

## SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN &amp; CO., - - Editors and Proprietors

Published Weekly at  
No. 361 Broadway, New York

## TERMS TO SUBSCRIBERS

One copy, one year for the United States, Canada, or Mexico, \$3.00  
One copy, one year, to any foreign country, postage prepaid, £0 10s. 6d. 4.00

## THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....\$3.00 a year  
Scientific American Supplement (Established 1874)..... 3.00  
Scientific American Building Monthly (Established 1885)..... 2.50  
Scientific American Export Edition (Established 1878)..... 3.00  
The combined subscription rates and rates to foreign countries will be furnished upon application.Remit by postal or express money order, or by bank draft or check.  
MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, MARCH 26, 1904.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are sharp, the articles short, and the facts authentic, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

## SALT-WATER MAINS FOR FIRE PROTECTION.

The provision of water mains and pumping stations as a protection against fire continues to be the subject of earnest and very intelligent discussion in the daily and scientific press; which in itself is proof that the Baltimore and Rochester fires have served the valuable purpose of opening the eyes of other large cities to the ever-present and stupendous danger which confronts them.

In our recent article urging the installation of a salt-water service, we stated that in this matter, while New York had been talking, other cities such as Philadelphia and Cleveland had been acting, and that the latter were now in possession of a thoroughly efficient equipment. The subsequent quotation of this article in the New York Sun has brought a letter to that paper from an engineer, who draws attention to the fact that in a certain sense New York city and Brooklyn were the pioneers in this type of fire service, inasmuch as the fire-boat system was established in these cities about thirty years ago for water-front fire service. He claims that certain western cities, taking the hint, soon adopted the same method, and that being situated on fresh water, and using fresh water in their fire-boat service, they soon conceived the idea of running iron pipes up the various streets from the water front, to which the fire-boats might be connected when needed. The next step in the development was taken by Philadelphia, which substituted a stationary pumping plant for the fire-boats. The same correspondent points out that the objection to the use of salt water is that there would probably be serious and rapid deterioration of the mains and connections, due to the action of the water on the metal, if it were allowed to remain permanently in the mains.

Among the many articles which have appeared on this subject, we think that the most practical is that of our esteemed contemporary, Engineering News, which proposes that an auxiliary pipe system, of large volume and fitted with the necessary standpipes, should be provided for purposes of fire protection alone, and that these standpipes and mains should be filled with salt water only on the rare occasions when the magnitude of a fire may demand the calling in of an auxiliary source of water supply. Our contemporary proposes to lay a system of high-pressure mains, which would be distributed in respect of its capacity according to the particular requirements of the districts of the city that were served. This system would be provided, at points of special danger, with standpipes and street hydrants for hose connections. At some suitable point on the water front, a powerful pumping station would be located, containing high-pressure pumps, delivering directly into the high-pressure mains. Ordinarily these mains would be connected to the regular city fresh-water supply, and the standpipes, mains, etc., would be filled with fresh water only, thus obviating the dangers of corrosion and general deterioration. For all ordinary fires the pumping station would draw from the regular Croton water supply. But should a fire begin to assume serious proportions, the suction of the station pumps would be cut off from the Croton mains, and connected directly with the salt water of the Hudson or the East River, as the case might be, thereby giving the Fire Department an unlimited supply adequate to any possible magnitude of conflagration. When the fire was subdued, the salt-water connection would be cut off, and the mains would be thoroughly flushed out and filled with fresh water, thus removing all danger of corrosion.

In response to the letter of Mayor McClellan to the Department of Water Supply, Gas, and Electricity, to which we made reference in a recent issue, the department's commissioner has submitted a report of a comprehensive plan for protecting two large areas in Manhattan and Brooklyn. The report is published in the current issue of the SUPPLEMENT, and it will be sufficient to state here that the plan agrees broadly with the provisions above outlined. The first install-

ment in Manhattan would cover the area bounded by Twenty-third Street and Chambers Street, Fourth Avenue and the Bowery, and the North River. It would consist of a system of mains served by three separate pumping stations. Over one thousand hydrants would each supply five three-inch hose at a pressure at the nozzles of 200 pounds to the square inch. There would be two hydrants at each street intersection, thus providing forty such streams to each block. The total supply in emergencies that could be concentrated on a single block would be 1,200,000 gallons per hour. Provision would be made for salt water connections should they prove necessary.

Brooklyn would be similarly served in three districts: Coney Island, the dry goods district, and the lower water front district. The total first cost of the installation would be \$3,950,400 if electrical power were used, and \$5,293,200 if gas engines were employed. Although the first cost is large, it is small in comparison to the great value of the interests protected.

## FUTURE EXTENSION OF THE SUBWAY SYSTEM.

With the present subway lines in such a state of completion that the opening of the system for public use is only a matter of a few months' time at the most, the question of the location and inter-relation of new subways becomes of pressing importance, especially in view of the fact that at least four great corporations, to say nothing of the general public, are vitally interested.

The Inter-Borough Rapid Transit Company, in which is included the old Manhattan Elevated; the Metropolitan Railway Company, which owns practically all the street surface railways in Manhattan and the Bronx; and the New York and New Jersey Company, representing New Jersey trolley interests, have all applied to the Rapid Transit Commission for authority to build subways in this city; while the Brooklyn Rapid Transit Company, although not an applicant for authority to build, is anxious to cross the Williamsburg Bridge and run its cars over a belt line to be built between the two bridges that land in Manhattan, although it prefers that the connection should be made by means of an elevated structure.

It must be exceedingly gratifying to the Rapid Transit Commission to compare the present eagerness on the part of the big transportation companies to build subways with the indifference or distrust with which the rapid transit scheme was regarded by these same interests only four years ago, when bids for the construction of the present subway were solicited. At that time it looked for a while as though the years of labor entailed in arousing public interest, and securing the necessary legislative powers, were to be rendered useless by the reluctance of capital to embark upon an enterprise calling for such a large outlay of money, and necessarily involving many engineering problems of a novel and difficult nature. Great credit is due to the contractor, Mr. Macdonald, and his financial backer, Mr. Belmont, for the courage with which they took hold of this scheme, and the successful issue to which they have carried it. The practicability of building subways, the solution which it has afforded of many questions of construction and cost, and the flattering prospects of profitable operation, have removed subway enterprises from the domain of doubtful ventures to that of practical and very promising investments.

By the middle of the present summer, or at the latest by the early fall, when the term of the present subway contract expires, the new system will be in operation, and it will provide New York city with a four-track road from City Hall Park by way of Elm Street, Fourth Avenue, Forty-second Street, Broadway, and the Boulevard to 104th Street, and two divisions from 104th Street, one running north to the Harlem River and the other extending northeastwardly to a tunnel beneath the Harlem River, and through the Bronx to Bronx Park. The extensions now proposed are as follows: The Inter-Borough Company has applied to the Rapid Transit Company for permission to build an extension of the present subway system below Broadway from Broadway and Forty-second Street, where there is a station on the present subway, to Twenty-third Street, and thence south below Fifth Avenue, West Broadway, and Greenwich Street, to connect with the subway loop, which is now under construction at the Battery as part of the present extension of the subway to Brooklyn. They also seek authority for the construction of a subway and elevated system from the intersection of the present subway and Melrose Avenue in the Bronx, to and beneath the Harlem River, and down Lexington Avenue to a junction with the present subway at Forty-second Street and Fourth Avenue, in front of the Grand Central Station. This is obviously the next natural extension to be made of the present system; seeing that it provides an independent north-and-south line to the west of the present subway below Forty-second Street, and an independent line in the eastern section of the city north of Forty-second Street.

The Metropolitan Street Railway Company, which is one of those interests that was earnestly urged to undertake the construction of the present subway four

years ago, are now so thoroughly convinced of the value of the system, that they have filed with the Rapid Transit Board an application for an even more extensive series of lines than that asked for by the Inter-Urban Company. They propose to build a subway from Third Avenue and 138th Street in the Bronx, to extend down Lexington Avenue to Fifteenth Street, then under Union Square to Broadway, down Broadway to Chambers Street, thence eastwardly below Chambers Street to William Street, down William Street to Hanover Square, and then to the Battery, by way of Coenties Slip and South Street; around the Battery outside of the present subway to Greenwich Street; up Greenwich Street, West Broadway, and Hudson Street to Eighth Avenue; and up Eighth Avenue, through the new Pennsylvania tunnel, and eastwardly through Thirty-fourth Street to a junction with its proposed line down Lexington Avenue. There would also be a cross-town connection between the east and west side branches on Thirty-fourth and Chambers Streets. As it is carefully stated in the application that the proposed subway would pass under the existing subway, evidently no connection is contemplated between the two, a defect which, we think, must militate very strongly against the application of the Metropolitan Company in its consideration by the Rapid Transit Commission. On the other hand, the company pledges itself to a system of transfers between its subway lines and the sixteen cross-town surface lines which it controls.

The evidently careful avoidance of the present subway lines, which is manifested in this application, will suggest at once to the public mind that the proposition, if accepted, will be directly opposed to that very unification of the transportation system of this city which is so eminently desirable, as proved by the good results shown in the excellent management by the Metropolitan Company of its own amalgamated street surface lines.

In addition to these very ambitious proposals, the New York and New Jersey Company, which has just completed its first tunnel beneath the river, has applied to the Rapid Transit Commission for authority to extend its tunnel by way of Tenth Street and Sixth Avenue to Herald Square, an extension which would put the large residential districts of New Jersey in direct touch with what is rapidly becoming the principal shopping district of New York city.

The last, and not by any means the least important, subway extension is that proposed by the Rapid Transit Commission itself, which has for its object the provision of a belt line between the termini of the Brooklyn and Williamsburg bridges. This subway would extend from the Brooklyn Bridge by way of Centre Street, Grand Street, and Delancey Street to the terminus of the Williamsburg Bridge. It is sincerely to be hoped that the connection between the two bridges will be made by subway, and not by elevated structure. The elevated structure is preferred by the Brooklyn Rapid Transit Company, for the reason that the Brooklyn Rapid Transit Company's cars are not suited, because of their lack of fireproof provision, for subway travel. If a subway is built, it would be necessary for the company to provide an entirely new equipment of cars, and this, in their present condition, they are utterly incapable of doing. To build an elevated structure between these points would add a further disfigurement to the city and would be a step backward from modern, up-to-date methods. Perhaps the best way out of the dilemma would be to build a subway between the bridges, and operate it as a separate system, providing loops at the Manhattan end of the Williamsburg Bridge for the return of the Brooklyn cars. This would serve until the advent of the day, which is most certainly coming, when the whole of the transportation system in Greater New York, elevated, surface, and subway, in Manhattan, the Bronx, and Queens, will be unified in one system, with a single five-cent fare between all points.

## A FLORAL MAP OF THE UNITED STATES AT THE ST. LOUIS EXPOSITION.

The exhibit of the Bureau of Plant Industry of the United States at the St. Louis Exposition will be one of the most interesting exhibits at the Fair. Work has already been commenced upon the making of the monster map of the United States, to form a greater portion of the exhibit. Mr. D. A. Brodie, an expert in the employ of the Plant Department, is superintending the work of laying out the map, though the United States government board appointed by Congress to represent the Federal government at the Exposition will have charge of the appropriation of \$5,000. The map will cover six acres, and each State is to be outlined by a cinder path. The entire area has already been underlaid with wooden drains, plowed deep and planted in cow-peas as fertilizers. In each State reservation will be shown plants grown in that State. Where the climatic conditions of St. Louis forbid the growing of plants out of doors, they will be grown under glass. Cotton, tobacco, and sugar cane are to be shown in the Southern States, orange and pineapple in Florida, and corn and wheat in the Middle States. No attempt