SCIENTIFIC AMERICAN

ESTABLISHED 1845

MUNN & CO. - - Editors and Proprietors

Published Weekly at
No. 361 Broadway, New York

CHARLES ALLEN MUNN, *President*
361 Broadway, New York

FREDERICK CONVERSE BEACH, *Sec'y and Treas.*
361 Broadway, New York

TERMS TO SUBSCRIBERS.

One copy, one year, for the United States or Mexico $3.00
One copy, one year, for Canada 3.75
One copy, one year, to any foreign country, postage prepaid, 18s. 6d. 4.50

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (established 1845) ..... $3.00 a year
Scientific American Supplement (established 1876) ..... 5.00 "
American Homes and Gardens ..... 3.00 "
Scientific American Export Edition (established 1878). ..... 3.00 "

The combined subscription rates and rates to foreign countries, including Canada, 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 5, 1908.

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.

ORNAMENTAL ELEVATED STRUCTURES.

It would seem that at last the question of the ornamental appearance of such elevated structures as may be built in this city is to receive the attention which its really great importance demands; for we understand that the civic authorities have taken a decided stand upon this too-long-neglected subject. The first attempt to give such architectural beauty as is possible to an elevated railway will be made in connection with the elevated road to be built through Flatbush Avenue extension, from Fulton Street, Brooklyn, to and across the new Manhattan Bridge. It cannot be denied that an elevated railway, of the type that has been constructed so freely on Manhattan Island and in Brooklyn, is a decidedly unsightly structure. For the matter of that, it may be said that any elevated railway is unsightly; but the structures of this type to be found in this and other leading cities of the East are rendered particularly so by the fact that their proportions and lines were drawn with a rigid regard to utility, that is to say, to the engineering requirements of expeditious and cheap construction and erection. The rectangular outlines are stiff, and wearisome in their endless monotony; while, as for the stations, the less said about their ornamental features the better.

That the inevitable harshness of the lines of such construction may be softened, and its monotony varied by judiciously applying a limited amount of ornamentation, has been proved in the case of some European elevated railways, and notably those in the city of Berlin. In the elevated roads of that city, graceful curves unite the vertical supporting members with the horizontal girders, and dome-roofed stations of a simple design are made to harmonize with the general treatment of the roadway itself. Fortunately, the occasions on which short stretches of elevated structure must be built in this city will be few and far between; and it is gratifying to learn that such as are put up will have some pretensions to that architectural treatment of which the existing roads are so commonly barren.

EXPERIMENTAL DAMS AT THE PANAMA CANAL.

Judging from the extended and elaborate series of experimental tests which are being made in connection with the great Gatun Dam on the line of the Panama Canal, this structure, as completed, will be of a character to command the confidence even of its most skeptical opponents. When the proposal was first made to turn the valley of the Chagres into a huge lake, containing over 100 square miles of water surface, and to hold this inland sea back by an earthen dam, built upon a subsoil consisting of alluvial material, the scheme was immediately subjected to the most bitter criticism by many engineers and contractors of wide experience and reputation. The dangers of excessive seepage through the dam itself, or of escape of the water through pervious strata in the bed of the valley underneath the dam, which were dwelt upon so earnestly by the critics, are being met and answered by the series of investigations which has been carried on for the past eighteen months and is still actively in progress. Two experimental dams have been built, both on a scale of 1 to 12, each being 85 inches high to the high-water line, as against a height of 85 feet of the dam itself. In the first dam the material was deposited by pumping, the work commencing at the downstream toe, and being carried on until the upstream face was finished, with the result that the finest particles of material, most impervious to water, were deposited along the upstream face. A head of water of 85 inches was then applied at the upstream face and the rate of seepage, as noted, proved to be satisfactory beyond the expectations of the engineers. In the second experimental dam the material will be pumped into place and deposited simultaneously from both the downstream and the upstream faces, with the result that a larger percentage of the finer material will be deposited as an impervious core in the center of the dam. When a similar head of 85 inches of water is applied, it will be possible to determine the relative rate of seepage of the two types. Hitherto, all the data obtained in the experimental work, not merely in these two dams, but in the bore holes, test pits, tank tests, etc., have given results superior to those predicted when this type of dam was first proposed.

THE STREET NOISE CRUSADE AND THE RAIL JOINT.

The present crusade against unnecessary street noises is one of the most commendable movements of reform of recent years. There is no denying that the average big city during the hours of business life is a perfect pandemonium of discordant sounds; and probably there is no city in the country where the clamor is more persistent and penetrating than in New York. Of all the contributory agents, undoubtedly the most distressing are the various railroads, both surface and elevated, and the major part of the racket and din which they produce is attributable to the passage of the wheels of traffic over the rail joints. In spite of the amount of thought and money which have been expended on the problem of providing a joint which will hold up the rail ends in true level, it has to be confessed that no such joint has been provided that is satisfactory. It is only a question of time when the splice bolts begin to slacken, the splice bars to wear at their upper and lower edges, and the rail ends to sag under the passage of the heavily-loaded cars. When this condition has been brought about in ever so slight a degree, the rail end which the rolling wheels are about to leave is depressed more or less below the abutting rail end ahead, with the result that there is a distinct and very heavy blow given by the wheel as it climbs this rail, and the sound of a loud metallic blow is produced, the intensity of which increases with the looseness of the joint. Similar conditions exist at crossings and switches, and at every point, indeed, where the continuity of the rails is broken. The defect may be remedied or mitigated to a certain extent by careful maintenance; that is, by constant inspection of the joints and continual tightening up of the bolts to take up as far as possible the wear. On steam railroads where the rails stand entirely exposed to view this can be done; and on first-class roads with heavy rails and a thorough system of inspection the rail-joint problem has been so far solved that the jar and noise occasioned by low joints have been fairly well eliminated. On street railroads, however, such as we have in New York city, the joints, after they have been screwed up to a snug bearing, are covered up by stone or asphalt pavement, so completely that any further adjustment of them is impossible, and the loosening of the joints and battering down of the rail ends is only a question of time and of the density and weight of the traffic. Several years ago when the new heavy steel rails weighing 110 pounds to the yard (the heaviest steel rails at that time in existence) were laid down upon the Broadway line, we predicted that, in spite of the fact that specially heavy splices were provided, there would be a steady depreciation of these joints, due to the fact that they were entirely asphalted over and inclosed beyond any possibility of upkeep. The prediction has come true, and every year the clash and clang of the joints has increased until it threatens to become a positive nuisance.

Probably no one is more alive to this evil or more anxious to find a remedy than the engineers of the railroad company itself. Practically the only way in which a permanently silent joint could be secured would be by welding the ends of the rails together, thus providing a practically continuous member. That this method would serve largely to render the track silent has been proved in the Borough of Brooklyn, where, some years ago, on several miles of road the bolted splices were removed and solid splices were electrically welded on, making the rails practically continuous. On the stretches of track where this was done the results were immediate; the track riding so smoothly that neither by sound nor jolt was it possible to detect when the wheels passed over the joints. The objection to electric welding is that it leaves no provision for expansion and contraction of the rails under changes of temperature; but where the rails are imbedded in the pavement, the direct action of the sun is shut off from the body of the rail and the changes of length are considerably reduced. Moreover, we believe it is a fact that the number of broken joints that occur in cold weather is not so large as to cause any serious inconvenience, or materially to increase the expenses of upkeep.

It is still open to the inventor to produce some form of connection that will hold the rail ends up to their work independently of any adjustment after they have been first laid. We confess that the problem is an extremely difficult one, and we would advise the inventor who approaches the problem to make a careful study of everything that has been attempted in this line before. Failing the production of such a joint, we would commend to the Public Service Commission the question of electric welding as being one of the most effective methods for reducing the discordant noises on our public streets.

A DELAYED-ACTION TORPEDO.

It cannot be denied that the results obtained with the torpedo in the Russo-Japanese war were disappointing as regards the amount of damage done when the torpedo made a fair hit against the vessel attacked. In more than one case the injury extended but little beyond the immediate point of impact, and was confined to the bursting in of the skin of the ship and the flooding of the one compartment surrounding the point of injury. It was the floating mine, with its enormous charge of high explosive, which sent such ships as the "Petropavlovsk" and the "Hatsuse" to the bottom within a few minutes of contact. We draw attention to this fact with no intention of belittling the great value of the torpedo; we merely wish to point out that in its present condition it is not the absolutely fatal weapon which it was once popularly supposed to be. The comparatively limited amount of injury wrought by the torpedo is not due to any lack of destructive power in the high explosive charge which it carries; for there is enough gun cotton stored in the war head to insure the absolute wrecking of a ship, if its energy can only be developed at the right spot within the structure of the ship. But the torpedo is arranged to explode immediately upon contact with the outer skin of the vessel, and hence, its work is done chiefly upon the hull plating and frequently fails to produce serious effect upon the internal structure. In this respect the torpedo is limited by the very conditions which, up to a few years ago, rendered the high-explosive shells comparatively harmless when delivered against the side armor of a warship; and it was not until the delayed-action fuse was invented, by means of which it became possible to restrain the explosion of the charge until it had passed through the armor, that the high-explosive shell became the deadly and destructive projectile which it is to-day. Evidently, if the torpedo is to develop its full destructive efficiency, it must carry its high-explosive charge through the outer shell and develop its explosive energy well within the ship itself.

The extremely interesting photographs shown on another page of the present issue illustrate the successful trial of a new form of torpedo designed to accomplish the very object above noted. The idea of using the automobile torpedo to carry a gun which should fire its shell into the vitals of a ship at the moment of contact occurred to the inventor several years ago; but because of the difficulties due to the considerable weight involved in constructing a gun of steel, it was not then possible to work out the problem to a practical issue. With the introduction of new alloys of extraordinary strength for their weight, Lieut.-Com. Davis took up the problem again, and in vanadium steel he found a metal which enabled him to bring the automobile gun within the limits of practicable weight. We do not suppose that at this early stage the inventor considers that this remarkable device has shown its full possibilities. Apparently the gun is mounted centrally within the air flask, and if so, the air capacity and, therefore, the range of the torpedo may have been somewhat limited. This, however, might be corrected by an enlargement of the torpedo; and, in any case, it must prove an invaluable weapon for use in the submarine, whose torpedoes will always be delivered at a comparatively short range.

In view of the remarkable results shown in the photographs elsewhere published, we do not hesitate to pronounce this one of the most striking advances made in recent years in the art of torpedo warfare. There can be no question that the destructive effects of this type of weapon have been enormously increased; for reliance can no longer be placed upon the heavy armor plating for keeping high-explosive shells outside of the vitals of a warship. Its effect upon the already complex problem of warship design must be felt at once; for if the device fulfills its early promise, it is certain that the question of extending the armor plating yet further below the waterline will demand the immediate attention of naval designers.

The new German military dirigible balloon, during its second trial on July 1, plunged downward from a considerable height and struck some trees. None of the five men on board was hurt, though the machinery and envelope were damaged.