

# Scientific American.

ESTABLISHED 1845.

MUNN &amp; 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. The price 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 one address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union, eight dollars and fifty cents 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, to one address, \$5.00 a year. To foreign Postal Union countries, \$5.50 a year. Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, \$9.00 a year. To foreign Postal Union countries, \$11.00 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. \$5.00 a year, post paid to any part of the world. Single copies 25 cents. See prospectus.

MUNN &amp; 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, JULY 22, 1893.

## Contents.

(Illustrated articles are marked with an asterisk.)

A great fire at Columbian Exposition.....	53
Armour plate, American.....	55
Art metal work at the Fair.....	56
Antediluvian monsters.....	59
Botanical garden, N. Y.....	59
Carpenter's square, Dunnington's.....	54
Coffee plantings.....	54
Columbian Exposition, State buildings.....	54
Comet, a new naked eye.....	54
Ceramics and mosaics at the Fair.....	54
Columbian Exposition notes.....	51
Columbian Exposition the, cold storage building.....	52
Dinosaurians.....	52
Eclipse of April 16, as seen in Bengal.....	57
Electric and steam railroads.....	54
Electric welding process, new.....	53
Equatorial and spectroscopes.....	57
Ignazodons.....	57
Jacquard, the inventor, a talk with.....	59
Jewelry and ornaments at the Fair.....	59
Landscaping as a fine art.....	55
Laws and lawn drainage.....	55
Lobster eggs, hatching.....	58
Metal, sheet, weight per foot.....	56
Montana State building at the Fair.....	56
New York State building at the Fair.....	56
Notes and queries.....	61
Observatory for viewing eclipses, African.....	57
Ohio State building at the Fair.....	56
Patent Office printing delay.....	59
Photographing apparatus, solar.....	59
Piles, test of bearing power of.....	59
Printing exhibits at the Fair.....	54
Railroads, street, protective devices for.....	59
Ring, with watch set in diamonds.....	59
Road building.....	55
Roads, tropical.....	59
Siderostat for furnishing solar rays.....	57
Skating rink freezing pipes.....	53
Solar corona, eclipse of April 16.....	57
Staff moulding, a section of.....	53
Steam pipes, sent for.....	59
Territorial building at the Fair.....	59
Thigh bone, a monster.....	59
Watches, the smallest and finest.....	51
Wire mat, Horrocks.....	53
World's Fair scenes.....	51

## TABLE OF CONTENTS OF

## SCIENTIFIC AMERICAN SUPPLEMENT

No. 916.

For the Week Ending July 22, 1893.

Price 10 cents. For sale by all newsdealers.

I. AGRICULTURE.—Sulphate of Ammonia as a Manure.....	14644
Savoy Cabbage.—1 illustration.....	14644
Poisonous Plants and their Poisons.....	14644
II. ARMY AND NAVY.—Sugestions for Military Improvements.—By Capt. CORNELIUS GARDNER.....	14635
III. ENGINEERING.—Kollman's Locomotive Railway Apparatus.—A full article.—4 illustrations.....	14634
IV. MEDICINE AND HYGIENE.—The Rats of Ischia, of Voltagio and of Casciana.—By BENJ. D. HOWARD, M.D., F.R.C.S. Edin.....	14643
The Anti-Emetic Action of Menthol.....	14643
Phosphates in Milk.....	14643
Preparation of Liquid Organic Extracts.—By C. E. BROWN-SQUARD, M.D.—1 illustration.....	14643
V. MISCELLANEOUS.—Protection of Iron and Steel Specimens.—1 illustration.....	14643
New Musical Instruments.—Pedal clarinet.—Cornophone.—2 illustrations.....	14638
Lecture on Decoration.—By Mr. LOUIS SOLDER.—Delivered at Heriot-Watt College, Edinburgh.—2 illustrations.....	14640
VI. PHOTOGRAPHY.—Physical Development.....	14641
VII. PHYSICS.—The Motion of Liquids Studied through Chronophotography.—14 illustrations.....	14639
A New Photometer.—2 illustrations.....	14642
VIII. TECHNOLOGY.—The Kieselguhr Fire Brick.....	14635
Manufacture of Soda Alum.....	14636
Woven Wire and Segregation.—A paper read before the National Association of British and Irish Millers' Convention, held at Liverpool, 1893.—By BRYAN CORCORAN.—18 illustrations.....	14637
Improvements in the Manufacture of Borax.—By H. M. WARREN.....	14643
IX. WORLD'S COLUMBIAN EXPOSITION.—Germany at the World's Columbian Exposition.—The German exhibits.—Palace of Manufactures and Liberal Arts.—1 illustration.....	14631
Notes from the Great Exposition.....	14632
Exhibit of the Royal Porcelain Works, of Saxony.—1 illustration.....	14632
The Ferris Wheel at the World's Fair.—1 illustration.....	14633
French Exhibits.....	14633
Testing an American Sawmill.....	14633

## THE DELAY IN THE PUBLICATION OF THE PATENT OFFICE GAZETTE AND OF COPIES OF PATENTS.

The *Patent Office Gazette*, as published during recent years, has fairly ranked as a model for the world. In its printing, illustrating, perfect and complete indexing and general character it has excelled both in typography and in clerical accuracy. When it is considered that each week the claims of some 500 patents had to be printed within its pages, with illustrations of very many of them, it will be seen that the work of doing this satisfactorily and up to date was no slight one. It is questionable if the government received better service from any of its contractors or employees than from those concerned in the publication of the *Gazette*. Incidental to its publication was the printing of half a million full copies of the patents of the week and the photolithographic reproduction of the drawings for them. The amount of the most difficult kind of supervision and proof reading involved in all this work was very great, and the expensive adequate plant for doing the mechanical work had to be supplemented by trained employees at high salaries. Recently, as our readers know, a change has taken place in the administration of the Patent Office, a new commissioner has been appointed, and for some reason the work of printing has been given to some other printer. Apparently this has been done without making proper arrangements for satisfactorily doing the work on time. Consequently, we find the production of the *Gazette*, the production of the copies of patents and drawings, all are delayed, and complaints about the matter are pouring into the Patent Office from all quarters. This is not creditable to the new administration of the Patent Office, and we hope a remedy will be applied quickly.

There is nothing to be said about the expediency of changing the printer, but there is a great deal to be said about the inexpediency of making the change before sure and adequate facilities had been provided for effectively keeping up the work.

## AMERICAN ARMOR PLATE.

It was shown at the Indian Head proving grounds, July 11, that the United States apparently leads the world in the manufacture of the strongest armor plates. There were two plates tested, which were to be attacked by three projectiles each. The first test, besides determining whether the 250 tons of armor plate should be accepted, also determined whether the makers should receive \$30 a ton in addition to the contract price of \$575 a ton. The first plate tested was a 9 inch nickel steel plate weighing 10 tons. The plate was 6½ feet wide by 9½ feet long, and was made by the Carnegie-Frick Company. Three Holtzer projectiles weighing 250 pounds each were fired from an 8 inch rifle, the muzzle being 68 feet from the target. The results of the three tests were as follows:

1. Velocity 1,400 feet per second, penetrated plate and backing to a depth of 11.7 inches. 2. Velocity 1,688 feet, penetrated plate and 3 feet of oak backing; was lost in earth behind. 3. Velocity 1,536 feet, penetrated plate and backing to a depth of 14½ inches. No cracks were perceptible in the plate, which met all the requirements for acceptance without premium, as the second shot lost the makers the premium.

The second plate was made by the Bethlehem Company, and was also made of nickel steel. It was 8½ feet high by 12 feet 1 inch in length, and was 17 inches thick. The plate weighed 31½ tons. A 12 inch rifle was used at a distance of 319 feet, and threw Carpenter shells weighing 850 pounds. The result of the tests was as follows: 1. Velocity 1,322 feet per second, penetrated 16.6 inches. 2. Velocity 1,495 feet, penetrated plate and 3 inches of backing. 3. Velocity 1,858 feet, plate penetrated as well as 86 inches of backing, the embankment, and disappeared beyond, either in the woods or the river. The plate secured the acceptance of the contract lot of 500 to 700 tons, but earned no premium. The projectiles acted admirably, and were hardly injured. Captain Ord Brown, of the English Ordnance, was surprised to find no cracks in the large barrette plate. Commodore Sampson said: "The tests to-day demonstrate that the United States makes the best armor in the world, and makes it cheaper than other nations are able to produce it. We pay for the addition of nickel to the steel plate half a cent a pound, or \$11.20 a ton, while the French government pays \$140 for the addition of nickel to the steel plates."

## PROTECTIVE DEVICES ON STREET RAILROADS.

The story of George Stephenson and his famous answer as to the effect which would be produced upon a cow getting in front of a locomotive, aptly voiced an objection to rapid transit which its promoters have always met. The danger to people and animals, either by running over or into them, and the frightening of horses, have been repeatedly brought forward as objections to the use of improved systems of rapid transit. Vested rights in highways have been cited over and over again in opposition to the crossing of the same by steam railroads. In England, famous for its maintenance of personal rights, grade crossings are

not admitted, and the integrity of the highway is religiously preserved.

In the United States prescriptive rights seem to have taken less hold upon the people. All sorts of trespasses upon public property are permitted. The subject of improvement of roads and city streets has no sooner been made an issue, macadamized roads no sooner begin to traverse country regions, than streets and roads alike are surrendered to rapid transit companies. All this is done, whether mistakenly or otherwise, with the virtual consent and in furtherance of the views and wishes of the majority. The minority seem to be the sufferers. It is in vested and prescriptive rights that the latter find their protection. With the loss of such rights the battle of the minority is lost.

The immense power of the electric trolley system in concentrating force at any desired point upon a line of many miles in length has brought about new conditions of city as well as country transit. A small motor underneath a car is the only mechanism required to develop a high mechanical horse power. An electric street car may run on a down grade with little or no absorption of energy, but it possesses the capability of converting a very large amount of electrical into mechanical energy. On an emergency it can absorb and utilize a surprisingly high horse power.

The consequence of this is shown in several ways. Grades virtually insurmountable by steam roads are climbed by the trolley car with almost undiminished speed. In an instant the motive power can be raised to its highest pitch, as the car passes from a level to a steep ascent. The other consequence appears in the carrying of great loads at undiminished speed. The crowding of passengers into the car increases its tractive power. The motor takes the requisite energy demanded by the increased strain without trouble.

The presence in crowded streets of abnormally heavy cars, moving at full speed, has had the natural consequences. A number of deaths and minor accidents have been chronicled. Within a few days several deaths have occurred in Brooklyn by the trolley cars. A steam railroad is provided with the most elaborate safety appliances. Gates protect grade crossings, the block system is used to prevent collisions, yet accidents constantly occur. The trolley cars, too heavy to admit of adequate control, run without protection through crowded streets. It would seem that invention should find in them a field for humanitarian work.

A car carrying perhaps eleven or twelve thousand pounds of humanity is driven at the regular running speed by the electric current. It can be almost instantly started. The same form of energy can be applied to stopping it. Electric and electro-magnetic brakes without number have been invented. It would seem as if some way of stopping such a car for an "emergency stop," within a few feet, might save many lives. The motorman may have but a fraction of a second in which to stop his car or to prevent it from striking a human being. A proper electric brake might enable him to work thus quickly. Electricity has the potentiality of doing this. In the system of series arrangement of cars, now little used, the motor itself could act as an efficient brake, by converting the mechanical energy of the moving car into the current form of electrical energy, which again helped to drive the other cars. This interesting feature is lost in the parallel connections of the usual system. The reversing of the present motor, however, is in the line of work suggested, and the motor then appears as a brake in itself. The subjective aspect of the case would call for some method of instantly doing this, without the delay incident to the movement of heavy switches.

Many appliances have been invented for preventing people from getting under the wheels. A successful guard or cowcatcher, which would be thoroughly operative and practical, which would not require too much room, and which would save life with some approach to certainty, seems to be a need. It might be so arranged as to be thrown into use only when required. The transit companies would certainly welcome any invention of this character which would be the thing needed. It seems as if it yet was not invented, in spite of the many patents taken out. If this is the correct view, the inventor of the successful appliance should reap a rich harvest. The field is still open. In the interests of human life it is to be hoped that it will not be long so.

It is satisfactory to learn that the gentlemen who have urged the New York botanical garden project are nearly now in a condition financially able to begin actual preliminary work near the Bronx River. At least the sum of \$215,000 has been received. There are several large subscriptions yet expected from wealthy citizens, and when these are received it is probable the general public will be asked to contribute. There will be no pains or expense spared to make the garden worthy of the State and of the nation. Kew Garden is the model which the far-seeing men who have undertaken the charge of this enterprise have in view, and there is every reason to believe that their efforts will be crowned with success.