

Scientific American.

ESTABLISHED 1845

MUNN & CO., EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN.

(Established 1845.)

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, postage prepaid, \$4.00

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

The Scientific American Supplement

(Established 1876)

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, \$3.00 a year, for the U. S., Canada or Mexico, \$4.00 a year, or \$1 1/4 3d. to foreign countries belonging to the Postal Union. Single copies 10 cents.

Building Edition of Scientific American.

(Established 1885.)

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture. Each number is illustrated with beautiful plates, showing desirable dwellings, public buildings and architectural work in great variety.

Export Edition of the Scientific American

(Established 1878)

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN. Every number contains about 100 pages, profusely illustrated. It is the finest scientific industrial export paper published.

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, FEBRUARY 5, 1898.

Contents.

(Illustrated articles are marked with an asterisk.)

Acetylene explosions, 90
Archeological news, 87
Arid regions, temperature of, 87
Bridge, a third East River, 83
Cableway carrier, Richardson's, 84
Cathod rays, action of, 85
Civil engineers' meeting, 83
Commerce on the great lakes, 83
Cosmetics, a variety of, 80
Croton dam, the new, 81
Cruiser, Japanese, launched, 83
Duell, Hon. Charles H., 89
Electricity on London underground roads, 82
Electric motor, the Sprague, 82
Electric third rail system, Germany, 82
Engine, rotary, Engberg's, 85
Exhibition, Dijon, France, 86
Export trade, the iron and steel, 82
Fear, causes of, 86
Fireproofing fabrics, 90
Greeley, Judge A. P., 89
Heavens in February, 83
Inventions recently patented, 82
Lacquer, negative, 90
Lenses, cleaning, 90
Measuring pole, Hegarty's, 84
New York City water supply, 81
Odor mixture, 91
Ozone, production and applications of, 86
Patent decision on Sprague motor, 82
Patents granted, weekly record of, 93
Patents, the new commissioner of, 89
Petroleum fuel, 83
Phosphorus, preparation of, 85
Pistol, Nygren's magazine, 84
Pole and chimney problem, the, 87
Science notes, 86
Smoke and its prevention, 82
Soap to quiet waves, 87
Spider and the fly, the, 91
Steam, cost of, 1870-1897, 82
Sun's eclipse in India, 86
Timber, government tests of, 83
Tin plate industry, our, 82
Tire, Hamp's punctureproof, 84
Torpedo boats, United States, turbine for, 82
Venus, observations of, 85
Wage earners, Pullman, nativity of, 84
Weatherproof coating, 84
Willow culture in Europe, 91

TABLE OF CONTENTS OF Scientific American Supplement No. 1153.

For the Week Ending February 5, 1898.

Price 10 cents. For sale by all newsdealers.

I. AGRICULTURE.—The Smithfield Club Show, 18424
II. ARCHAEOLOGY.—Archaeological Discoveries in Northern Africa, 18430
III. ARCHITECTURE.—Effect of Electric Currents on Adjacent and Surrounding Buildings, 18425
IV. ASTRONOMY.—Astronomical Photography with Photo-Micrographic Apparatus.—By A. CLIFFORD MERCER, 18433
V. AUTOCARS.—Condition of the Horseless Carriage Industry.—By C. E. CORRIGAN, 18425
VI. CIVIL ENGINEERING.—Model of a Wooden Bridge of a Single Span that May Reach a Length of One Hundred and Forty Feet.—A description of a curious old bridge of the eighteenth century.—1 illustration, 18424
VII. ELECTRICITY.—Electricity in Cotton Mills.—By W. B. SMITH WHALEY.—This article gives valuable data regarding electricity as a motive power in textile factories. Effect of Electric Currents on Adjacent and Surrounding Buildings, 18425
VIII. MATHEMATICS.—Pyramid Geometry, 18434
IX. MECHANICAL ENGINEERING.—Transmission of Motion by Flexible Wire.—1 illustration, 18424
X. MEDICINE AND HYGIENE.—How to Prevent Typhoid Fever in Rural Districts.—By HARVEY B. BASHORE, 18435
Some Questions Often Asked About Drinking Water and Their Answers.—By B. C. LOVELAND, 18435
XI. METEOROLOGY.—Rain Drops.—Their size and rate of fall, 18432
XII. MISCELLANEOUS.—The Dreyfus Trouble in Paris.—8 illustrations, 18428
Engineering Notes, 18427
Electrical Notes, 18427
Industrial Notes, 18434
Selected Formulas, 18427
Opening of the Sarcophagi of Voltaire and Rousseau.—A full illustration of the curious researches which have just been carried on in the Pantheon, Paris.—2 illustrations, 18430
XIII. NAVAL ARCHITECTURE.—Shipbuilding in Japan, 18422
XIV. PHOTOGRAPHY.—Astronomical Photography with Photo-Micrographic Apparatus, 18433
XV. POULTRY.—The Standard Breeds of Geese.—9 illustrations, 18432
XVI. TECHNOLOGY.—Optical Glass.—Almost important address by JOHN A. BRASHEAR, treating of the manufacture of flint glass, annealing glass, etc., 18422
XVII. TRAVEL AND EXPLORATION.—Prince Henry of Prussia and His Fleet.—A full account of the expedition of Prince Henry of Prussia to China, with illustrations of the fleet.—3 illustrations, 18421
A Drowned Continent.—By R. LYDEKKER, 18431
China of To-Day, 18429

STRIKING SUCCESS OF THE TIN-PLATE INDUSTRY IN THE UNITED STATES.

There is, perhaps, no industry in the history of the United States which has enjoyed such a rapid and uninterrupted growth as the manufacture of tin-plate. Each year has shown an increase over its predecessor in the number of mills in operation and in the total output, and the most gratifying feature of all is that the price of the tin-plate to the retail dealer has steadily declined since the year when its manufacture in this country was first fairly started.

Of these fifty firms, only one used foreign-made plates during a portion of one quarter, the amount being 57,208 pounds out of a total production by the firm for that quarter of 213,687 pounds. Compare this with the report of the previous year, when, of fifty-three firms reported as producing tin and terne plates, three used both American and foreign rolled sheets, with an aggregate output of 15,503,523 pounds, of which 4,226,523 pounds, or 27 per cent, was made from foreign rolled sheets.

ELECTRICITY TO REPLACE STEAM ON THE LONDON UNDERGROUND RAILWAYS.

At last, after nearly half a century of discomfort due to steam and gases from the locomotives, the two famous underground railways of London, known familiarly as the "Metropolitan" and the "District," are about to banish the steam locomotive altogether. It has been decided to use electric traction; and it is likely that the third rail system will be employed. Only those who have had the misfortune to travel on these lines can appreciate what a relief the proposed change will afford to the general London public and to the City business man in particular.

THE THIRD RAIL SYSTEM IN GERMANY.

Travelers by the Brooklyn Bridge cars will recognize familiar features in the description of a third rail electric system which is about to be installed in Germany. The line, which is about 7 1/2 miles in length, runs between Berlin and Zehlendorf. The conductor will consist of a third rail carried at the side of the track on wooden saddles which will themselves be bolted to the ends of the ties.

SMOKE AND ITS PREVENTION.

Experiments recently carried out at Sibley College to determine the physical features of smoke show that dense smoke from a furnace produces on an average from 10 to 12 pounds of soot to the ton of fuel used. About one-half of the former was carbon, and the remainder was chiefly made up of unburnt hydrocarbons, from 10 to 15 per cent of ash and 2 per cent of moisture. The figures just stated were obtained with a restricted air supply. Low temperature combustion and a restricted supply of oxygen are the most fruitful causes of smoke production.

near by means of the lever opened the doors for each shovelful and instead of shutting them abruptly drew them slowly together. He explained that he was "burning the smoke," and illustrated the fact by shutting the door quickly after a shovelful was thrown in, when dense volumes of smoke appeared at the smoke stack. This was an extreme case; but it serves to indicate the careful firing to which, no doubt, is due in large measure the economy of the British express locomotives, which burn only from 22 to 35 pounds of coal per mile according to the load hauled.

SPRAGUE MOTOR PATENT DECISION.

An important decision affecting the Sprague patent for a suspended railway motor has been given by Judge Wheeler, in the United States Circuit Court. It is well known that in the earlier attempts at electric traction the motors were either carried upon the car platforms or rigidly attached to the wheel trucks, connection with the driving axle being made by chain and sprocket or by friction wheels.

Frank J. Sprague patented a method of suspending the motors so that both they and the track would be relieved from shock and yet the motor would be always maintained in its proper relation to the axle. This was done by suspending one end of the field magnet of the motor on the axle and supporting the other end on springs, thereby causing the latter to move with a radial play around the driving wheel axle and permitting the use of gear wheels.

The Sprague Company was absorbed by the Edison Electric Company, and the latter was eventually absorbed by the General Electric Company. The present suit was brought by the General Electric against the Union Railway Company and the Walker Company, of Cleveland, on the ground that the latter were infringing upon the Sprague patent, and the present decision of Judge Wheeler sustains the plaintiff.

Commenting upon the decision, the Walker Company, who intend to carry the case to the Circuit Court of Appeals, state that they expect the patent to be overthrown, and believe that the use of the invention will be thrown open to the world.

The decision states that "the defendants' structures differed in some respect from those of the patent, but have all these parts" specified in the decision "working together in the same relation to each other for the same purpose and producing the same result."

COST OF STEAM IN 1870 AND 1897.

One of the best papers recently read before the American Society of Mechanical Engineers was presented by Mr. F. W. Dean, on the decrease in the cost of steam power between the years 1870 and 1897. This was shown to amount to nearly 40 per cent. Seventeen per cent of this is attributed to the use of multiple cylinder engines, steam jacketing, higher steam pressure and superheating the steam. Five per cent is due to the use of vertical engines, 7 per cent to improved boilers, 7 per cent to economy realized in heating the feed water, and 2 per cent is put down to the credit of improved construction of grates.

EXCELLENT CONDITION OF THE IRON AND STEEL EXPORT TRADE.

The present condition of the iron and steel export trade is very satisfying and full of promise. If the figures for the first ten months of the year are a criterion, the total exports for the year 1897 will amount to some 600,000 tons, valued at about \$13,000,000. The largest item was pig iron, of which we shipped in the first ten months 194,734 tons; the next was steel rails, 108,816 tons. The other most important exports in their order were steel ingots, billets, bars, etc., 59,633 tons; wire, 44,016 tons; scrap and old iron for remanufacture, 34,929 tons; and cut nails and spikes, 13,165 tons. Our steel rails and locomotives are being sold in Europe in successful competition with the local manufacturers, and in view of this fact it is needless to add that we are gathering in an increasing share of the foreign trade of the world, which was formerly exclusively controlled by Europe.

THE TURBINE FOR UNITED STATES TORPEDO BOATS.

We are pleased to note that the United States is not to be behindhand in the development of the steam turbine for naval purposes. The truly astonishing results obtained with the Turbinia have a significance which cannot be gainsaid. We do not predict that the turbine will revolutionize marine propulsion in general, but we are satisfied that for vessels up to a size yet to be determined, it is the coming motor. Commodore Melville, Engineer-in-Chief of the Navy, is about to make tests of an American design of turbine in the