A constant watch has to be kept for incoming steamers.

Many of the vessels are from fifteen to eighteen miles away, and some go by in the night and in fogs and cloudy weather. So skillful has Mr. Keegan become in the work of detecting them, that during the whole time that he has been at his post, he has only made one mistake, and that was owing to the substitution of another steamer for the regular one on the Bremen line. His acquaintance with steamers has been formed entirely by noting their peculiarities at long range. Only once has he read the name of a passing vessel, and that was about three years ago, when the Amerique came within three miles of the shore. Mr. Keegan keeps a careful record of the departure of all regular steamers, also reports of storms, adverse winds, icebergs, and everything which would be likely to cause delay; and from his knowledge of the steamer's average speed, he approximates her arrival, and decides when he must be on the lookout. At night all steamers, when opposite Fire Island, send up a signal. That of the Inman line is two blue and red lights followed by a rocket showing blue and red stars. The Cunarders burn two Roman candles showing six blue balls. These signals merely indicate the line to which the vessel belongs.

To make sure of the name of the steamer, careful observation must be made of the side and stern lights. It is often with the greatest difficulty that their signals can be distinguished at night, as they are not always displayed at exactly the same point, so that as soon as the steamer comes in sight, the observer must fix his gaze steadily upon one of the lights until the signal is given, which makes the work very tedious indeed. During the day the signals are given with different colored flags, but these have been found to be very deceptive, as the colors appear differently under different conditions of the atmosphere.

Yellow is the color which can be the most distinctly seen on the ocean, and a flag of three colors, one of which is yellow, will appear to be all of that color at a long distance. No signals of this kind can be seen at a greater distance than five miles. In consequence of this, Mr. Keegan has been compelled to rely upon noting and remembering the peculiarities of the several steamers, and in doing this he has gained great proficiency. These peculiarities consist in the general outline of the vessel, position of the smoke stack, cabins, lifeboats, nature of the smoke, etc., as well as the course of the vessel. The Cunard steamers generally pass the observation station in the evening, while those of the French line pass early in the morning. On one of the smoke stacks of the Servia is a square white mark, while on the others of the Cunard fleet the mark is oblong. Certain vessels carry their sails in a peculiar way, while one steamer has a derrick in a certain place, while there are a number of other peculiarities which assist in their identification. Vessels are often distinguished merely by the smoke.

On one line a certain kind of soft coal is burned, and the smoke is so peculiar that the approach of the vessel is known at Fire Island before the hulls are seen. The fast liners are steering farther and farther away from Fire Island in order to shorten their course, and the difficulty of reporting them is consequently increased.

Last December the life-saving stations from Coney Island to Montauk Point were connected by telephone, so that in case of disaster help can be quickly summoned from one or more of the adjoining stations. The observatory has been made the central station, and all news of disasters is telegraphed to New York, and thus the owners or consignees of vessels know of a disaster anywhere on the Long Island coast almost as quickly as if it had happened in New York harbor.

IT has hitherto been supposed that the maximum depth of the Mediterranean was 10,785 feet, between Sicily and Sardinia. Lieutenant Magnachi, of Italy, has found a depth of 13,550 feet, between Malta and Candia.—*Revue Geographique.*

Preserving Milk.

A. VASARHELYI AND J. JAMBOR, BUDAPEST, HUNGARY.

Fresh and sound milk not later than one hour after milking is placed in jars made of a suitable material.

The jars are made in three parts. The bottom part, in which eventually the milk is preserved, is first filled; the other two parts together form what is called the mediator. This is screwed into the bottom can and acts as a filler. For this purpose, even after the bottom can is filled, the top filler is kept three parts full.

When a number of cans and mediators have been fixed in a tray they are filled, and the whole lowered into water in a suitable boiler. The milk is heated up to 76°–77° R. (a little over 200° F.) As soon as the mediator and can are full, by the milk expanding, a tap at the top of the mediator is turned and the whole is thus hermetically closed. The water in the boiler is then raised "to an intense heat, and this will keep the milk for another 50 minutes at a somewhat high temperature." The jars are next deposited upside down in a cooler, and left in this position for 60–80 minutes. This insures the mixing of the milk, as it is in the nature of the milk that its fatty particles, and therefore the buttermilk, will rise to the surface. The cans are finally placed in an upright position. The vacuum above the milk in the mediator is caused by the contraction of the milk. The air-tight stopper between the can and mediator is now turned, and as the ordinary temperature is rather higher, the can will be full, and there is little chance of the fat coagulating should the cans be shaken. The mediator is opened, and the milk in it having been run off, it is taken off and the process is complete. The milk is said not to lose its freshness, pureness, and sweetness, even after eighteen months or two years in hot countries, and when opened tastes like new milk, fresh and sweet.—*F. W. T. K.*

To Obtain Beautiful Crystals.

In order to obtain beautiful crystallizations, Mr. H. N. Warren uses the alums. He dissolves 13 ounces of potassa alum in 1 quart of water and leaves the solution in a water bath at a temperature of 26°. At the end of an hour there deposit small but perfectly regular octahedrons. These are detached and put aside. The solution is afterward cooled to 15·5°, and there are then deposited group crystals, which are rejected, while the first crystals are put back into the solution. The lower part of the vessel is put into a refrigerant mixture composed of A_2O_3K and A_2H_4Cl, P. E. During this time, the upper layers remain at a temperature of 10°, and a feed tube charged with solid alum is introduced into them, so that the concentration shall remain coustant. After this, the small crystals form so many centers of crystallization and progressively enlarge. Warren has thus obtained chrome alum in magnificent crystals, absolutely transparent ferrocyanide of potassium, etc.—*Moniteur Scientifique.*

Premiums for Inventors.

The Verein deutscher Eisenbahn-Verwaltungen has offered nine premiums, of a total value of 30,000 marks, for inventions and improvements relating to (1) the construction and mechanical arrangement of railways (three prizes of 7,500, 3,000, and 1,500 marks respectively); (2) rolling stock and its maintenance (three prizes of 7,500, 3,000, and 1,500 marks); (3) the administration and working of railway and railway statistics, as well as important works on railway (three prizes of 3,000, 1,500, and 1,500 marks). Without restricting the scope of the competition, and without binding the jury in its decisions, it is recommended that competitors should confine themselves to the following subjects: (1) Design and construction of a locomotive boiler which, without increasing its weight, affords safety against explosion, and reduces, at the same time, working expenses; (2) improvements in the construction of locomotives, especially the valve motion, whereby a better utilization of the steam may be obtained; (3) proposal and justification of a simpler means of calculating truck hire; (4) the construction of a durable and practical coupling for steam pipes or continuous brakes, without the use of India rubber; (5) the construction of a practical and cheap switch break. The competition is limited to inventions and improvements covering the period of eight years extending from July 16, 1883, to July 15, 1891, and works and drawings must be sent in between January 1 and January 15, 1891, to the Verwaltung des Vereins deutscher Eisenbahn-Verwaltungen, Bahnhofstrasse 3, Berlin, S. W., from which complete copies of the regulations governing the competition may be obtained.

THE following is given in the *Archiv fur Eisenbahnwesen* as the railway mileage at the beginning of 1889: Europe, 133,900; America, 190,000; Asia, 17,800; Africa, 5,200; Australia, 10,500; total, 357,400, as compared with 293,000 in 1884. Of the increase of 64,000 miles during the four years, 40,000 is in America and 30,000 in the United States alone; 11,000 miles were opened in 1885, 17,000 in 1886, 23,000 in 1887, and 13,000 in 1888; showing that the changes in rapidity of railway construction in this country have been closely followed in other parts of the world.

The Approaching Meeting of the Iron and Steel Institute.

An event of importance in the history of the Iron and Steel Institute of Great Britain will be the holding of its annual meeting this year in the United States.

The provisional programme of the meeting has been issued. While the meetings of the Institute do not begin until Wednesday, October 1, a cordial invitation is extended by the American Institute of Mining Engineers to attend its sessions, which will be held in New York, on Monday, September 29, and Tuesday, September 30. The meetings of the Iron and Steel Institute at New York will be held on Wednesday morning, October 1, Thursday morning, October 2, and Friday morning, October 3. These meetings will be held in Chickering Hall, Fifth Avenue and Eighteenth Street. During the meetings there will be an excursion, by steamer, on the Hudson River, to West Point and return, and other trips and entertainments are being arranged for. One afternoon will be set aside for the proceedings connected with the unveiling of a statue of the late Mr. Alexander L. Holley. The headquarters of the Institute at New York will probably be at the Park Avenue Hotel. Trips are intended as follows:

Oct. 4 and 5, to visit a number of manufacturing establishments and works in Philadelphia and its vicinity. Oct. 7, to Lebanon, to visit the famous Cornwall iron ore mines, and to inspect the plant, at Steelton, of the Pennsylvania Steel Company. Oct. 8, to Pittsburg, stopping at Altoona and at Johnstown, the former town famous for the shops of the Pennsylvania Railroad Company; passing through Johnstown—the scene of the great flood of 1889. Oct. 9, 10, 11 and 12, at Pittsburg. A number of excursions will be arranged during these days to iron and steel works, natural gas wells, and the Connellsville coke region. During the stay at Pittsburg, two international meetings will be held. Oct. 13 and 14 will be spent in Chicago. Excursions are being arranged to local iron and steel works and manufacturing establishments. Members will make choice of two alternative excursions from Chicago—the one to the iron and copper mines of the Lake Superior district (I.), and the other to the iron and coal regions of the Southern States (II.)

I. NORTHERN TRIP TO LAKE SUPERIOR, ETC.

Iron Mountain, Michigan, October 15. A visit will be paid to the air-compressing plant of Chapin Mining Company, at Quinnesec Falls, and subsequently to the Chapin mine, which this year will produce about 800,000 tons of Bessemer ore.

Oct. 16, visit the iron mines of the Gogebic Range, which, in 1889, produced 2,016,391 tons Bessemer ore. Oct. 17 and 18, visit the copper mines of Lake Superior, including the plant of Calumet and Hecla, the Tamarack Mines, and the stamp mills and smelting works on Torch Lake. Hotel accommodation is so inadequate in this region that the greater part of the members will have to remain in the sleeping cars. Oct. 20 and 21, visit to the iron mines of the Marquette district, the oldest of the Lake Superior ranges. Oct. 21, proceed to Sault Ste. Marie, viewing the large locks through which, in the last calendar year, a freight tonnage of 7,516,122 tons passed, thus affording an opportunity of seeing something of the commerce of the lakes. Oct. 22, leave Sault Ste. Marie for Niagara Falls. Oct. 24, leave Niagara, arriving at New York on Saturday morning, Oct. 25. Those of the party who desire it will be conveyed from New York in special trains to Washington and back. It is probable that a reception of the members will be given by the President of the United States.

II. SOUTHERN TRIP TO ALABAMA AND KENTUCKY.

Leave Chicago, Oct. 15, via Louisville and Nashville. Oct. 16 and 17 will be spent at Birmingham, Alabama, visiting the coal and iron mines, coke plants, blast furnaces, and rolling mills, thereby affording opportunities for studying this iron district, famous for its recent rapid development. Oct. 18, the typical brown ore deposits of Shelby and Anniston will be visited, and the charcoal and coke blast furnaces will be inspected. Oct. 19 will be spent on Lookout Mountain. Oct. 20, visits to the National Cemetery and to localities of historic interest. Oct. 21, inspect Middlesbrough, Kentucky, in the morning, and in the afternoon Knoxville, Tennessee. Oct. 22, visit the Pocahontas coal field and coke district, the most famous of the South. Oct. 23, visit Roanoke, Virginia, and its recently developed industries. Oct. 24, visit Luray Cave, discovered a few years since, and now lighted throughout with electric lights. Oct. 25 and 26, these days will be devoted to Washington. It is probable that the party will be received at the White House by the President of the United States. Oct. 27, the party will return to New York. Those of the party who so desire will, after their arrival at New York from the southern tour, be conveyed to Niagara Falls, returning to New York Oct. 29.

Provisional List of Papers for the Autumn Meeting of the Institute in New York.

1. "American Blast Furnace Yields." By Mr. James Gayley, Pittsburg, Pa.
2. "Testing Materials of Construction in the United States." By Messrs. Hunt & Clapp, Pittsburg.
3. "The Manufacture of Steel in the United States." By Mr. Henry M. Howe, Boston, Mass.
4. "The Thomson Electric Welding Process." By Prof. Thomson, New York.
5. "The Manufacture of Spirally Welded Steel Pipes in the United States." By Mr. J. C. Bayles, New York.
6. "The Development of the Iron Manufacture of Virginia." By Mr. E. C. Pechin, Cleveland, Ohio.
7. "The Use of Water Gas in the United States." By Mr. B. Loomis, Hartford, Conn.
8. "The Coke Industry of the United States." By Mr. J. D. Weeks, Pittsburg.
9. "Recent Progress in the Manufacture of War Material in the United States." By Mr. W. H. Jaques, Bethlehem, Pa.
10. "The Composition and Wearing Qualities of Steel Rails." By Dr. Chas. B. Dudley, Altoona, Pa.

Provisional List of Papers to be offered by the Iron and Steel Institute, at the proposed International Meeting in the United States, October 9 and 10.

1. "The Protection of Iron and Steel Ships against Foundering from Injury to their Shells, including the Use of Armor." By Sir N. Barnaby, K.C.B., London.
2. "The Recent Development of Marine Engineering." By Mr. A. E. Seaton, Hull.

Sir Lowthian Bell has also been asked to prepare a paper embodying his views on the present state of the iron manufacture.

The American Institute Fair.

The announcement of the annual fair of the American Institute of the City of New York is always a matter of interest to a great number of inventors and manufacturers, from the fact that, at these exhibitions, it is possible to bring their devices, their machinery, and their goods practically before so large a body of examiners and possible customers. The just completed returns of the last census show a population of about two and a half millions of people within the city limits of New York and Brooklyn, all of whom are thus within easy distance of the fair as an opportunity for an ordinary evening's entertainment. Besides this, New York is the headquarters of capital itself, while also taking the lead in various lines of industry. It is not strange, therefore, that these fairs are always well attended, and that they present a great variety of exhibits calculated to instruct and interest all classes. The next exhibition will open October 1, and remain open for two months. Intending exhibitors should be prompt in applying for space.

Creosoting of Wood.

The practice of the Eastern Railway Company, of France, in creosoting sleepers is described in a recent issue of *Revue Generale des Chemins de Fer.* Sleepers as delivered are stacked and seasoned in the open air. They are then adzed and bored by a special machine, loaded on trucks, and run into a drying oven, where they remain twenty-four hours or more. After drying at a temperature of about 176° Fah., they are run into a metal cylinder, 6 feet 3 inches in diameter and 36 feet long, which is hermetically closed. The air is then exhausted, and a partial vacuum is maintained for about half an hour. Communication is then opened with reservoirs of dead oil, which is allowed to flow in at a temperature of 176° Fah., under pressure. When the oil ceases to flow under moderate pressure, it is forced in by a pump up to a pressure of 83 pounds per square inch, and this pressure is maintained for an hour or an hour and a quarter. Communication with the oil reservoirs is then opened again, and the excess of oil not absorbed by the timber flows back into the reservoir. The cylinders hold 168 sleepers each. The quantity of oil absorbed is measured by determining the difference in volume of the oil before and after operation. The wood used is principally oak and beech. The oak sleepers, absorb from 2·4 to 2·7 quarts per cubic foot; beech sleepers, from 8·7 to 10 quarts per cubic foot. The whole operation takes about four hours. This method of treatment has been practiced by the company since 1865, with, it is stated, very good results. After fifteen years of service the sleepers taken out have been 15 per cent for creosoted oak and 50 per cent for creosoted beech.

Marriage with Drunkards.

The efforts to raise the poor and degenerate inebriate and his family are practically of no value as long as marriage with inebriates is permitted. Recently the legislature of the state of Victoria, in Australia, has passed a law which gives a wife the right of divorce if the husband is found to be an habitual drunkard. If after marriage she discovers that he is an inebriate, she can also get a divorce. The husband can do the same with a wife if she is proved to be an inebriate. This is a clear anticipation of the higher sentiment which demands relief from the barbarous law which would hold marriage with an inebriate as fixed and permanent.—*Jour. of Inebriety.*