

Scientific American.

ESTABLISHED 1845

MUNN & 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. £6 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....\$3.00 a year.
 Scientific American Supplement (Established 1876)..... 3.00
 Scientific American Building Edition (Established 1885)..... 2.50
 Scientific American Export Edition (Established 1870)..... 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, corner Franklin Street, New York.

NEW YORK, SATURDAY, FEBRUARY 23, 1901.

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.

EAST RIVER RAPID TRANSIT TUNNEL.

The Rapid Transit Commission, having approved its engineers' plans for the extension of the subway system beneath the East River to Brooklyn, is now seeking the necessary powers to proceed with the construction. We trust that the required authority will be secured, and with the least possible delay. The present Rapid Transit scheme terminates in a four-track loop beneath City Hall Park. The proposed extension, the estimated cost of which is about \$8,000,000, will reach from City Hall Park, New York, to the Borough Hall, Flatbush Avenue, and the Long Island Railroad depot in Brooklyn.

The new structure will consist of a two track subway which will extend from the City Hall, beneath Broadway to Pine Street, where it will change into two two-track structures, separated by a partition wall, each of which will contain an up and a down track. At Battery Park one of the two-track structures will swing into a return loop terminal. The other structure will turn to the left, and on a descending grade will connect with two 15-foot parallel cast iron tubes, by which the tracks will be carried beneath the East River. On the New York and Brooklyn sides of the river, the tracks will have an elevation of 66 feet and 68 feet below mean high water. They will descend from either side to a sump below the center of the river, where the elevation will be 91 feet below mean high water, the respective levels being 31, 47 and 32 feet below the bottom of the river. The tubes will be carried on the Brooklyn side beneath Joralemon Street to the Borough Hall, where they will connect with two subways, one of which will swing into a terminal loop encircling the Borough Hall, the other extending below Fulton Street. Above the terminal loop of the tunnel tubes already mentioned as encircling the Borough Hall, there will be another loop which, after making the circuit of the Hall, will also run up Fulton Street, ultimately connecting with the single track from the lower loop, and forming a two-track structure which will extend to Flatbush Avenue, and from there to the Long Island Railroad.

The sum of \$8,000,000, which this extension is to cost, might seem, at first thought, to be a heavy addition to the cost of an enterprise for which a sum of over \$35,000,000 has already been authorized; but we must remember, first, that the efficiency of the Manhattan Island subway will be vastly increased by this extension; and, secondly, that all provisions for rapid transit in a city which grows as rapidly as New York, must be built with an eye to the enormous traffic requirements of the future.

SIR WILLIAM WHITE AND THE NEW ROYAL YACHT.

A notable instance of the celerity with which a host of detractors will rush into print in the effort to ruin what they consider to be the shaken reputation of a truly great man is seen in the case of Sir William White, the Chief Constructor of the British navy. In all the world there is not to be found a naval architect who is responsible for such a vast amount of work as is carried out under the Chief Naval Constructor of Great Britain, and it must of necessity follow that, in a position which entails so much routine official work, he is unable to do more than lay down the broad features of new designs, and must leave the details to his subordinates. It seems that in the construction of the royal yacht, the distribution of weights was such at the time of her launch that she proved to be unstable. The error was traced to one of the staff, and subsequent reconstruction in the way of cutting down the topmasts, funnels, etc., so far corrected the instability of the vessel that at her recent trials, in which she made about 21 knots an hour, she proved to be an excellent seaboat in all kinds of weather.

The attack upon Sir William White was indignantly resented in naval circles, and nowhere more so than in the United States navy. Several of our naval constructors, including Constructor Bowles, the coming Chief Constructor, were at one time students of Sir William White in England, and their strong testimony to his abilities has been indorsed by Charles Cramp, president of the well-known shipbuilding firm of that name. As a matter of fact, the modern navy of Great Britain, dating from the era of the Naval Defense Act, is entirely of his designing, and the correctness of his theories is proved by the fact that the type of ship to which he has clung steadily, with few variations, for the past fifteen years bids fair, at least in its general features, to become general throughout the world.

TESLA'S WIRELESS TELEGRAPHY.

Long distance wireless telegraphy, if we may believe the current story of its latest developments, is about to take an enormous stride both in its reach and its rapidity, for we are shortly to be in possession of a means of wireless telegraphic communication across the Atlantic, by which we can send messages at considerably greater speed than is possible by the present cable. The feat is to be accomplished by the assistance of that "oscillator" with which the name of Nicola Tesla is so well identified. We are, all of us, fairly well familiar with the Marconi system in which Hertzian waves are utilized, the transmission of currents being aerial, or to speak more correctly ethereal. Mr. Tesla, however, manipulates his recently discovered "stationary electrical waves in the earth" by setting up "vibratory currents which can be transmitted through the terrestrial globe, just as through a wire, to the greatest distances."

According to public reports, Mr. Tesla during the past year or so has been devoting his time chiefly to the improvement of his generator and receiver. He claims to have so far perfected the system that by means of proper "tuning" he can direct his messages infallibly to any particular receiver. It seems that the primary purpose of his recent Pike's Peak experiments was a series of elaborate tests, the result of which satisfied Mr. Tesla that when a suitable plant is built, he can establish wireless electrical communication between the old and the new world. The system, as described in interviews with the author, involves the production of electrical vibrations of enormous frequency, a transmitter which receives the current, intensifies it, and sends it to the earth, through which it flows in every direction. A receiver which is adjusted so that its vibrations are in tune with those of the transmitter is set up, say in London, Paris or Berlin, picks up the vibrations, and intensifies them so that they become decipherable at the receiving station. These electrical vibrations are recoverable at any spot on the surface of the globe, provided that the Tesla receiver be at hand to pick them up, and intensify them to a point at which they may be read.

HIGH-SPEED PASSENGER STEAMERS ON THE HUDSON

It is somewhat surprising, in view of the excellent facilities for a rapid steamer service afforded by the Hudson River, and the inducement which is offered by the existence of many populous residential suburbs along the shores of the river, that there has been no attempt as yet to manipulate such a line for the benefit of suburban residents. It was only at the close of last year that preliminary steps were taken looking to the provision of a service of this kind, and the scheme has now reached a stage of its development at which some facts regarding the vessels which are to be employed will be of interest. There will be three twin-screw vessels, built from designs by Mosher upon the lines of the remarkable type of craft with which his name is identified. They will be 130 feet in length, 15 feet in beam, with a depth of 7 feet, and an extreme draft of 4½ feet. They will have two twin-screw, quadruple-expansion engines of 4,000 horse power, and the displacement, with an average load on board, will be about 100 tons. There will be a large general saloon, and a smoking saloon, and a seating capacity for 250 passengers. The lines of the boats will be similar to those of the "Elliott," which is credited with a speed of 34¼ knots an hour on the measured mile; and while these steamers will be capable, when the engines are run at their full power, of making an equal or even greater speed than this, the present arrangements are to run them at a speed which under normal circumstances will enable them to make the trip from Nyack to 22d Street, New York, in one hour. A steamer will leave every hour from six o'clock in the morning to eleven o'clock at night, and calls will be made at Rector Street, 22d Street, Yonkers, Dobbs Ferry, Tarrytown and Nyack. The landings will be made at the ends of the piers and there will be special provision made to allow a clear course for the steamers in approaching and leaving the docks. We think it is more than likely that such a service will prove extremely

popular during at least six months of the year, and its successful maintenance will mark a very important step in the development of high speed travel by water.

SMOKELESS POWDER AND GUN EROSION.

The Board of Ordnance of the navy is to be congratulated on the excellent results obtained with the multi-perforated smokeless powder, the perfecting of which has involved a great amount of investigation and experiment. The advantages of smokeless powder are well known to the public; but it is not so well understood, perhaps, that these advantages, in the case of some of the best-known smokeless powders, are largely offset by certain serious defects, chief among which is their destructive action upon the interior surface of the gun, which is shown in a pitting or eating away of the bore. The direct result of this erosion is that, the obturation being imperfect, the gases escape past the shell, and there is a consequent falling off of the muzzle velocity below that which theoretically should be produced by a given charge of powder. This erosion is most marked in the case of smokeless powders that contain a large percentage of nitroglycerine, the well-known cordite which contains over 58 per cent of this explosive being, perhaps, the chief offender in this respect. The temptation to include a large percentage of nitroglycerine is due to its enormous energy; but it has always been recognized that if a powder could be produced that contained a minimum of nitroglycerine, and still possessed high ballistic qualities, it would be an ideal powder. It is satisfactory to know that the Ordnance officers both of the United States army and navy have developed powders which are so far superior to cordite, that the army smokeless powder contains only 25 per cent of nitroglycerine, and the navy powder none at all, the latter being an all-gun-cotton product.

It is with this powder that the Board of Ordnance has secured the remarkable ballistic results which, from time to time, have been chronicled in the SCIENTIFIC AMERICAN. Thus, the new 12-inch naval rifle has shown a velocity of 2,854 feet per second, while velocities of 3,000 foot seconds and over have been obtained with the 6-inch, 4-inch and 3-inch 50 caliber guns, and in every case these high velocities have been obtained without exceeding the designed chamber pressure of 17 tons to the square inch, and, what is equally important, without any sacrifice of the mass of the projectile.

So much for proving ground results. Can they be sustained in regular service; or will there be, as in the case of the naval guns of at least one foreign power, a gradual falling off in velocity, due to erosion and enlargement of the bore? It is with considerable satisfaction that the Ordnance Bureau is able to certify that no such deterioration will result from the prolonged use of its new powder, since a 4-inch rapid fire gun at the Indian Head Proving Ground has been fired 661 times, and a 5-inch gun 636 times with the smokeless powder, without causing sufficient wear to be detected by micrometer measurement.

Another defect to which smokeless powders are liable is that when they are in storage, or in the magazine, for a considerable length of time, they are liable to undergo a chemical action which results in a great falling off of energy. Powders that depreciate with age give unreliable results in service, since it can never be determined just exactly how the gun sights should be adjusted. Should they be adjusted to suit the full velocity of the powder when that velocity is actually one or two hundred feet per second below the designed velocity, the shell will fall proportionately short of the object. Hence, stability is a feature which is second only in importance to that of erosion, and it is gratifying to learn from the Department that our navy powder has proved to be thoroughly stable, a sample of powder which had been in the magazine for two years having shown at a recent test that there had not been the least loss of its ballistic qualities, nor any evidence of chemical alteration.

PRIZES FOR INVENTIONS A LEGITIMATE ENCOURAGEMENT

The closing year of the nineteenth century was a remarkable one in the field of invention, not only as regards the number of patents issued, but for the remarkable inventive ability displayed. It is gratifying to note the increase in the esteem in which inventors are being held, and the substantial rewards which crowned many of their efforts. They can reap not only the full benefits to be derived from their inventions, but they can also compete for the remarkable series of prizes which have been offered by associations and individuals in the hope of improving our economic condition. The great prizes of 1900 were the Pollak prize for life-saving devices, which was \$20,000; the prize offered for labor-saving machinery for the sugar business, made by the Hawaiian Planters' Association, the amount being \$6,500, and a number of prizes of smaller value. There is every indication that the year 1901 will be even more fruitful in liberal offers for inventions than the year which preceded it. Only \$2,000 of