

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

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 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.

Building Edition.
THE ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN
is a large and splendid illustrated periodical, issued monthly, contain-
ing 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 archi-
tectural work in great variety. To builders and all who contemplate build-
ing this work is invaluable. Has the largest circulation of any architec-
tural 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, \$6.50 a year.
Combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUP-
PLEMENT, \$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 typo-
graphy with the BUILDING EDITION OF THE SCIENTIFIC AMERICAN. It 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 posses-
sions—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 especially requested to notify the publishers in case of
any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, JUNE 24, 1893.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as 'Aerolite, fall of an', 'Agricultural inventions, the latest', 'Battle ship Massachusetts', etc., with corresponding page numbers.

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 912.

For the Week Ending June 24, 1893.

Price 10 cents. For sale by all newsdealers.

Table listing sections I through IX: ASTRONOMY, BIOGRAPHY, CIVIL ENGINEERING, ELECTRICITY, MECHANICAL ENGINEERING, METALLURGY, NAVAL ENGINEERING, PHYSICS, TECHNOLOGY.

THE OLD AND THE NEW SHIPS.

On another page we publish an illustration of the recently arrived Viking ship, as she would appear in mid-ocean, speaking a modern steamer. The picturesque little craft, of model which has been pronounced almost perfect, with her gayly striped sail, decorated stem and stern posts, and her rows of shields on either side, is seen driving before the wind toward her port. Back of her looms up the giant form of a modern steamer, bringing together the naval architecture of to-day and that of ten centuries ago.

Our illustration shows vividly the difference in size between the old and the new ship. A modern vessel may be nearly as wide as the Viking ship is long; the Viking ship could be dropped end-first into one of the funnels of the Campania and be completely ensconced therein with 40 or 50 feet to spare.

In the absence of a sail the Viking ship was to be propelled by oars; the aggregate horse power which this method of propulsion would represent could not well exceed a sustained average of 3 or 4.

Many stories are related of the ancient Viking ships which were, in many instances, little better than piratical craft. Of one of their commanders it is told that he could walk upon the shafts of the oars projecting from the sides; one ship is said to have been so large that a warrior standing on her bottom could hardly touch her beams with uplifted battle ax.

LAUNCH OF THE BATTLE SHIP MASSACHUSETTS.

On June 10, at 10 A. M., there was launched at Cramp's shipyard, at Philadelphia, the battle ship Massachusetts. This ship is a sister to the Indiana launched last March, and to the Oregon, which is not yet afloat. In every respect the launch was a great success.

This ship is the second of three ships of 10,200 tons burden, commenced during Secretary Tracy's regime. She is very heavily armored, the water line belt being 18 inches thick and extending along three-fourths of the ship's length.

doubts are 17 inches thick. Above the belt of armor the side is protected by 5 inches of steel; one deflecting steel protective deck is provided in addition to steel decks above it, also of sufficient thickness to afford a measure of protection.

In her armament she is of the most powerful class; at a single discharge she will be able to throw 6,800 pounds of projectiles. Her battery is to include four 13 inch rifles, eight 8 inch rifles, and four 6 inch rifles as the main armament in addition to her secondary battery of light rapid-fire pieces.

The Relation of Photography to Art.

M. Robert de la Sizeranon has an excellent article on the subject, "Relation of Photography to Art" in the mid-February number of the Revue des Deux Mondes, translated into The Review of Reviews. He dwells, first, on the service photography has rendered to painters in enabling them to study correctness of detail.

Photography is growing more perfect every day; even the great color problem seems to be as good as solved at last. M. Lippman has succeeded in producing several very successful photographs in colors, by availing himself of the laws of interference of light.

It may be said that, since this last step has been taken, photography leaves nothing for the painter to do. If it were true that the only object of art is the mathematically accurate reproduction of the world around us, this argument would be unanswerable.