

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. or Canada. \$3 00
One copy, six months, for the U. S. or Canada. 1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00

Australia and New Zealand.—Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit \$1 in current Colonial bank notes. Address 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. and Canada. \$6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S. or Canada, on receipt of seven dollars.

The safest way to remit is by draft, postal order, express money order, or registered letter.

Australia and New Zealand.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for a little over one year on receipt of £2 current Colonial bank notes.

Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, FEBRUARY 16, 1889.

Contents.

(Illustrated articles are marked with an asterisk.)

Appliances, railway. 106
Armaments, new, progress of. 96
Bags, waxed paper. 97
Boiler, locomotive, Smith's\*. 98
Box, ice cream, Van Dyk's\*. 99
Brake, car, Fane's\*. 99
Business and personal. 100
Canal, Nicaragua, profile\*. 105
Canal, ship, Nicaragua\*. 95, 105
Cloth, wood. 104
Coupling, car, Clarridge's\*. 99
Coupling, hose, Sloan's\*. 99
Cutter, road, and harrow, Madison's\*. 100
Decisions relating to patents. 101
Delamater, C. H. 97
Dikes, building, Weeke's system\*. 98
Electric light men, meeting of. 96
Electric wires in gas mains. 96
Enquiries to be answered. 106
Escape, fire, Abbott's\*. 100
Exhibition, Paris. 101
Exhibitor for window shades, Bullard's\*. 99
Fire Department, New York. 101
Flooded by dead cattle. 104
Fort Castillo, Nicaragua\*. 95
Fortifications, modern. 101
Greytown, Nicaragua\*. 95
Gun, dynamite, trial. 97
Gun, machine, automatic, the Maxim\*. 102
Husks, corn, cloth and paper of. 100
Hut, native, Nicaragua\*. 95
Inventions, index of. 106
Inventions, mechanical. 106
Inventions, miscellaneous. 106
Machines, elastic suspension of\*. 18
Metals, luster of. 100
Mitrailleuse, Maxim, in action\*. 102
Nicaragua, bird's eye view\*. 95
Notes and queries. 106
Notes, miscellaneous. 106
Notes, natural history. 104
Palm, coconut. 104
Pipe, stove, and tent support, Ancey's\*. 93
Photographers, int. cong. of, at Paris. 101
Replies to enquiries. 107
Steamers, map showing paths of. 105
Strikes, horse railway. 104
Tramways in Damascus. 101
Vaccination. 95
Well, flowing, in Iowa. 101
Wire, deadly, the. 100
World, celestial. 96

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 685.

For the Week Ending February 16, 1889.

Price 10 cents. For sale by all newsdealers.

I. BIOLOGY.—Yeast, its Morphology and Culture.—By A. GORDON SALAMON.—The more practical points of this subject considered with reference to brewing, giving the techniques of the mashing and brewing operations.—2 illustrations. 10946
II. CHEMISTRY.—Detection of Antimony.—By ALEXANDER JOHNSTONE.—A new blow-pipe test for antimony, distinguishing it from all other metals. 10950
Note on the Determination of Gold. 10948
III. CIVIL ENGINEERING.—Manchester Ship Canal.—Plant and Machinery.—By L. B. WELLS.—Work in progress at the docks in Manchester and the great ship canal giving access to vessels of over 20 feet draught, different types of machinery used in the excavation. 10938
The Canadian Pacific Railway.—By THOMAS C. KEEFER.—Continuation of this elaborate paper on the great railroad enterprise, giving many details of snow fences, snow sheds, cost of work, and other engineering data. 10940
IV. ELECTRICITY.—A New Determination of the Ohm.—A new determination of the unit of electrical resistance, with details of the process and apparatus employed.—1 illustration. 10944
A New Secondary Battery.—A new battery invented by Faure capable of using different electrolytes. 10945
Cambridge Electric Light Company.—New electric light station containing a Thomson-Houston alternating plant.—1 illustration. 10944
The Electrolysis of Common Salt.—An effort to produce sodium by electrolysis from fused salt. 10944
V. GEOLOGY.—The Colorado Oil Fields.—By Prof. J. S. NEWBERRY.—A review of Prof. Newberry's recent investigations in Colorado, with a plea for the continuous formation of petroleum and reasons for believing that its supply will be permanent. 10948
VI. MECHANICAL ENGINEERING.—Air Compressor.—By A. NOSHBAUM.—A apparatus for compressing air by steam injector, giving the maximum of simplicity as regards structure.—1 illustration. 10942
An Improved Globe Valve.—A new globe valve, with a removable phosphor-bronze seat.—1 illustration. 10941
Express Locomotive, Grand Trunk Railway.—Full details of the construction of the new engines for the Canadian railway, with diagrams of construction and parts and tables of dimensions.—34 illustrations. 10938
VII. METALLURGY.—American Blast Furnace Practice.—A most interesting description, by an English metallurgist, of the work of American blast furnaces. 10945
Improvements in Ore Dressing Machinery.—A new machine for the treatment of auriferous and other ores by the process of sizing or gravity separation of the pulverized material.—1 illustration. 10942
Recovery of Tin from Scrap.—By A. S. RAMAGE.—An effort in the direction of utilizing the waste of tin factories, recuperating the metallic tin. 10950
VIII. MISCELLANEOUS.—Note on the Largest Sailing Ship in the World. 10941
The Monumental Fountain at the Paris Exposition.—The design of the great fountain, with descriptions of the allegorical figures and the water effects.—1 illustration. 10935
The Paris Exhibition.—Present aspect of the great exhibition, scientists connected with it, and general division of exhibits, with plans.—2 illustrations. 10936
Views in Guatemala.—The coffee culture of Guatemala, its scenery, and railroad enterprises.—6 illustrations. 10949
IX. PHOTOGRAPHY.—The Inventors of Photography.—Monuments erected to three of the French pioneers in the art of sun portraiture.—3 illustrations. 10943
Woodbury types.—The Woodbury type process of photo-engraving fully described, with details of the requisites for success. 10942
X. TECHNOLOGY.—Improved Paint Grinding Mill.—A new combination of a pug mill and double roller mill, especially adapted for grinding white lead.—1 illustration. 10942
The Egyptian Papyrus, Paper, and Ancient Mexican Paper.—Interesting review of the ancient manufacture of paper and of its present manufacture by uncivilized races.—4 illustrations. 10949

THE CELESTIAL WORLD.

A STARRY LOZENGE.

An interesting geometrical figure may now be traced in the heavens on starlit nights. It is an irregular lozenge formed by four stars of the first magnitude. Sirius, which is on the meridian about 8 o'clock on the last of February, may be taken as the starting point, occupying the southeast corner of the figure. A line drawn northwest from Sirius will lead the eye to Betelgeuse in the shoulder of Orion. Rigel, in the foot of the mighty hunter, is opposite Betelgeuse, and a line extending from Sirius through the belt of Orion will reach Aldebaran in the constellation Taurus. These four stars—Sirius, Betelgeuse, Rigel, and Aldebaran—form the corners of the celestial lozenge, a figure which once traced will never be forgotten, and whenever on winter nights the eye is turned toward the sky, the superb combination will be recognized.

Each star of the shining quartet has a history. Sirius shines with a transcendent luster, so far exceeding all other stars of the first magnitude that it seems to belong to a class of its own. It is a white star, rejoicing in the glory of its highest period of development, its grande jeunesse. It is made specially interesting by the discovery, in 1862, of a dark companion star. Betelgeuse, the leading brilliant in Orion, is a singularly beautiful star, in color a rich topaz with a reddish tinge. It shines with an irregular light, for, like our sun, it is a variable. Rigel is a brilliant star, its light in striking contrast with that of Betelgeuse. It is a noted double, the companions being pale yellow and sapphire blue.

Aldebaran is the brightest star in the constellation Taurus, and resembles Betelgeuse in color. It is a double star, with a minute companion. It is frequently occulted by the moon, for its position in the heavens is in or near her path.

This geometrical figure is not only interesting for the brilliants that form its corners, but also for the charming collection of stars contained within the boundary lines. The whole constellation of Orion, first in rank among all the clusters of stars, here finds place. The observer will perceive with the unaided eye the belt symmetrically placed in the center, the sword slanting downward from the belt with its nebulous star, and the irregular parallelogram made up of the four brightest stars—Betelgeuse, Bellatrix, Rigel, and Saiph.

The telescopic observer has a rich field for study in this marvelously beautiful constellation, abounding in double, triple, and quadruple stars, variables and nebulae. A powerful instrument transforms the nebulous star in the sword into the Great Nebula of Orion, the most impressive and awe-inspiring vision of celestial loveliness that the boundless star depths reveal to mortal sight.

It is sometimes difficult to trace stars by triangulation or alignment, the surest way of impressing them upon the memory; but the stars forming the combination here described come into view at a glance without exertion on the part of the observer, with the radiant gems they inclose, draw forth a spontaneous tribute of admiration for the exceeding beauty of this portion of the star-spangled firmament.

PROGRESS OF NEW ARMAMENTS.

The Secretary of War has awarded a contract to the Pneumatic Dynamite Gun Company for seven guns for coast defense. Five are destined for the defense of the harbor of New York.

The contract calls for three guns for Sandy Hook, two for Fort Schuyler, and two for Fort Warren, Mass. All the peculiarities presented by the 15-inch gun now mounted at Fort Lafayette are virtually specified. The guns must be capable of elevation and depression by either pneumatic or hydraulic power, and have an extreme elevation of at least 35 degrees. They must be capable of an all-around fire, or through 360 degrees, the training and elevating to be wholly under the control of the gunner in charge. The range of fire is also specified, the extreme demanded being a mile. Rapidity of fire is also called for, being a requirement not demanded in the recent tests of the stationary gun. The delivery of the guns ready for mounting must be made within eight months of the time of execution of contract. The sum of money as bid by the Pneumatic Dynamite Gun Company is \$395,500.

The guns will be able to deliver upon an enemy projectiles that contain 500 pounds of dynamite, the explosion of which, on or close to the strongest ironclad ship now afloat, would knock down every man on deck, and probably sink the vessel. Our new torpedo boat Vesuvius, 725 tons, is armed with these guns, and, speaking of her recently, the Engineer, London, says: "We may allow something for pardonable exaggeration, and still we have enough left to induce the belief that Uncle Sam has got hold of a craft which an ironclad would not care to fight for the fun of the thing."

The New York Times says: "The success of the Vesuvius has contributed to the success of the dynamite gun, inasmuch as vessel and gun appear inseparable. This dual success is looked upon by foreign governments as a matter of the very greatest importance, and military men in this country feel sure, from

the number of emissaries of foreign governments now in this country inquiring into the features of gun and vessel, that Italians, Russians, Spaniards, and French will have dynamite guns in their coast defense system before many months have passed."

A successful trial of a new cast steel gun was made at Annapolis, Md., on the 7th inst. Two rounds were fired with a charge of thirty-six pounds of powder to set the gas checks and warm the gun. At 2:15 P. M. the first round with a full charge was fired. The shell struck the butt with great force, throwing up much mud, but the gun was uninjured. After sponging, the gun was loaded again, and in two minutes the second round was fired; the gun was still as solid as ever. Eight other rounds were fired at intervals of about two minutes, with complete success. This is the first high-powered American cast steel gun that has successfully passed the test of ten rounds with full charge delivered rapidly.

It will be remembered the first gun of this character burst on its trial. Both guns were made of open hearth steel and were cast by the Standard Steel Casting Company, of Thurlow, Pa. The gun tested on the 7th is 195 inches in length; diameter at breech, 22 2 inches; diameter of chamber, 4 5 inches; diameter of bore, 6 inches; weight of gun, 13,125 pounds; weight of shell, 100 pounds; weight of charge, 48 1/4 pounds.

MEETING OF ELECTRIC LIGHT MEN.

The National Electric Light Association meets at Chicago, in the Exposition Building, on the 19th, 20th, and 21st instants, and, from what can be learned, is likely to be more than usually interesting. There will be at the same time a large exhibit of electrical and kindred apparatus, the most interesting of all, perhaps, a 900 foot track, with curves of 90 feet radii, on which it is expected the various types of electric motors will be tried. The principal magnet—we speak figuratively—to attract the electrical men will be the papers to be read and the discussions following them; notably, "Current Meters," "Static Charge in the Puncturing of Underground Cables," "Relation of the Material of Conduits to the Insulation of Cables."

These discussions are unique in their way, and, perhaps, it is not going too far to say that the manner of conducting them is quite as novel as the apparatus which is their inciting cause. At the meeting of scientific associations—there are exceptions, of course—one must needs listen to much which, though often good and sometimes true, is not always new, and again to what is new, but neither instructive nor entertaining; for, as in a society of artists, there is the old academician, who is hors concours, and whose pictures must be accepted and hung "below the line," whether good or bad, so in the long established scientific association there are those who have the right to talk, to occupy the time of a meeting, whether or no they have any information to impart. But, in the electrical field of to-day, apparatus and methods change so quickly that a new device or idea is scarcely arrived when that which is still more novel is treading upon its heels.

The electrical men come from all parts of the country at stated intervals to compare notes concerning these; it being of vital importance, and by no means an easy task, to keep abreast of all that is going on in a particular line. There is no time for idle talk, for oratory, for ancient history, for dissertations on things in general, with an occasional remark on the subject under discussion. The chairman has no traditions to follow, and no mercy; the committee, to whom all papers must be submitted, rarely pass one that does not treat of a live issue. When it is remembered that many of the best practical minds of the country gather at these conventions, and that in their line they are, it is conceded, leading the world, it is not, perhaps, going too far to say that to attend these conventions is to get a liberal education in applied electrics.

ELECTRIC WIRES IN GAS MAINS.

The Consolidated Gas Light Co., of this city, some years ago, in laying a gas main, took advantage of the opportunity to introduce a telephone line in it, suspending it from insulators within the main. Excellent results were attained. On recently opening the main the wire was found to be coated with naphthalene, but the line as such was intact. Such a line is proof against the severest blizzards, and insures communication under all conditions. Recently they have extended the system, and have laid about five miles of three-conductor lead-covered lines within some new mains, so as to act as a basis for quite a complete system of telephonic intercommunication between the different offices. The wires are supported by short boards laid across the interior of the main at intervals of twelve feet, or one for every length of pipe. The wires enter and leave the main through stuffing boxes, plaster of Paris being used as packing and glass as insulating material. It forms an interesting instance of subway work—one which is of a class that will necessarily always be limited in application.

An objection, possessing some force, has recently been made against the use of overhead trolley lines for electric railways. It is to the effect that these lines,