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
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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 "

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MUNN & CO., 361 Broadway, New York.

NEW YORK, SATURDAY, APRIL 13, 1907.

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.

ELECTROLYSIS IN ARMORED CONCRETE.

One of the strongest recommendations for the use of armored concrete, and for the use of concrete as a protective envelope for structural steel in tall buildings, is the fact, or the belief, that concrete effectually prevents the corrosion of the imbedded material. As far as we are aware, nothing has transpired where concrete has been used for structural or protective purposes under normal conditions, to shake this confidence.

The question has recently been raised, or rather revived, as to whether, under certain conditions, the steel of reinforced concrete may not be subject to the destructive effects of electrolysis. The revival of interest is due to some experiments recently made by Mr. A. A. Knudson, of this city, and reported a few weeks ago to the American Institute of Electrical Engineers. The experiments were carried out as follows: Some blocks of one-to-one Portland cement sand concrete were molded in a common metal water pail, with a piece of 2-inch wrought iron pipe placed vertically within the blocks to a depth of about 8 inches. When the blocks were three years old, one of them was placed in a tank of sea water, and another in a tank of fresh water, and direct current was fed to the iron pipes in the center of each block, the negative electrode consisting of a piece of sheet iron placed in the tank. A third block, similar to the other two, was placed in a tank of sea water but was not subjected to the electric current. After a period of thirty days the last-named block was found to be in perfect condition and the imbedded pipe was perfectly bright. But the two other blocks, which had developed cracks during the test, were easily broken open; yellowish deposits were found in the cracks, where the concrete had deteriorated to such a degree that it could be cut easily with a knife; and the pipes were considerably corroded, showing a loss of weight of over 2 per cent. Similar results were obtained in tests with blocks of standard Rosendale cement, made in the same mold, although in this case the blocks were tested thirty days after they had been made. The cracking of the concrete appeared as early as the sixth day of the test, and by the eighteenth day they looked as though they might fall apart. One of the pipes showed a corrosion similar to the pitting action of underground electrolysis, a hole ⅜ by 1 inch being formed through the wall of the pipe.

It cannot be denied that these results are of profound significance. They call for careful investigation on the part of concrete engineers, and the provision of special means of insulation in all cases where imbedded structural steel, or the reinforcing material of armored concrete, is liable to attack by stray currents in the neighborhood of wet foundations. The whole subject of electrolysis which, because of the exaggerated use to which it has been put by a sensational press, has not received from technical men the attention which it deserves, should be made the subject of a searching investigation with a view to determining the laws and limits of this form of corrosion.

IN TOUCH WITH THE CONDITIONS.

The method of studying transit conditions in this city adopted by Mr. Shonts, who lately exchanged the presidency of the Panama Canal for that of the Interborough Metropolitan Company, cannot be too highly commended. In order to acquaint himself with conditions, he has mingled with the crowds which overflow the various lines of travel during the hours of heaviest travel, and has thus been able personally to experience the intolerable discomforts to which those who are "caught in the rush" are daily exposed. As the result of his experiences he has frankly admitted in one of our contemporaries that "there is reason for the dissatisfaction of the people with the present transit system." As a means of relieving the congestion Mr. Shonts makes the following suggestions:

First: A seat for every passenger. Second: An effort to enforce a car-full-no-more-passengers rule. Third: A trial of the pay-as-you-get-on plan. Fourth: Two more tracks on the Second Avenue elevated road. Fifth: The addition of side entrances to the Subway cars. Sixth: Wider car platforms, with doors for the exclusive use of boarding passengers, and others for those alighting. Seventh: Such restrictions of street traffic where congestion is greatest as will allow the surface lines a reasonable, although not exclusive, use of the tracks.

Taking these suggestions *seriatim:*

The provision of a seat for every passenger except, perhaps, at the height of the morning and evening "rush," depends absolutely upon the Interborough Company. It is merely a question of the provision of more cars, or shall we say, of the abolishing of the present practice of withdrawing cars from service between the rush hours to such an extent that there must of necessity be a large number of unseated passengers. If the company is sincere in the wish thus expressed through its president, it can, with its present facilities, provide every passenger with a seat—on some lines at every hour of the day, and on all lines except at the height of the rush hour.

It is questionable whether the enforcement of a car-full-no-more-passengers rule, as adopted in European cities, would meet with favor in America. Excellent in theory, it would scarcely be workable in practice, at least in a city like New York, where the tide of travel is always overflowing the transit facilities. But the principle back of such a rule is a good one, and it should certainly be applied to the extent of limiting the number of standing passengers to those who can conveniently be accommodated in the aisles of the cars, leaving the platforms free for ingress and egress.

The pay-as-you-get-on plan, we presume, includes the use of tickets which could be obtained of agents or at booths on the street corners. If passengers were encouraged to buy tickets in sets of a dozen at a time, the institution of ticket booths could be limited to the more congested districts, and the use of tickets would have the great advantage of allowing the conductor to remain where he properly belongs, on the rear platform. The passengers would thus be saved from the great inconvenience of the conductor crowding his way through the aisles to collect fares; and he would be free to attend to his duties of starting and stopping the car from a position where he could properly take care of the embarking and alighting passengers.

Although the construction of two additional tracks on Second Avenue would greatly relieve the congestion, the objection on the ground of unsightly appearance must be considered to be insuperable. All future tracks must be built in subways.

The next two suggestions are the most valuable of all; for nothing would increase the carrying capacity of the Subway and surface cars more effectually than the provision of side entrances on Subway cars, and wider car platforms with separate doors for boarding and alighting passengers on both Subway and surface cars. It is not the speed between stations but the duration of stops at the stations which determines the average speed of the trains and the number of trains which can pass over a certain line in a given time; and the length of the stops is determined entirely by the facilities for loading and unloading. As we have often pointed out, the present end doors and narrow platforms are about the crudest and most absurd arrangement that could possibly be imagined for rapid transit or even street railways. We believe that the express service on the Subway during rush hours could be made to show an increase in capacity of twenty per cent, and the local service of forty per cent, by the provision of central doors and platforms of double the present width, with separate doors for entrance and exit.

The last suggestion of Mr. Shonts, that street traffic be restricted where the congestion is greatest, should receive the most careful consideration of the authorities. Such restriction presupposes a due consideration of the interests both of the traveling public and of the owners of the vehicles—carriages, automobiles, and trucks—which would be affected, and in some cases seriously affected, by such restriction. Judged on the grounds that the greatest good of the greatest number should always be sought in adjustments of this kind, it would seem that some form of restriction on the more crowded thoroughfares, particularly during the rush hours, ought to be imposed. As matters now stand, the inconvenience suffered by the public, as the result of the interference of trucks and slow-moving vehicles with the movement of the surface cars, is simply enormous. In fact, on some stretches of line, the number of passengers carried per hour must be fully 75 per cent below that which could be carried, if vehicular obstruction were removed.

The President of the Interborough Company is to be congratulated both upon the common-sense method which he has adopted in his investigation of the transit situation, and upon the general excellence of the remedies proposed. His action will go far toward restoring that mutual confidence and sense of mutual interest between the corporations and the public, which will form the best guarantee of an early reversal, or at least amelioration, of the present conditions.

A NEW THEORY OF GUN EROSION.

One would have thought that at this late day, after so many years of painstaking investigation, all the conditions that produce gun erosion would be well understood. Erosion of the bore began to cause anxiety to the artillerist as far back as the days of black powder; it was present in more marked degree in the days of brown powder; and smokeless powder, with its higher temperatures and pressures, has increased the trouble to such a degree that it has been accepted by the Bureau of Ordnance of the army as the controlling factor in the design of artillery; as witness the fact that three coast defense guns have been ordered whose caliber, pressures, and velocity have been determined entirely by the necessity of keeping down erosion and so prolonging the life of the gun. Throughout the whole of this period of the development of modern ordnance, the trouble of erosion, because of its magnitude, has received as much, if not more, attention than any other element connected with the construction of high-powered guns. The announcement that the erosion question must predominate absolutely the design of our guns might reasonably be taken to indicate that the subject was now thoroughly understood in all its bearings; that its causes were clearly defined; and that, except in unimportant particulars, there is nothing further to be learned about it.

And yet at this late hour, a theory of the fundamental cause of erosion is advanced which is so simple and reasonable that one fails to understand how it could have been overlooked for all these years. We refer to the theory advanced by our correspondent in a letter published elsewhere in this issue, that it is the stretch of the metal and enlargement of the diameter of the bore under the pressure of the powder gases, which, by providing an annular opening between gun and projectile at the instant of explosion, permits the gases to escape past the projectile, that causes the erosion of the bore. Whether the gun be built of hoops shrunk one upon another over a central tube, or of miles of wire wrapped under high tension around the tube, the walls of the gun consist in either case of highly-elastic material overlaid on and gripping a tube of elastic material, the latter being thrown by the tension of the former into a condition of permanent compression. When a charge, no matter how small, is fired, the pressure produces a corresponding stretch of the walls of the gun. The amount of stretch will increase with the increase of powder pressure, until, under the 18 to 20 tons to the square inch which exists in the powder chambers of modern smokeless powder guns, it becomes sufficient to spring the bore of the gun away from the projectile and allow the gases, particularly in the first few feet of the movement of the projectile down the bore, to escape freely past the shell. Moreover, at these high pressures there must be a proportionate compression of the projectile. When to the annular opening thus formed is added the vents which are due to imperfect seating of the copper rifling band, it can readily be understood that there must be a considerable escape of gases, particularly under the high initial pressures of discharge.

Now herein, in this stretching of the walls of the gun away from the projectile, is a strong argument in favor of the contention that it is insufficient obturation or sealing which lies at the bottom of the erosion trouble, and if this be the case, we certainly fail to see how the proposed army 14-inch gun, whose walls will be reduced in thickness proportionately to the reduction in pressure, can be expected to cure erosion. The amount of stretch of the gun is determined by the relation between the degree of pressure and the amount of metal opposed to it; and since, in all well-designed guns, this ratio is fairly constant, we may look for the same, if not more stretch, or enlargement of the bore in the new 14-inch guns, and the same escape of gases, with its inevitable eroding effects. The erosion will not be so great as in the present 12-inch guns, for the reason that the temperatures will be less; but we believe that it will be sufficient to greatly disappoint the hopes of those who look for a considerable prolongation of the life of the gun.

It is evident, from what has been stated above, that the formation of an annular vent between bore and projectile is inevitable, being inherent in the principles upon which guns are constructed. Therefore, the cure for erosion seems more than ever to lie in the direction of the proper sealing of the base of the projectile. We know of no subject to-day in the field of ordnance construction that is more worthy of the efforts of prop-