

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 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 any address in U. S., Canada or Mexico, on receipt of seven dollars. To foreign countries within Postal Union, nine dollars 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. It 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, \$5.00 a year; combined rate for BUILDING EDITION, SCIENTIFIC AMERICAN and SUPPLEMENT, \$9.00 a year. To foreign countries, \$11.50 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, APRIL 11, 1891.

Contents.

(Illustrated articles are marked with an asterisk.)

Anti-fouling composition for ships bottoms.....	232	Launches, fast.....	226
Astronomical mirror.....	226	Mining in the Rocky Mountains.....	231
Barium Institute, Bridgeport, Conn.....	225	Moon of Jupiter, a double.....	225
Bicycle, the Lovell.....	233	Navy, build up the.....	224
Blind hinge, Porter's.....	226	Notes and Queries.....	234
Books and publications, new.....	234	Passenger train, Pullman, a notable.....	229
Building in America.....	229	Pasteur Institute, the New York.....	230
Canal boats, haulage of by locomotives.....	233	Patent fees, the reduction of.....	224
Combustion.....	227	Patents granted, weekly record.....	225
Convicts in the United States.....	232	Photography as it was and is.....	228
Court of Appeals, the new Circuit.....	229	Pipe hanger, Scott's.....	224
Dehorning with the "Ingaham's".....	235	Population, possible growth of.....	224
Drawer stop, Levy's.....	233	Railroad train, "the ghost".....	223
Egg tariff, beating the.....	233	Refrigerator, artificial.....	225
Electricity in foreign countries.....	229	Sawdust, utilization of.....	232
Electroplating the dead.....	227	Ship railway, Chignecto, route of.....	230
Envelope fastener, Kingsley's.....	233	Shipping subsidies in France.....	230
Fishing ground, a new.....	233	Stones, large quarried.....	232
Fruit packing press, Randall's.....	233	Steam engineer, duties of the.....	232
Furnace sawdust feed, automatic.....	231	Telephone rates, a war.....	227
Girth fastener, McKelane's.....	226	Timber, protecting from the terebro.....	229
Great lakes, traffic of the.....	234	Tomb of St. Francis Xavier.....	229
Inventions, recently patented.....	234	Truss, Brownlow & Warner's.....	233
Inventions, signaling, new, called for.....	225	Tunnel Building.....	233
		Venus, spots on.....	227
		Waves caused by explosions.....	224
		World's fair, site of the.....	225

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT

No. 797.

For the Week Ending April 11, 1891.

Price 10 cents. For sale by all newsdealers

I. ARBORICULTURE.—The Black Knot of Plum and Cherry Trees. By H. H. H. H. H. A very bad affection of fruit trees, the difficulty of coping with it, and the examination of its nature and mode of propagation.—7 illustrations.....	12738
The Peach Yellow.—A very serious menace to peach culture in Western New York, and present investigations by United States government on the subject.....	12742
II. ARCHÆOLOGY.—Recent Discoveries at Thebes.—Recently discovered mummies and funeral coffers near the plain of Thebes.—A most valuable discovery.—2 illustrations.....	12738
III. CHEMISTRY.—Jubilee of the Chemical Society of London.—Continuation of the account of the Jubilee of the Chemical Society of London, presentation addresses and illustrious visitors thereto.—Concluding ceremonies.....	12740
IV. CHRONOLOGY.—A Perpetual Calendar.—By R. W. MCFARLAND.—An interesting example of a calendar available for use for any lapse of time.....	12728
V. CIVIL ENGINEERING.—Removal of Earth by Means of Scrapers.—A very full treatment of a subject of interest to all dwellers in the country and to contractors, the various designs of scraping machines and methods of using them upon roads and elsewhere.—35 illustrations.....	12734
VI. ELECTRICITY.—Electrical Units of the Present and Future.—By Prof. FRANCIS B. CRICKER.—A recent address before the New York Electric Club, giving the basis of the present units of electricity.—Notes of the determinations of their value and of units needed for the future.—A suggestion for naming a unit after Benjamin Franklin.....	12736
VII. FINE ARTS.—Pyrogravure.—A development of the old hot poker method for producing designs.—The application thereto of a gas flame.—2 illustrations.....	12727
VIII. MISCELLANEOUS.—Associated Journalism.—By PAUL WILCOX.—An interesting article on the subject of the making up of newspapers and the syndicate system of supplying matter.....	12728
Iodine as a Detective.—A method of detecting erased signatures on paper by the use of iodine.—A valuable suggestion.....	12727
Liquid Fuel in Ocean Steamers.—Note by Capt. W. V. CARMICHAEL.....	12728
Nickel in the Steam Engines.—By W. A. H. H. H. H. Curious instances of the antiquity of this class of machines, and examples of them and of more modern designs for the same.—14 illustrations.....	12730
IX. NAVAL ENGINEERING.—Some Recent War Ship Designs for the American Navy.—By J. H. BILES.—A very valuable review of the present aspect of the United States navy.—The probabilities of the future.—All criticised from the English standpoint.....	12732

THE REDUCTION OF PATENT FEES.

The patent system of this country was established "to promote the progress of useful arts," as set forth in the title of the creative act of April 10, 1790. This wise purpose has been most grandly accomplished, and we have become a nation of inventors. It was probably no part of the original design that this system should be a source of revenue to the general government, yet so greatly has the business of the Patent Office been extended that we are officially informed in the last report of the Commissioner of Patents that there was on January 1, 1891, the sum of \$3,872,745.24 in the treasury of the United States which had been received from the Patent Office in excess of its running expenses, and that the excess for the single year of 1890 was \$241,074.92. This surplus has been taken from the pockets of inventors for fees. Every inventor pays a first fee of \$15 when he makes an application for a patent, and a final fee of \$20 before his patent can issue. Now, while this large surplus may be proof of the prosperity of the Patent Office, it is also proof that inventors are paying more in fees than is necessary for the support of the system as at present managed, and more than is necessary to accomplish the design of its institution. Of course, the cheaper patents can be obtained, the greater the number that will be applied for, and the more will the inventive business of the country be stimulated, and the greater will be "the progress of useful arts." That the present tariff of fees is too high seems to be proved by the report already mentioned, in which it is stated that the number of patents withheld for non-payment of final fees during the year 1890 was 3,559. In other words, 3,559 inventors who had paid their first fees of \$15 each, or \$53,385 in the aggregate, after their applications had been granted failed to pay their final fees, and forfeited their patents and the money already paid. How many were too poor to pay cannot be told, probably a large proportion. The number of patents issued in 1890 for inventions, exclusive of designs and reissues, was 25,284. If a reduction of \$10 in each of these final fees had been made, the total reduction would have been \$252,840, or a little more than the surplus for that year, and it is probable that if such a reduction had been made, enough more of the final fees that were forfeited would have been paid to have more than made up the deficiency. From this *resumé*, believed to be a correct statement of the facts, it seems evident that a reduction of \$10 might safely be made in the fees in each case of obtaining a patent, that it would be a boon to the inventor, and would "promote the progress of useful arts."

BUILD UP THE NAVY.

In 1886 the House Naval Committee were of the opinion and recommended that the government should at least create a navy that would be of respectable size and that it should demonstrate its capacity to increase rapidly to any required extent.

In what manner can such proposed rapid increase be provided if substantial encouragement be not given to our manufacturers to enable them to maintain the most improved modern plant for such work? What incentive will these manufacturers have to keep in hand the mechanism for this magic expansion unless appropriations are continuous and liberal? It would be impossible to exercise too great impartiality in the recognition of those who risk their wealth and reputation in the vast undertakings thus far so inadequately provided for.

The silver men are so eager for the success of legislation that will guarantee a market for their mines, and the farmers are so clamorous for the political control which they believe will secure for them an outlet for their produce, that they cannot pause long enough to realize that a liberal naval policy will, by the aid of its insurance and mechanical education, assure an increase of the output of the mines of the one and the more rapid and secure transit of their grain for the other. These and other important advantages would be attained by a policy of generous appropriations for increasing the strength of our navy.

Since 1861, when a wooden ship could be built and armed with iron smooth-bore guns in three months, thirty years have passed, during which time the most prominent European powers have adopted and developed the models, suggestions, and conceptions that were the direct fruit of our civil war, and which have produced radical alterations and transformations in vessels of war.

As many years are now required as months formerly to build and arm a modern battle ship. What folly, therefore, to talk of creating a navy in an emergency.

If we are to have a navy at all, let us have one that can whip the enemy if we must fight, and one that will be a school of the highest form of mechanical education if we shall be blessed with peace.

The country's naval strength cannot be reached and maintained by impetuous and spasmodic effort; it can only result from a well determined programme of such magnitude and duration as will induce our manufacturers to make the requisite provision for such a supply as will secure and reward their best efforts.

What is needed is a legislative encouragement that will secure for the nation the ripest fruit of our ablest mechanical minds, ready and willing to acquire and impart the education that such a policy must entail. Congress encourages medical development, agricultural development, makes special legislation for mining and opens the treasury for thousands of measures of greater or less importance; why not give equal stimulus to the new industries that have become so necessary and prominent a factor in the development of our new navy?

Whether these expenditures are needed from the standpoint of insurance, for "no man objects to paying money to have his house insured against fire, though he never expects it to be burned, nor should he object to the slight tax necessary to insure his house, his business, his country, against the transgressions or the possible transgressions of an enemy," or whether from the standpoint of avoiding temptation, for "there is no greater temptation to malevolents than an undefended people, a country with unprotected shores is an invitation to all the thieves and robbers of the world," or whether from the standpoint of education in the mechanical arts, to which we wish to give particular prominence, the work of protecting our nation, its people and its wealth, should go on vigorously and the requisite lines of naval and shore defense provided without delay. This done, and we shall be a nation anxious for peace, ready for war.

THE PATENT CENTENNIAL CELEBRATION.

The significance of the exercises connected with this celebration touches almost every department of human activity, and it is difficult to exaggerate the importance of their real meaning. Coming so gradually as we have to a realization of the vast results which have been but a natural outgrowth of the establishment of our patent system, one does not immediately perceive how great has been the actual progress, a conviction of which is most forcibly borne in upon the mind when it is remembered that it is only a hundred years ago that President George Washington signed the original law putting the patent system on a permanent basis. The present anniversary of this day is, therefore, fittingly marked in the programme of exercises for the week by an excursion to Mt. Vernon and an address on "Washington as an Inventor and Promoter of Improvements," while the programme for the evening of the same day includes a meeting presided over by the inventor who has given his name to the telephone. And the subjects of the papers of this evening—could they but be looked upon in the light which was vouchsafed our legislators of a hundred years ago—what would they not suggest of the marvelous and incredible? One of these papers of itself covers a wide scope, and touches upon many separate branches of inventive activity. It is entitled "The Relation of Invention to the Communication of Intelligence, and the Diffusion of Knowledge by Newspaper and Book." This rather Baconian title, however, wide as its scope, by no means trenches on the subjects of other speakers, as the literary feast provided by the programme has many other equally interesting and comprehensive papers. The most important of these we shall endeavor to lay before our readers, in whole or in part, at an early day.

Waves Caused by Explosions.

Methyl nitrate, CH_3NO_2 , may give by explosion CO , $+\text{CO} + \text{N}_2 + 3\text{H}_2\text{O}$, or $2\text{CO}_2 + \text{N}_2 + \text{H}_2 + 2\text{H}_2\text{O}$. In both cases the volume of the gas generated is the same, viz., 1,028 liters for 1 kilogramme, the heat of decomposition being 1,451 calories. These numbers are very nearly the same as those furnished by nitro-glycerine and gun cotton. The pressure developed when 1 kilogramme of methyl nitrate is exploded in a vessel of 1 liter capacity is no less than 11,000 kilogrammes per square centimeter. The author has attempted to measure the velocity of propagation of the waves, but the vessels employed were always broken by the shock. A calculation shows that the resistance offered by the vessels only increases with the thickness up to a certain limiting pressure. The pressure developed above this limit has infinite force. Hence nothing can resist it.—*M. Berthelot, Academy of Sciences, Paris.*

Sustaining Capacity of the Great Republic.

According to a recent census bulletin, the ratio of land and water surface is 98:16 and 1:84 per cent respectively. This bulletin also gives the area of the States and Territories by counties, and the classification of the latter by sizes. The average number of persons to each square mile of the land surface of the Union is 21.08.

As illustrative of the sustaining capacity of the United States, the bulletin says that if Texas, the largest State in the Union, was as thickly populated as the State of Rhode Island, it would have 83,523,628 inhabitants, while if the United States had a density of population equal to that of Rhode Island, the population of the Union, instead of being 62,622,250, would reach the enormous sum of 945,766,300, or nearly two-thirds of the present population of the world.