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, MARCH 7, 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.

BLOCK SIGNALS AND THE AUTOMATIC STOP.

The proposal to use the automatic stop as a check upon engineers who play fast and loose with block signals is evidently gaining ground. In a recent report of the Illinois Railroad Commission, there are given some statistics of derailments at interlocking grade crossings of railways in the State of Illinois for the past year, from which it appears that while, out of a total of 197 derailments only 7 were due to defective interlocking functions (including defects caused by snow, ice, etc.), and 27 were due to defective track or rolling stock, no less than 138 derailments were due to trains running against the signals. With such an extraordinary result of their investigation before them, there was only one thing for the Commissioners to do, and that was to recommend the use of an automatic stop, acting directly upon the engine. The attitude of the engineer to any signal system should be one of absolute obedience, first, last, and all the time. From the very moment when he begins to interpret block signals to suit his own particular judgment of the situation, the system loses its value, and in some cases may become worse than useless.

DIVERGING AGAIN.

It now begins to look as though the British and American yacht designers, after converging in their designs to a common type of racing yacht for the "America" cup contests, will this year show a marked divergence. The American boat will be even more extreme than her predecessors, with a comparatively shallow moderate-displacement hull, and excessive sail spread; whereas the British designers, apparently, have come to the conclusion that the extreme was reached in "Shamrock II.," and that better results can be obtained by returning to a more wholesome model, with larger displacement, and a more moderate sail spread. This divergence will lend added interest to this year's series of races. It is a curious fact, moreover, that the new challenger will conform more closely to the new rule of measurement recently adopted by the New York Yacht Club, than will the vessel that is now building at the Bristol yard. We are of the opinion that while the more moderate boat may show up to advantage in certain conditions of wind and weather, the extreme craft which Herreshoff has in hand will prove to be better suited to the prevailing conditions on the Sandy Hook course during the month of August.

THE EFFECT OF FIRE ON BRIDGE CABLES.

In connection with a letter written to this journal by Capt. F. E. Chadwick, president of the Naval War College at Newport, R. I., on the danger to the Brooklyn Bridge cables from a possible conflagration among the buildings beneath the shore spans, which we published in our issue of December 20, 1902, it is interesting to note that Admiral O'Neill, Chief of the Bureau of Ordnance, has recently had some tests made to determine the strength of steel wire at varying temperatures. Out of one group of five specimens the first, which was not subjected to heat, showed a tensile strength per square inch of 71,350 pounds, whereas a specimen heated to a dark red heat and tested at that heat showed a tensile strength per square inch of only 12,579 pounds, while two specimens tested at a light red heat showed respectively only 6,123 pounds and 9,911 pounds tensile strength per square inch. In another set of tests of similar specimens the tensile strength fell from 68,000 and 73,000 pounds at normal temperature to 15,378 pounds at a dark red heat, and as low as 6,810 pounds at a light red heat. The ¼-inch round soft-steel rods from which was made the wire for the tests above mentioned showed a strength of 67,471 pounds and 70,670 pounds per square inch.

The bearing of these tests upon the question of danger from fire to the cables of the Brooklyn Bridge is evident. The greatest risk occurs where the cables descend below the roadway at the point of their attachment to the anchorages, for here, especially on the Manhattan side, it would be possible for one at least of the cables to be heated beyond the danger point by a fierce fire occurring in the buildings beneath or adjacent to the bridge. Moreover, a fire on the bridge itself, especially if it occurred during a high wind, would find sufficient combustible material in the floor of the bridge to cause an extremely hot conflagration, and the risk would be especially great if both the floor of the bridge and the buildings beneath it were fiercely burning at the same time. We are pleased to note that the Commissioner of Bridges has given special attention to the question of fireproof flooring, and that the three new structures now under construction will carry only thoroughly fireproof material.

We think the question of risk to the cables from buildings immediately beneath or adjoining the Brooklyn Bridge cables, as noted by Capt. Chadwick, should receive, if it has not already done so, the consideration of the Department of Bridges. We understand that at the time of the erection of the bridge, some attention was given to the matter, and the height of these buildings was restricted.

THE NEW CUNARDERS

The task that the Cunard Company, aided by the British government, have set themselves of placing in the Atlantic service two 750-foot, 25-knot ships, is proving itself of formidable proportions at the very outset; for it seems that the announcement that these contracts had been let was premature, and that the builders are hesitating to put their names to a contract carrying such onerous conditions as are imposed in the case of the two vessels. According to the latest reports that have reached this side of the water, the vessels are required to show an average speed of 25 knots over several thousand miles of continuous steaming, the average speed to be maintained irrespective of the conditions of wind and weather. Now, while we believe that such conditions of trial speed as this are the only satisfactory ones, since they are conditions that exist in every-day service, it will be realized at once that they are enormously more burdensome than the requirement that a vessel should show a similar speed over the measured mile. If the new Cunarders are to be capable of maintaining an average speed of 25 knots on a westward passage, they must be prepared to do so in spite of a succession of westerly gales such as incoming vessels have recently reported. To accomplish this they must not only be built of exceptionally strong scantling, with special construction forward, to enable them to withstand the heavy seas that are certain to come aboard, but to maintain 25 knots in heavy weather they must be capable of at least 26½ or 27 knots speed in smooth water. We have seen the 23 1-3 knot "Deutschland" being pushed into a whole gale from the southwest, when her engines were indicating some 35,000 horse power; but the best speed that she could make under these conditions was 21 knots per hour, although she averaged 23 1-3 knots per hour on the run to the eastward in fine weather. Of course, the greater weight and power of the new Cunarders would be in their favor; but in any case they must have a large margin of power to enable them to maintain a 25-knot average in bad weather, while the construction of the bridges, deck houses, boat fastenings, deck rails, etc., will call for special consideration on the part of the designer.

DELAY IN THE CONSTRUCTION OF WARSHIPS

Rear-Admiral Bowles, Chief Constructor of the Navy, has submitted a report on the question of the great delay in the construction of United States warships. The document, which is too lengthy for full publication in these columns, will be found in full in the current issue of the SUPPLEMENT. The delays may in general be attributed to one or more of the following causes: First, inadequate plans, which were prepared in haste with a view to awarding contracts for vessels as soon as possible after their authorization by Congress. Second, changes in the disposition of armor, or armament, or in the details of the designs after the awarding of the contract; in some cases these changes have been so great as to include the lengthening of ships and the increase in their engine power and speed. Third, delays in the delivery of armor and ordnance, due to the discovery of improved methods of manufacture of armor, and in the case of the "Maine" class, by the refusal of Congress to authorize the building of the vessels until the contractors had agreed to furnish the required armor at a specified maximum price. Fourth, delays due to the very thorough system of government inspection, which Rear-Admiral Bowles believes is more complete than that given by any other nation. Fifth, delays due to slowness of delivery of steel and other structural materials by sub-contractors. As a matter of fact, the steel-makers, instead of delivering the plates and frames in the order in which they are required by the builders, prefer to roll the various sizes and shapes in such lots as will prove most economical and convenient to themselves. That is to say, deck beams are liable to be delivered at the builders' yard ahead of keel plates when the contractor finds that it is more convenient or profitable to deliver them in that order. Sixth, delays due to inadequate facilities or insufficient ability in the contractor's technical staff; and finally, delays due to inadequate supply of skilled workmen.

EXTRAORDINARY IMMIGRATION FIGURES.

If one were asked to name the strongest proof of the virility of the American race, he would not be far wrong if he pointed to the fact that we are able to receive and assimilate the enormous immigration which pours like a flood, year by year, upon our shores, without losing our strongly-marked characteristics either in the nation or in the individual. How vast is this immigration is shown by the statistics of the number of cabin and steerage passengers landed at the port of New York during last year, in which all previous records were surpassed. Of cabin passengers there were 139,848, while the enormous total of 574,276 steerage passengers was landed at this port. The previous year the figures were 128,143 cabin and 438,868 steerage passengers; while in 1900, 137,852 cabin and 403,491 steerage passengers were landed in New York city.

Evidently the tide of immigration is rising steadily. But just to think of it! Over half a million of foreigners of all nationalities, composed chiefly of the very poorest and most ignorant peoples of Europe, are absorbed by this country, so easily and naturally, that beyond the mere registration of numbers, this multitude makes, for all evidence to the contrary, no visible impression upon the routine of our daily life. The explanation of our easy assimilation of these heterogeneous millions is to be found in our magnificent public school system, which is undoubtedly the chief agency in making the immigrants' children who are native by birth, native also in sympathy and training.

THE SCIENTIFIC AMERICAN AND THE INTRODUCTION OF THE TELEPHONE INTO EUROPE.

The Chicago Chronicle in one of its recent issues published an account of the introduction of the telephone into Europe, which may not be without interest to the readers of the SCIENTIFIC AMERICAN. It seems that at a banquet recently given in Chicago for telegraph and telephone operators, Mr. Fernando Jones made a speech in which he told an anecdote which reflects upon the SCIENTIFIC AMERICAN no little credit. Mr. Jones stated that he saw and used the first telephone instrument ever made in Europe. "It was in Florence, and in the studio of Preston Powers, a son of Hiram Powers, the sculptor. It came about in this way: One day the mail brought to Mr. Powers a copy of the SCIENTIFIC AMERICAN which contained an account of a new and marvelous invention called the telephone. In the account were diagrams and particular descriptions, all of which Mr. Powers, who had a fine mechanical talent, understood almost at a glance. I then left the city for a short trip, but after a week's absence I returned and called again upon my friend. He said he had a wonderful thing to show me. Then leading me into a small room just off the studio, he pointed to a box that was set on another and larger one. It was a rude enough thing, but it had attached to it a tube with a mouthpiece and another tube that was adapted to the ear. There was a wire which extended from the box through the board partition of the little room, and I presently learned that it passed out through the window of the studio and up to his wife's drawing-room in his house. This house was situated on the Porta Romana, and the studio was some five hundred feet below it. Now I was for the first time to see the telephone used. 'Mr. Jones,' he said, 'I am going to ask you to dinner this evening, but first I will telephone my wife that you are coming.' This he did, and the answer came quick, clear and cheery, 'All right.' That was the only telephone then in Europe, and when I had returned to the United States, there probably were not a dozen in any American city." Thus it was that the SCIENTIFIC AMERICAN introduced the first idea of the telephone into Europe, and thus it was that from its plans and instructions, was built the first instrument of its kind on the European continent.

The inquiry by the French Naval Department into the cause of the recent explosion upon the submarine boat "Le Francais" has revealed a new danger in this type of craft. The accident established the fact that in stormy weather oxygen gas escapes from the electric accumulators on the boat, and remains within the vessel despite the ventilating arrangements devised to carry it away. The commander of "Le Francais" advises that the accumulators should be inclosed in wire gauze to prevent the gas exploding.