

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. £0 10s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) \$3.00 a year
 Scientific American Supplement (Established 1876) 3.00 "
 American Homes and Gardens 3.00 "
 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, SEPTEMBER 30, 1905.

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.

BUILDING THE ERIE BARGE CANAL.

It is gratifying to know that the work of enlarging the Erie Canal to accommodate 1,000-ton barges is fairly under way. Recent reports from the State engineer on the six contracts already let state that on four of them the work is making good progress, and that plants for work on the other contracts have been established. Corps of engineers have been established at fifteen points along the line of the work between Albany and Buffalo, and at each point there is a force of from ten to forty engineers and assistants. Ground will soon be broken on the first canal lock at Waterford, on the Champlain route, and it is gratifying to learn that the Canal Board has decided to make all the locks 45 feet in width instead of 28 feet, as contemplated in the original plan. This is a wise provision which future developments will surely justify. The contracts which are now under active prosecution will involve the expenditure of between five and six million dollars. At present there is an appropriation of ten million dollars at the disposal of the canal authorities, and the Superintendent of Public Works will shortly let other contracts which will cover the balance of this appropriation.

ANOTHER NORTH RIVER TUNNEL.

In addition to the tunnel now under construction beneath the North River for the Pennsylvania Railroad, and the two tunnels now under construction by the Hudson Companies, another influential company is about to construct a new tunnel whose location will be intermediate between those of the Hudson Companies. The Interstate Tunnel Railroad Company of New Jersey, which will build the tunnel, has been incorporated with an authorized capital stock of \$7,500,000. The work is to be carried out conjointly by the Metropolitan Street Surface Railway interests, which hope to secure authority to build an extensive system of subways in New York city, and by the Public Service Corporation, which operates all the surface lines in the counties of Hudson, Essex, Passaic, Union, and Middlesex in New Jersey, a total of about 550 miles of line. As part of the scheme, a new direct, high-speed line will be built from Newark, to afford communication, without changing, with the proposed tunnel in Jersey City, and it is proposed to have a schedule which will allow the trip to be made from Newark to the City Hall in New York in fifteen minutes, and between Jersey City and the Manhattan terminal of the tunnel in five minutes' time. The tunnel will run from a terminus in Jersey City at Erie and 12th Street, to a terminus under Chambers Street, between Broadway and the Brooklyn Bridge terminal. Arrangements have been made for a joint passenger station at Jersey City which will enable the Erie Railway Company to transfer its suburban passengers to the new tunnel line.

MAGNETIC SURVEY OF THE NORTH PACIFIC OCEAN.

The Department of International Research in Terrestrial Magnetism of the Carnegie Institution of Washington is about to make a magnetic survey of the North Pacific Ocean. The brig "Galilee," a wooden sailing vessel, has been fitted out at San Francisco for the expedition. The purpose of the expedition is to get exact data of the distribution of magnetic forces over the ocean, the present magnetic charts used by navigators of the North Pacific depending chiefly upon observations made on islands and along the coasts. Observations of this kind are subject to disturbance by local conditions, so that the charts now in use are not trustworthy. It is thought that the work can be accomplished in three years and the sum of \$20,000 has been allotted for the expenses of the first year. The "Galilee" will first cruise from San Francisco to San Diego, thence to Honolulu and back to San Francisco. Then

a circuit will be made from the west coast of America to the Galapagos Islands, and thence to the Philippine Islands and Japan, returning by way of the Aleutian Islands and closing the circuit at San Francisco. The observations will be continued over a series of areas bounded by parallels of latitude and meridians of longitude each five degrees apart, lying next on the mid-ocean side of the circuit last made, proceeding gradually and by successive circuits into the central region of the North Pacific Ocean. The whole length of the course proposed is 70,000 knots. The work is directed by Dr. L. A. Bauer, who is in charge of the magnetic work of the U. S. Coast and Geodetic Survey. He will accompany the expedition to San Diego. The vessel will carry a sailing master and nine men as crew. The scientific head and commander is J. F. Pratt of the U. S. Coast and Geodetic Survey, who has had thirty years' experience in geodetic, astronomical, hydrographic and magnetic work.

CHAINS VERSUS CABLES IN THE MANHATTAN BRIDGE.

On another page of this issue we publish a letter relating to the Manhattan Bridge, which affords an example of the futility of attempting to solve a complicated question by discussing merely one element thereof. The determination of the relative weight and cost of the cables of a long-span suspension bridge of 1,400 feet and over is so complicated and involves so many considerations peculiar to the type, that there are only a few engineers in this country to-day who have had occasion to master the problem in all its details. We would suggest to our correspondent that the rough-and-ready method by which he arrives at his conclusion that a chain cable for the Manhattan Bridge would cost \$4,000,000 more than a wire cable, might raise a reasonable doubt as to whether he was entitled to be included among the few above referred to.

That the weight of an eye-bar chain is greater than that of a wire cable of equal strength, is a fact familiar to all engineers. But to determine just how much is the difference in weight in any given case, is not the simple matter which Mr. Hildenbrand desires to demonstrate. He failed to convince the board of eminent engineers, who passed upon the chain design and unanimously recommended its construction, even after they had listened to our correspondent's arguments.

It does not follow that a chain suspension bridge must necessarily, by reason of its greater weight, cost more than a wire suspension bridge. Moreover, the greater weight and inertia of a chain suspension bridge are most valuable qualities contributory to greater stiffness and durability. This fact was recognized in the design for the Buda-Pesth structure, where the question as to whether eye-bar chain or wire cable should be used, was, we are informed, most carefully considered, purely on its merits, before a final decision in favor of chains was reached.

Comparisons of designs, to be of any value, must be made as a whole, and not on the basis of single features, unrelated to other features. It is not necessary to guess the relative values of eye-bar chains and wire cables in the two Manhattan Bridge designs, because they are matters of public record. Plans for both have been worked out and are before us. In the chain design, each chain had a maximum section of 635 square inches and a minimum section of 476 square inches, or an average section of 555 square inches, while the section for the wire cables is given as 275 square inches uniform throughout. Therefore, the sections are very nearly as 2 to 1, that is, the chain cable is about twice as heavy as the wire cable, instead of 4.84 times heavier, as Mr. Hildenbrand desires us to believe. A further corroboration of these proportions is to be found in the total quantities. The weight of the eye-bar chains was published as 14,200 tons, and the weight of the wire cables as round 7,000 tons, both weights including necessary details.

Bearing in mind that in a comparison of costs the whole work, including anchor chains, suspenders, trusses, and roadway must be included in the calculation, and not merely the chains alone, the following facts have an important bearing: The steel tonnage of the superstructure of the Blackwell's Island Bridge, as published, is 42,150 tons, including 6,200 tons of nickel-steel eye-bars and pins, and it was contracted for \$5,132,985. The steel tonnage for the superstructure of the chain design of the Manhattan Bridge was published as 45,000 tons, which is only 7 per cent larger than that for the Blackwell's Island structure, although of course, the former includes a much larger proportion of nickel-steel. The character of work for this design was considered by bridge contractors prepared to bid on it to be the same as that for the Blackwell's Island Bridge; that is, typical American pin connections for the chains and trusses, and the erection no more expensive than for that heavy cantilever structure. The cost of the superstructure, allowing for the larger proportion of nickel-steel, could, therefore, have been reasonably expected to be below \$6,000,000.

The steel tonnage of the wire cable design is given as 41,700 tons, for which the lowest bid was \$7,285,000.

Although, as may be seen, the steel tonnage of the Manhattan Bridge is somewhat lighter than that for the Blackwell's Island Bridge, it is, nevertheless, over two million dollars more expensive by reason of the high-priced steel wire cables and other wire work preferred by the present Bridge Department. If to the difference of \$1,285,000 between the lowest bid for the wire cable bridge and the very probable cost of the chain design be added the greater cost of the two anchorages for the wire cable design, by reason of the large mass of masonry and foundations, as shown on the plans for the same, then \$2,000,000 appears to be a fair estimate of the greater cost of the wire cable design over the chain design.

For a more accurate comparison, strain sheets are essential, because from them only can it be determined whether the computations have been properly made. Strain sheets for the chain design have been published and discussed, and their accuracy has not been questioned. Of the wire cable design no strain sheet has been published, or given out to contractors, which we believe is an unprecedented procedure in American bridge practice. Above all, three facts stand out prominently: First, that the chain design has been approved and recommended for erection by a board of five eminent bridge engineers, and that it was discarded for reasons which apparently will not bear the light of examination by experts; second, that the Department of Bridges declined to submit the new wire-cable design to a similar board of experts for comparison with the discarded chain design; and, thirdly, that the Bridge Department refused to invite bids on both designs. One of the reasons alleged for such refusal was that the plans for the chain design were incomplete. We are informed by engineers who saw them, that the plans are in the same state of completeness as those for the Blackwell's Island structure on which bids were obtained.

The policy of investigating and deliberating on the plans for large engineering work has long been practiced abroad; it is now going on with the plans for the Panama Canal; it should be the practice for all costly public works of this country. There can be no greater honor to an engineer than to obtain for his plans the indorsement of a board of leading experts, and instead of opposing such action engineers should solicit it for their own vindication.

TRADE MARKS ON COPYRIGHTED WORKS.

The public has again been reminded of the ineffective remedies afforded by the United States copyright statutes, by the action taken to punish Garrett J. Cauchois for the alleged infringement of a trade mark printed on copyrighted sheet music. The inability to secure redress under the copyright statutes led the proprietor of the copyright to institute criminal proceedings under provisions of the New York Penal Code, making it a misdemeanor to willfully infringe a trade mark. The defense was that the publishers of the music were endeavoring to enforce their copyright rights under the New York trade mark statute, and that if they were entitled to redress their remedy was under the Federal copyright law.

The remedies afforded for the infringement of a copyright are not uniform, and in the case of all works, excepting books and the play right in dramas and musical compositions, the amount recovered for the infringement, which depends on the number of copies of the work found in the possession of the infringer and in some cases the copies which have been sold, is in the nature of a penalty instead of as damages, with the necessity of dividing the amount recovered with the United States. In the case of a musical composition, unlike most other cases where the amount recovered for the infringement is in the nature of a penalty, there is no minimum or maximum amount prescribed which may be recovered, and unless the proprietor of the copyright can find a number of copies of the infringing work in the possession of the infringer, he is unable to obtain redress for the injury occasioned by the infringement. Even then he is unable to obtain satisfaction unless the defendant is in possession of sufficient property to pay the judgment. The infringer is therefore often able to go unpunished, except where a copyrighted drama or musical composition is unlawfully and willfully performed for profit, when the infringer is guilty of a misdemeanor.

The defendant applied for a writ of habeas corpus, which was dismissed by Justice Downing in the New York Supreme Court. In his opinion the justice said that "there was no question in the case of any violation of the copyright law. The prisoner was charged with knowingly selling articles of merchandise, which term included sheet music, to which a false and fraudulent trade mark was affixed. Entirely apart from the property protection itself secured to the author by copyright, there is the protection afforded to any trade mark used by the publisher or seller of copies for public use. If no trade marks were used by the publisher, no crime could be charged herein for merely pirating a copyrighted musical composition, but the