

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 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, \$6.50 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. \$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 specially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, FEBRUARY 17, 1894.

Contents.

(Illustrated articles are marked with an asterisk.)

Table listing various articles such as Agricultural devices, Air, liquid, Prof. Dewar on, Aluminum coating, Armies of Europe, Bicycle railway, the Boynton, Boilers, use of austic soda in, Books and publications, new, Bread, sour, Button fastener, Bell's, Carbon, what is it?, Cement mortar, Cigary, manufacture of, Coal dump, Barrett's, Colonial relics, Columbian Exposition, Coloring, effect on the behetrom of plants, Court building, New York, new, Dextrine, white, Fat, what shall we?, Electrical apparatus, new, Electric railway Boynton bicycle, Envelope, display, Billwiler's, Exposition, California, Feedwater heater and purifier, Collins, Flour, chemicalized, Gas lights, incandescent, Glass, compound, Glass, expansion of, Gun, Maxim, Inventions recently patented, Jewish, the, Japanese steel, Mars, Mexico, drainage of valley of, Miles Standish's pipe, Milk skim, enriching, Montgomery, new U. S. cruiser, Motor, street car, new, Natural history notes, Nitrate deposits in Colombia, Patent applications, divisional, Patents granted, weekly record, Plants, respiration of, Paster, marble-like, Putoch, a cold iron, Johnson's, Putnam's torch, Scorpions, do they commit suicide, Steam shovel, Boudrie & McManus, Stone, artificial, Street cars, helping up hill, Telephone, the Bell, how it was paid, Telephones, cheap, Test paper, a new, Torpedo, Fulton's, in 1805, Trees, evergreen, removing.

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 946.

For the Week Ending February 17, 1894.

Price 10 cents. For sale by all newsdealers.

Table listing sections such as I. AERONAUTICS, II. ARCHAEOLOGY, III. ARCHITECTURE, IV. BIOGRAPHY, V. BOTANY, VI. CHEMISTRY, VII. ELECTRICITY, VIII. HORTICULTURE, IX. MISCELLANEOUS, X. PHYSICS, XI. SOCIOLOGY, XII. TECHNOLOGY.

CHEAP TELEPHONES.

The expiration of the Bell telephone patents is revolutionizing the sale of telephones in this country. It will be seen by the advertisement of the Metropolitan Telephone Company, of this city, who are licensed under the Bell Telephone Company, that they are now offering the genuine Bell telephone instruments for sale at \$1.25 each. As these instruments are accurately made, and yield the best results, they are likely to give a great impetus to the construction of short telephone lines in buildings and in country places.

A NEW STREET CAR MOTOR.

A recent number of the Morning Call, San Francisco, contains an account of the trial in that city of a gasoline car, the invention of Daniel S. Regan. The propulsion of the car is effected by the injection into the engine cylinder of a small quantity of gasoline, the vapor of which is mixed with air, forming an explosive mixture that is fired by electricity. A pressure of 280 pounds per square inch is produced on the piston. The trial car is said to have operated with great success, demonstrating an economy and ease of working altogether superior to anything in the line of street car motors that has yet made its appearance. The Call says a reward of £50,000, or \$250,000, has been offered in England for the production of a new form of street car propulsion that shall be better than the overhead trolley or the cable system. But this, we think, must be an error. The only reward offered in this direction, so far as we know, is that of the Metropolitan Traction Company, of this city, who offer to pay a reward of \$50,000 for a new system that shall be approved by the New York State Board of Railway Commissioners, as being superior for practical uses in the streets of New York to the cable or the overhead trolley.

THE CALIFORNIA MIDWINTER EXPOSITION IN GOLDEN GATE PARK, SAN FRANCISCO.

On May 31, 1893, in the city of Chicago, a meeting was held in the rooms of the California Club and the suggestion was made by Mr. M. H. De Young, vice-president of the Columbian World's Fair, that a mid-winter exposition should be held in San Francisco, California. The idea was acted on, and the next day the announcement was made. Work at once began in the appointment of officers, enlistment of State and city recognition, and in the soliciting of subscriptions. Nearly half a million of dollars was soon obtained. The ground was broken in San Francisco on August 24, in the presence of a concourse of nearly 100,000 people. The work progressed rapidly. Advantage was taken of the Chicago Fair, and exhibits and attractions therefrom were secured. Six main buildings, distributed over nearly 200 acres of ground, lighted by 1,000 electric lamps and 15,000 incandescent lamps from Chicago, one hundred independent buildings, are some of the elements which unite to form what is termed the third most important exhibition the world has ever seen.

The fair grounds are situated in Golden Gate Park, San Francisco, the park being now in its best state, with its semi-tropical trees and plants, the lovely climate adding to the charms of the locality, which forms a setting for the architectural features. For by the use of staff beautiful buildings have been rapidly erected, and the system of the Chicago Fair has been followed in keeping in view the architectural elements of the scene. The cost of the fair, it is thought, will not exceed \$1,500,000, nearly half of which has been contributed by the people of San Francisco. As the Chicago Fair was termed the "White City," the name of Palm City has been bestowed on its western sister. The fair opened on Saturday, January 27, with due ceremonies and in the presence of an immense audience.

Speeches, a grand parade, concerts, and at night fireworks and illuminations made the occasion a memorable one. The admissions on that day aggregated 72,248 people.

Throughout the grounds are distributed every imaginable attraction, the Firth wheel, the scenic railway, the cascade, foreign villages and the like, entertaining, and in some cases instructing, the visitors. A reproduction by cyclorama of the Hawaiian volcano Kilauea is described as wonderfully realistic.

The fair is managed by the following executive committee: M. H. De Young, president and director-general; Irwin C. Stump, vice-president; P. N. Lillenthal, treasurer; R. B. Mitchell, A. Andrews, F. G. Berry, Eugene Gregory, J. H. Neff, and J. S. Slauson, of Los Angeles.

Divisional Patent Applications.

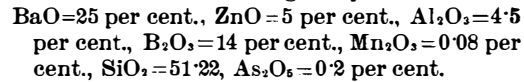
A late decision of the Supreme Court involves certain considerations as to patents issued upon divisional applications, the results of which the Electrical Engineer thinks are likely to be important and far reaching. Briefly, the doctrine now laid down by the court, as we understand it, is that only one patent can be taken for a single concrete invention, or for any part of such invention; and consequently, that when more than one patent has been issued purport-

ing to cover different parts of the same subject matter, all except the one bearing the lowest serial number are void. Especially is it held by the Court to be inadmissible to distribute the subject matter of an invention between two patents, distinguishable from each other only by the different functions ascribed to a common mechanical structure.

We entertain no doubt that the ultimate effect of this decision will be wholesome and salutary. As to its immediate effect, there is certainly abundant room for interesting speculation. One important patent may be mentioned, which would seem to be in imminent danger of being overthrown by the new doctrine—the famous Berliner transmitter patent, which, in reality, covers the employment, as a transmitter, of a certain mechanical structure which, in its capacity as a receiver, was patented as long ago as November 2, 1880. There are also a very large number of patents on electric railway apparatus and devices, heretofore assumed by their owners to be controlling, and upon which a considerable number of pending suits have been based, which are founded upon divisional patents. Some of these, at least, must unquestionably be obnoxious to the doctrine now laid down by the Supreme Court.

Compound Glass.

According to a report of the technical glass laboratory at Jena, O. Schott has introduced a glass which is of great technical interest and value. It is free from alkali, but can be worked before the blowpipe, has a small co-efficient of expansion, and is distinguished by many excellent qualities. Hitherto the view has been generally held that good glass must contain, together with silica and a divalent or trivalent metallic oxide, the oxide of a monovalent metal (an alkali metal or thallium). By the glass referred to (121¹¹¹) is free from alkalis and has the following composition:



Schott was led to the production of his compound glass (Verbundglas) by studying the state of strain in ordinary glass vessels and tubes cooled in contact with the air. A hollow glass vessel cooled in contact with the air has its outer skin in a state of compression, whereas the inside is in a state of tension; hence it is easily damaged on the inside, but is resistant on the outside. A hollow glass vessel, if introduced when cold into warm air, has its outer skin thrown into a state of compression; if, when it is hot, it is exposed to cold air its outer skin is thrown into a state of tension. This is the reason why cold air causes glass to crack more readily than hot air does. Schott succeeded in throwing the outer layer into a permanent state of compression by covering the glass vessel with a thin outer layer of glass which has a small co-efficient of expansion. The flasks made of this compound glass can be filled with boiling aniline and immediately sprinkled on the outside with cold water; and glass dishes can be heated over the naked Bunsen flame without cracking. Pressure tubes of this compound glass can be made to meet all the requirements of practice. They have been kept in continuous use on locomotives for five months, and when heated to 200° C., they can be sprinkled with cold water without any fear of cracking.

Incandescent Gas Lights.

According to a paragraph in a recent number of the Journal für Gasbeleuchtung, a trial has been going on since June last in the Badgasse, Budapesth, and since October in the Ofen Tunnel, with Dr. Auer's incandescent gas lights. So satisfactory is the effect, that when the Budget estimates come on for discussion, it is intended to put forward a request that all streets in which the electric light is not to be used shall be lighted by the incandescent gas system, as by it the amount of illumination afforded is increased by five or even six fold. In Agram also Dr. Auer's burners have been tried with equally favorable results. While under the old system each 630 square meters of street surface received light equal to only 32 candles, every 300 square meters of surface is now illuminated to the extent of 100 candles. The lighting, therefore, is more than six times as great as that ordinarily employed for streets.

The Maxim Gun in Action.

The Maxim gun has been well tested in the Matabeleland campaign. In the skirmish of October 25 the Maxim gun effectually checked the natives. Although the natives were armed with Martini-Henry and Winchester rifles, they were powerless before the terrible fire of the Maxim gun, which mowed them down like wheat before a scythe. In the morning the sight was terrible, bodies being literally torn to pieces by the shot. Each time the natives approached they were quickly repulsed with the aid of the machine gun. The Armstrong 7-pounder has also rendered efficient service in the campaign. On one occasion a shell dropped harmlessly upon the ground, when the negroes immediately began firing upon it. The shell then exploded, killing several.