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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.

CITY TERMINALS WITHOUT TRAFFIC CONNECTION.

The total lack of a co-ordinated plan (or shall we say of co-ordination of effort?) in the provision of transportation facilities in New York city, is forcibly brought to the notice of the public by a letter of Vice-President Rea, of the Pennsylvania Railroad Company, to Chairman Willcox of the Public Service Commission, which draws attention to the fact that when the Pennsylvania's new station at Seventh Avenue and 33rd Street, New York, is opened to the public in the summer of 1910, it will be without any connection with the rapid transit system of the city.

The predicament in which the magnificent new terminal will find itself has its parallel in the history of the three great bridges across the East River. The Williamsburg Bridge stood, for several years after its completion, completely isolated from the elevated railroad systems of Manhattan and Brooklyn; and it was only recently that the costly elevated approaches to, and roadways on, the bridge were placed in service. The great Queensboro Bridge, opened a few months ago, is likewise without any rapid transit or elevated railway connections; and the present indications are that the new Manhattan Suspension Bridge, which will be completed within a year, will find itself in the same predicament. The case of the new Pennsylvania terminal will be particularly aggravated, since it will not only bring all the express trains of America's greatest railroad into the city, but it will also serve as the gathering and distributing center for a large suburban travel from New Jersey and from the extensive and populous residential districts of Long Island.

Obviously the most satisfactory plan for placing the Pennsylvania terminal in immediate touch with the subway system would be to build an extension of the existing subway south from 42nd Street through Seventh Avenue to the Battery. This is the plan advocated by the Pennsylvania Company; and as far back as 1906 such a route was laid out by the old Rapid Transit Commission as part of a complete system through Manhattan and the Bronx, the northerly portion of which was to be built up Lexington Avenue from 42nd Street to provide the east side with greatly needed facilities. This route is indorsed by the present Public Service Commission. The failure to build the line must be laid at the door of the Interborough Company, which operates the present subway; for it was not until last June that the offer of this company to construct such a line was received by the Commission, who have the proposal now under consideration. The traveling public has no interest in the controversy as to where lies the responsibility for the delay; but it is tremendously interested in having this line constructed with the least possible delay. We are well aware that there are other rapid transit routes before the Commission, for each of which their particular sponsors claim special advantages and the necessity for immediate construction; but in view of the importance of the new Pennsylvania terminal as a distributing center and of the pressing need for another four-track line south from 42nd Street to the Battery, we believe it will be the consensus of opinion that this line should be one of the first, if not the very first, to be authorized, and that the contractors and the Public Service Commission should join hands in rushing it to an early completion.

MAGNITUDE OF WORK ON NEW STATE BARGE CANAL.

The stupendous engineering work which the United States government is carrying through at the Isthmus of Panama so completely fills the public eye, that very little is heard of that other great work of canal construction, which is being executed in our very midst in the enlargement and reconstruction of the old Erie Canal between Buffalo and Albany. Certainly but few people outside of professional circles are aware that in point of magnitude of excavation the figures for the New York State Barge Canal rival, if they do not exceed, those of the Panama Canal. Admitting that there can be no comparison on the score of accommodations between a canal twelve feet in depth and one with a maximum depth of forty-five feet, it should not be forgotten that whereas the Panama Canal from shore line to shore line is but forty miles in length the New York Barge Canal extends for nearly four hundred miles. Furthermore, the latter work involves the construction of thirty-four dams, fifty-three locks and seven guard locks, the construction of which is complicated by the fact that the canal, being built through the most thickly populated section of New York State, the effect of these works on adjoining properties and water powers has to be considered and due precautions against damage taken, involving additional costs in time and labor.

It is in the comparison of the amount of excavation done, however, that the surprising fact is developed that the total amount of excavation and its equivalent in concrete structures, if compared for the same period of time, is found to be actually greater on the State Canal than on the national undertaking at Panama. Up to January 1st, 1909, the excavation on the Barge Canal amounted to 15,168,000 cubic yards, and if to this be added the concrete and other constructional work, the total cost up to that date reaches $8,701,000. On the Panama Canal, up to January 1st, 1908, the total amount of material taken out amounted to 22,255,000 cubic yards, and up to that time practically no work had been done on the concrete structures. It is stated by the engineers that if the sum of money expended during the period under consideration on concrete and other structures on the Barge Canal had been paid for excavation at the prevailing rate, it would have been possible to remove an additional 10,417,000 cubic yards of material. This would have brought the total of excavation up to 25,585,000 cubic yards, which would have been equivalent to an increase of twelve per cent over the amount of excavation done on the Panama Canal during the same number of years of operation. It is only fair in connection with these figures, however, to bear in mind that the present rate of excavation in Panama is far more rapid than that on the State Barge Canal. This, however, does not invalidate the force of the above comparison, as showing the magnitude of the work now being done between Buffalo and Albany. It is greatly to be regretted that the canal enlargement was not planned on a more generous scale. When the canal is opened, the depth of twelve feet will appear to be pitifully insufficient, in view of the fact that by that time the construction of the new Georgian Bay Canal, which will provide a depth of 21 feet from the lakes to deep water on the St. Lawrence, will in all probability be well under way.

WIRE-WOUND VERSUS STEEL GUNS.

In these days of big-gun ships and long-range fighting, the gun as one of the offensive elements of naval warfare has taken on an importance greater than it ever held before. In the engagements of the future, which will be fought at ranges of from four to six miles, accuracy of aim and large remaining energies of projectile become of prime importance. The most effective big gun for the new conditions will be that which will strike the heaviest possible blow, at the greatest possible range, with the lightest possible shell, fired from the lightest possible gun. These ideal results, which can be obtained only in a gun of unusual strength for its weight, involve high powder pressures, great length of gun, exceedingly high muzzle velocity, and a temperature of the powder gases so high that it will necessarily induce rapid erosion. Abnormal powder pressures must be met, either by using more material in the gun, or by the use of steel of exceedingly high quality as to strength and toughness, or by some mechanical arrangement in the building up of the gun, which will secure the needed strength with a minimum amount of weight.

Never was it more true than to-day that the battles of the future will be won by the big gun. If the ten or twelve great pieces mounted in their several turrets are unable to fire their eighty or one hundred rounds apiece with accuracy and without diminution of energy; if there be an unusually rapid erosion; if they show longitudinal weakness and begin to droop at the muzzle; or if, as has often happened in the past, the muzzle and chase of the gun are blown bodily away, the ship that carries those guns will go down to a sure and terrible defeat. Unable to reach the enemy because of the failing velocity of her own guns, she will continue to be subject to the pitiless accuracy and armor-piercing energy of the enemy's shells, and the unequal combat can have but one issue.

There are two leading systems of gun construction, the wire-wound system, which is used by Great Britain and Japan, and the solid-steel system, which is used by all of the other leading naval powers, including our own. At the time the wire-wound system was adopted by the British, gun steel for hooped gun construction had not reached the high pitch of excellence which characterizes it to-day; but with improvements in furnace practice and working in the mills, it has become possible to turn out a quality of steel which the German, French, and American manufacturers claim produces a gun equal, weight for weight, to the wire-wound gun—a gun, moreover, which is simpler to build, and in some respects more reliable and less likely to serious injury in an engagement.

In view of the above facts, a recent lecture before the Junior Institution of Engineers, London, by Lieut. Dawson, in which he goes very thoroughly into the question of the relative merits of wire-wound and solid steel guns, is of timely interest; since it shows why, in spite of the acknowledged improvements in the manufacture of hooped guns, the English artillerists still prefer to build those of the wire-wound type. The chief advantage of the latter system, according to Lieut. Dawson, is that a uniformity of stress is attainable throughout the whole of the material employed in the gun structure, to an extent that is impossible in a gun built up of steel hoops only. Weight for weight, the wire-wound gun is the most efficient. The uniformity of stress is due to the fact that the wire is wound on at the theoretical tension necessary to obtain from every layer the maximum resistance when the gun is fired. Furthermore, the breaking stress of the wire now used is no less than twice as great as that of the best forged steel available for solid steel construction, the breaking stress of gun steel being from 34 to 44 tons to the inch, as against a stress of 90 to 100 tons for the wire. By regulating the tension in the successive layers of wire during construction, the resisting strength of the steel is obtained to a degree that it is not possible to get by shrinkage. Lastly, because of its small cross section, the wire is more likely to be free from minor defects; since it can be inspected and tested throughout its complete length. So much for the constructional advantages.

In the completed gun there is the advantage that if the inner tube of a wire-wound gun fails, it is still possible to continue firing without danger; whereas, splitting of the inner tube of a built-up gun renders the weapon immediately useless. Should a flaw occur in a tube or hoop there is great danger of such flaw extending until complete rupture occurs. In a wire-wound gun, on the other hand, a rupture in any coil cannot spread to adjacent coils. Again, should a large explosive shell burst in the bore, the wire construction, according to Lieut. Dawson, will prevent the explosion doing serious damage to the turret. It is possible, when a wire-wound gun becomes badly eroded, to reline the piece and render it nearly as good as new, a feat which is more difficult in solid steel guns. The increase in the power of the gun, due to the introduction of the wire-wound system and to the vast improvement in the quality of gun steel for hooped guns, is shown by the fact that the energy of the British 12-inch gun has risen from 18,200 foot-tons in 1895 to 53,045 foot-tons in the new 50-caliber gun which will be ready in 1910; while the corresponding penetration of wrought iron at the muzzle of the gun has risen in the same period from 24.5 inches to 52 inches, this last being the muzzle penetration of the new 1910 pattern.

BURGLAR-PROOF GLASS.

Consul William Bardel of Rheims reports that a new French plate glass has been brought out which is practically burglar-proof. While an ordinary plate glass, such as is usually put into jewelers' show windows, can be smashed by a single stroke of a metal-faced mallet, it is not possible to break this new plate glass in this manner. In an experiment made, a large piece of cast iron was thrown violently against the window, but the only effect on the glass was a small hole measuring one or two inches. Several shots of a revolver loaded with jacketed bullets were then fired at the show window, but the window suffered no damage except that the bullets entered to a depth of a fraction of an inch. The plate glass which will stand such usage is ordinarily made of a thickness of ⅞ to 1 inch. If desired, even a heavier glass can be made without diminishing the transparency.

In order to do away with attending to exhausted batteries of door-bell systems, a transformer has just been put on the market which enables one to obtain the current from the city mains. The transformer will operate on the ordinary lighting circuits. As it has no moving parts, once fixed it will thereafter require no attention. It is adapted to operate on circuits running from 100 to 130 volts, and is provided with taps giving 6, 12, and 18 volts, so as to meet the requirements of various styles and sizes of bells and buzzers.