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 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845) ..... $3.00 a year
Scientific American Supplement (Established 1876) ..... 5.00 "
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, MAY 23, 1903.

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.

THE ARTISTIC ELEMENT IN BRIDGE DESIGN.

At a time like the present, when we are constructing in this country, and notably at New York, so many important municipal long-span bridges, it is of interest to turn to similar work which is being designed and executed by foreign engineers and contractors. We present in the current issue of the SUPPLEMENT a series of views of some recent notable bridges constructed in Germany and Switzerland, which are characterized by that strict regard for the æsthetic and architectural side of bridge construction, which is such a marked feature in the best Continental work.

Thanks to the Municipal Art Commission, in the city of New York strict attention is being paid, and we hope will continue to be paid, to the artistic side of all bridges, great and small, that are erected in the metropolis. Of course, the architectural embellishment of an engineering structure is something that requires to be undertaken by the architect or artist in direct collaboration with the engineer who designs the structure. This collaboration is now being carried out; but it is quite a question whether the bridge engineer, particularly if he intends to devote himself to city or county work, would not do well to round out his professional course by including instruction in at least the elements of architectural design, or some kindred study. Hitherto, American bridge engineers have been governed in their work too much by the strictest considerations of utility; and in the endeavor to design bridges that can be built with the least expenditure of time and material for the maximum amount of strength, they have produced structures that are a literal translation into steel of the straight lines and angles of the strain-sheet diagram. For economy of material and speed of erection, these bridges stand unsurpassed in the world; but it must be confessed that, with a few notable and praiseworthy exceptions, our bridges do not compare in beauty and harmony with their surroundings with the work of the Continental engineers. Among the exceptions may be mentioned the noble Washington Arch Bridge, over the Harlem River, and the design by the present Bridge Commissioner for the new Manhattan Bridge across the East River, New York; while it need scarcely be added that the famous Brooklyn Suspension Bridge will be always a thing of beauty, in spite of the fact that the details of its construction, judged from the modern engineering standpoint, must be considered rather crude.

AMERICAN RAPID TRANSIT IN LONDON.

The managing director of the Anglo-American Company which is building and equipping a large section of the London Underground Railways, states that the vast system of rapid transit which is being built beneath the city of London is progressing with far less disturbance to the streets and discomfort to the public than is our own in New York city. The difference is due to the depth at which the "tubes" are being built and to the fact that the material is soft and easy to tunnel. The most remarkable feature of the London system, according to Mr. Yerkes, is the great power station on the bank of the Thames, from which power for the entire system will be furnished. The building will contain ten 7,500-horse power engines, and when the plant is all in, there will still be room in the building to increase the power capacity by fifty per cent. An interesting detail of the enterprise is that a portion of the system is being equipped with four rails, of which two are the main rails for the cars, while of the other two one is the feeder, and the other the return rail for the current. The placing of the fourth rail is due to one of those government regulations—so common in Great Britain—that are inserted for the protection of the general public when important franchises are granted to public corporations. In the present case the Board of Trade stipulated that there must not be a drop of more than three or four volts in the pressure of the return current as received at the power house. The object of this restriction is to prevent leakage with its well-known disastrous electrolytic effects on gas and water mains. Now, it would be impossible to prevent leakage, if the common system of return by way of the track rails were adopted; since the ordinary vitrified earthenware insulators could not be used between rail and track. Hence the necessity for a separate properly-insulated return rail.

THE NEW CUNARDERS.

Some interesting light was thrown upon the subject of the two new express steamers for the Cunard Line at the recent annual meeting of the shareholders, when the president of the company stated that there was no truth in the report that the objections of the shipbuilders are due to their inability to construct two ships of the huge proportions and high speed called for by the government requirements. It seems that the shipbuilding firms consulted are fully prepared to build these vessels, which are to be of the same beam as the "Cedric," 75 feet, and are to be about 150 feet longer than the "Kaiser Wilhelm II." Moreover, they are prepared to guarantee that they shall show an average sea speed of 25 knots an hour, which is a knot and a half better than the highest speed for a single voyage ever made by a transatlantic steamer, and is over two knots higher than the average sea speed for a whole season of any existing ship. The government requirements, however, demand that the average sea speed, voyage by voyage, shall be 25 knots, and to insure this result the vessels would have to be capable of making an average speed for a single voyage under the best conditions of wind and sea of not less than 26½ to 27 knots an hour. As matters now stand, the British government expects the company to put these two ships in service with the stipulation that if they do not maintain an average throughout the season of 25 knots, they will be thrown back upon the shipbuilders' hands. As the two vessels will cost about $10,000,000, it can readily be understood that private firms are reluctant to undertake the contract subject to such onerous conditions.

The obligations imposed upon the builders of German express steamers are that the ship must give satisfaction on the trial trip, and that the builders must be prepared to remedy any defects that may show themselves during a specified period of their service; and these requirements would seem to be sufficiently exacting to protect the interests both of the government and of the steamship companies. It begins to be pretty evident that unless the government makes a considerable modification of its demands, the 25-knot steamers will never get beyond the paper stage.

FLIES AS CARRIERS OF BACTERIA.

There is, of course, nothing new in the theory that flies may be active agents in the spread of bacteria, but a forceful demonstration made under the auspices of Johns Hopkins University, which has been recently brought to our notice by a member of the medical staff of that institution, is well worthy of record in these columns. The experiments were conducted with a box that was divided into two compartments, in the first of which was exposed some food material infected with an easily-recognizable species of bacteria—harmless bacteria, of course, being used—while in the second compartment was placed an open dish containing a sterile nutrient such as is used as a culture medium for bacteria. Flies were placed in the first compartment, and, as soon as a number of them had been seen to walk upon, or eat of, the infected material, they were allowed to pass through a small door into the second compartment, where they had a chance to come in contact with the culture medium in the dish. The result was that bacteria deposited upon the surface of the sterile nutrient, multiplied there, and formed characteristic colonies. In these experiments molasses mixed with a growth of yellow bacteria was spread on a plate in the first compartment, and a dozen flies were put into the apparatus. Half an hour later, the door between the two compartments was opened, and as soon as several of the flies had been seen to come in contact with the sterile nutrient, the dish that contained it was covered and put away to develop. A few days later there had grown on the nutrient over a hundred colonies of yellow bacteria. The experiment was repeated with red and violet culture, and colonies of corresponding color were obtained. To prove that the germs from which these colonies grew came from the infected material in the first compartment, and not from accidental sources, further experiments were made with other groups of flies, but with no infected material in the first compartment. In this case, however, none of the dishes used in the second compartment developed yellow, red, or violet colonies. To prove further that the flies were the only means of transmitting the bacteria, experiments were made with infected material in the first compartment, but with no flies in the apparatus. The dishes containing the nutrient in these experiments also developed no colonies; and from these results it was considered to be absolutely demonstrated that flies are capable of carrying bacteria from one place to another, if they have an opportunity to come in contact with material containing these organisms.

BRITISH WORKMEN ON AMERICAN INDUSTRY.

The Mosely Industrial Commission to the United States, of which we have lately heard so much, was organized by the gentleman after whom it is named, who offered to pay the expenses of a certain number of secretaries of British trades unions for a visit to this country, in order that they might examine and report upon American industries. Not only did Mr. Mosely provide the necessary funds, but he accompanied the delegation himself; and the report of the findings of the various delegates is prefaced with one by himself, which is perhaps the most valuable, because of his broader point of view and his more philosophical treatment of the subject. There are in all twenty-two separate reports by the trades union delegates, representing as many different British industries. To insure that the field should be fully covered, a list of forty-one questions was proposed, which each delegate was requested to answer as far as he could. These questions related to the early training of the workmen in America; their general social condition; and the relations between employe and employer. The organizer of the commission reaches the conclusion that "The true-born American is better educated, better housed, better fed, better clothed, and more energetic than his British brother, and infinitely more sober. As a natural consequence, he is more capable of using his brains as well as his hands."

The commission as a whole agreed with Mr. Mosely. The reports are practically unanimous on the question of sobriety, although one of the delegates considers that "while the American workman is sober during working hours, yet he is as much inclined to a spree as the ordinary Britisher." On the question of gambling, it is considered that the American workingman, as such, knows practically nothing about it, and in this connection we are surprised to learn that the wagering habit is increasing rapidly in the present day among British workmen. Mr. Mosely draws attention to the fact that many of the leading positions in industry in America are held by men who are either English or Scotch. The delegates agree with him in the statement that one of the chief reasons why the American workman has an advantage over his British brother is that he has received a more thorough and generally better education. There can be no question that one of the chief inducements to self-improvement in American education, is the reasonable hope of advancement that social conditions hold out to young men of all classes in America, if their abilities fit them to fill higher positions. The delegates frequently allude to the great appearance of equality or absence of restraint in the intercourse between the masters and men. "But this," it is asserted, "is an effect and not, as seems to have been imagined, a cause. The American employer has more sense of the value to himself of what may be comprehensibly described as talent among those who do the work of the establishment than his British *confrère*." In this connection an instance is quoted of a young British mechanic whose ambition prompted him to come to America, and who was rapidly promoted until he became manager of one of the largest works in the United States, which under his vigorous direction forms one of the most successful in the country. It is urged that a little encouragement of the same sort would doubtless have kept the workman at home, with a benefit to English industry which it is difficult to estimate.

There is no doubt whatever that just here is to be found at once one of the greatest secrets of our industrial success in the United States, and of the comparative stagnation in many British industries. In Great Britain a workman or subordinate who presents a new device or theory to a superior will more likely than not be coldly received for his trouble. Here a premium is placed upon ingenuity and useful suggestions. Another most fatal hindrance to successful competition on the part of Great Britain with her Continental and American rivals is the fact, as pointed out by Mr. Mosely, that, "It has been the rule for generations past that as soon as a man earns beyond a certain amount of wages, the price for his work is cut down, and he, finding that working harder or running his machine quicker (naturally a greater strain) brings in the long run no larger reward, slackens his efforts accordingly." We are informed that this policy is rapidly passing away; and surely it is high time; for under such a system, there