Scientific American.

ESTABLISHED 1845

MUNN & CO., - - -EDITORS AND PROPRIETORS

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS FOR THE SCIENTIFIC AMERICAN. (Established 1845.)

The Scientific American Supplement (Established 1876)

(ESCHDINGEN 15/0) 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, \$500 a year, for the U.S., Canada or Mexico. \$600 a year, or £1 4s. 8d., 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 deltars. To foreign countries, right dollars and fifty cents a year, or £1 18. 11d., postage prepaid.

Building Edition of Scientific American. (Established 1885.)

(Established 1885.) THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendidly illustrated periodical, issued menthly, 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. To architects, builders, and all wao contemplate building this work is invaluable. Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$250 a year. To foreign countries, \$3.00 a year, or £1 68. 9d. Combined rate for BUILDING EDITION with SCIENTIFIC AMERICAN, and SUPPLENT, \$3.00 a year. To foreign countries, \$11.00 a year, or £2 58. 2d., postage prepad.

Export Edition of the Scientific American (Established 1878)

(Established 1878) with which is incorporated "LA AMERICA CLENTIFICA 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 errort paper published. It circulates througheut Ouba, the West Indies, Mexico, Central and South America, Spain and Spanish possessions—Wherever the Spanish language is spoken. THE SCIENTIFIC AMERICAN EXPORT EDITION has a large guaranteed circula-tion in all commercial places throughout the world. \$X:00 a year, or \$10 12s. 4d., postpaid to any part of the world. Single copies, 25 cents. MUNN & CO., Publishers, 351 Broadway, New York. The safest way to remit is by postal order, express money order, fraft 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, MAY 15, 1897.

Contents.

(Illustrated articles are marked with an asterisk.)

307 310 316 307 310 311 311 . 311 . 311

PAGE

TABLE OF CONTENTS OF

Scientific American Supplement

No. 1115.

For the Week Ending May 15, 1897.

Price 10 cents. For sale by all newsdealers.

- improvement for the city of Bordeaux.—An interesting engineer-ing work.—S illustrations. The Jungfrau Railway.—Full details of this most interesting of mountain railways, work upon which will be started at once.—II-lustrations of the mountains, profiles, etc., are given.—3 illustra-1781 17815 17817 III. CYCLING.-Bicycling in Germany and France...... 17830

THE UNITED STATES AND THE PARIS EXPOSITION. It is to be hoped that Congress will take early action as the result of the President's message urging it to make provision for our adequate representation at the Paris exposition in 1900. The message recommends that such timely provision be made that our inventors and producers may have adequate opportunity to "fortify the important positions they have won in the world's competitive fields of discovery and industry."

It is certainly advisable that action should be taken during the present session, inasmuch as a delay of a whole year, at a time when other nations are making such special efforts is liable to result, among other disadvantages, in our securing an insufficient allotment of space. No one who is unacquainted with such work can appreciate the great amount of labor and time that is necessary in organizing a great national display of the kind that we ought to make at the French capital. The forthcoming exhibition will be a great opportunity for America. We have made great advances in the years that have intervened since the great French exposition of 1889. In a single decade we have started new industries and so developed them that we hold a leading position where but a few years ago we were not represented. In older industries, such as the manufacture of steel, we lead the world ; and invention has never been so fruitful in our midst as in this closing decade of the century. The outside world is cognizant of these facts in a vague way, and the forthcoming exposition will give us an opportunity to demonstrate our advancement in a concrete and practical form. -----

SHADE TREES FOR THE STREETS OF NEW YORK.

We note that the Tree Planting Association has opened offices at Nos. 64 and 66 White Street, New York City. Its aim is to beautify the city by encourage ing the planting of shade trees on each side of the streets, and it is endeavoring to start the movement by persuading property holders on Fifth Avenue to plant trees in front of their houses. The aims of the association are in every way praiseworthy, and there is no conceivable way in which the "wilderness of streets" which is found in many parts of the metropolis could be so cheaply beautified and relieved of its monotony as by lining the curb of the sidewalks with suitable shade trees. Many of the side streets which lead up to Central Park on the east and west are rendered extreinely handsome by the costly and artistic houses which they contain ; but they all have a certain air of coldness or formality which would be largely dispelled by the presence of an avenue of trees.

BRITISH INTEREST IN THE NICARAGUA CANAL.

The editor of Engineering, who is well known for his fairminded and courteous attitude toward this country in everything relating to American engineering and industry, states that it is a mistake to suppose that Great Britain has any desire to build and own the Nicaragua Canal because of its strategic value. He is of the opinion that the conditions are entirely different from those relating to the Suez Canal, where England's aim is simply to maintain neutrality. As a matter of fact, the strategic route to the East, where the United States is never likely to be a hostile power, does not lie through the Suez Canal, nor would it lie through the Nicaragua Canal. As a mere strategic route in time of war the Nicaragua Canal would never be worth the vast sum of money that it would cost; for it would be entirely in foreign territory, and would be "at the mercy of a small hostile republic or of a collier blocking the waterway."

THE MISSISSIPPI FLOODS.

The calamitous floods which have again laid waste the lower Mississippi Valley have brought forth a vast amount of correspondence and suggestion as to the best way to control the great river and keep it within its banks. As is usual, the majority of the critics betray a complete ignorance of the magnitude of the locomotives and the demand for new stock has shown problem and the cost of carrying it out in its entirety. a relative decline. One of the leading morning papers of New York has in the embank:nents prove that as a system of proa tection the levees are a failure : and the writer goes on by to condemn the whole system as such, and characterizes the outlay as a waste of public money. The by obvious reply to such critics is to ask them what they ¹⁶ would substitute in place of levees and revetment. at any time extremely perplexing, and it is rendered doubly so in the case of the Mississippi on account of the enormous amount of silt which it carries down. Wherever the river broadens out into shoals, and the tracks of some of the foreign and colonial railways. rapidity of its flow, and therefore its transporting power, is reduced, this silt is deposited and the avail-

is to scour out this deposited silt, or to raise the height of the adjoining banks, or both. This can be accomplished by building wing dams, cut-offs, etc., and protecting the banks by revetment and building artificial levees. The work of this kind which has been already carried out has rendered effective service, not merely in the Mississippi Valley, but along the course of other rivers that are subject to overflow. Because at certain points it has failed to stand the supreme test of the past few weeks, it is folly to condemn the whole system for all time. Compared with the whole scheme of improvement aimed at by the Mississippi River Commission, the work which has been done thus far has been fragmentary, and, to a certain extent, experimental, and it is absurd to condemn it for lack of efficiency at this early stage of the work. Works of this kind, whether for the control of rivers or the regulation of tidal harbors, cannot be expected to show their full efficiency until considerable sections of the work have been brought to completion.

THE MERITS OF THE WATER TUBE BOILER.

The points of advantage which the water tube boiler possesses over those of the Scotch type were briefly summed up by Rear Admiral Fitzgerald in a paper before the Institution of Naval Architects. The admiral is recognized as one of the most advanced and practical officers of the English navy, and his paper gave the good points of the boiler from the standpoint of the man who has to fight the ship. The type of boiler upon which the observations were based was the Belleville, and the experience was that gained on the Powerful and Terrible and on the smaller range of experiments carried out on two or three gunboats. The points of superiority are : 1. Ability to raise steam rapidly. The Sharpshooter, a gunboat of 735 tons displacement, has raised steam in twenty minutes from fires out" and cold water. She would have taken from two to three hours with her old boilers. 2. Ability to make large and rapid increase of speed, and also large and rapid reductions without blowing off. With a Scotch boiler a ship has to be worked up gradually to full speed : but with water tube boilers even a large ship can start off almost like a torpedo boat. 3. Comparative safety. The risk from scalding in the event of a shell penetrating the boiler room is far less. Each of the water tube boilers of the Powerful holds only a ton of water; but each boiler of the Majestic holds 22 tons. 4. Facility for examination, cleaning, and repairs. Unlike the Scotch boilers, these can be cooled with great rapidity without any danger of injury, in order that they may be examined, cleaned, and if necessary, repaired. In the Scotch boiler such rapid cooling would involve leaky seams and tube plates. 5. Saving of weight. The weight of the boilers, uptakes, etc., of the Powerful for 25,000 horse power, with natural draught, is only 1,164 tons. If she had been fitted with Scotch boilers. it would have been about 1,862 tons-asaving of nearly 700 tons, or about 40 per cent.

THE AMERICAN LOCOMOTIVE EXPORT TRADE.

There is perhaps no branch of foreign trade in which the United States have won a more speedy recognition than in the locomotive industry. It is not many years ago that the foreign locomotive trade was almost entirely in the hands of European manufacturers, and the American locomotive was an unknown quantity outside of the United States. The causes were not far to seek. In the first place, the large colonial interests of the European nations brought them into close contact with foreign states and peoples, who had the opportunity to see the European locomotive at work, as it were, at their very doors. On the other hand, the development of the railroad system of this country was so extraordinarily rapid, and produced such an enormous demand for locomotives, that our manufacturers were fully occupied in supplying the home market. Of late years, however, the rate of railroad construction has been steadily reduced; the older roads have become thoroughly equipped with modern and more powerful

One natural result of this has been to cause our criticised the methods of the engineers to the extent | builders to give increasing attention to the foreign of stating that the crevasses which have been formed market, and a very successful attempt has been made to introduce the American locomotive in those countries which have hitherto been exclusively controlled by European builders. Our success has been greatly assisted by the fact that the American built machine is specially adapted to the requirements of foreign railroads. It is strong in those points in which the As a matter of fact, the present methods are the relother type is weak. The European locomotive has [] sult of long experience and a careful study of the always suffered from a certain rigidity which, while it problem by skilled engineers. The problem of the has no particularly bad effect on the comparatively control of rivers which are subject to heavy floods is | level and straight lines which are found on the railways of the old world, has proved to be positively disastrous when these machines came to be run on the sharp curves and more or less loosely constructed Now, it is a fortunate fact that the circumstances which caused the earlier roads of the United States to able depth between the banks is reduced. The only be built on a rather rough and ready plan, with light possible way to prevent an overflow at the next flood rails, sharp curves, and heavy grades, produced a type

IV. ECONOMICS.—Productive Forces of Cuba	11069
V. ELECTRICAL ENGINEERING.—The Synchronograph.—A new method of rapidly transmitting intelligence by the alternating current.—By ARTHUR OUSING CREHORE and GEORGE OWEN SQUIRT.—The conclusion of this important paper, describing the polarizing receiver and the chemical receiver and the line.—It describes most interesting and brilliant experiments.—I illustra tion	17820 17819
VI. GEOLOGYDinosaursThis article gives restorations of the curious extinct animals, many of them of enormous size8 illus- trations.	17828
VII. HEATA Thermal Regulator,-4 illustrations	17816
 VIII. MISCELLA NEOUS.—A Bicycle Clock.—A description of a cu- rious olock constructed entirely of parts of bicycleslillustra- tion. Belected Formulas Engineering Notes Miscellaneous Notes 	17817 17824 17825 17825 17825
IX. NAVAL ENGINEERINGModel of an Old Vessel1 illustra- tion.	17817
X. PHYSIOLOGYExperiments upon Metabolism in the Human Body, under the Direction of the United States Department of AgricultureThis paper describes the important investigations upon food economy and nutrition	17823
XI. PROJECTIONThe Electric Lightin the Optical LanternBy CEOIL M. HEPWORTH.	17819
XII. REFRIGERATIONNote on the modification of the tempera- ture of rooms for decorative purposes	17824
XIII. TRAVEL AND EXPLORATIONThe East Frontier of Dahomey5 illustrations.	17826