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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.

## ARMY ENGINEERS WILL BUILD PANAMA CANAL.

At the very time when the nation is looking for an announcement from Washington that the contract for the construction of the Panama Canal has been awarded, somebody, or something, gives a sudden twist to the kaleidoscope, the nation is informed that there is to be no contract, that another commission is to be formed, and that the building of the canal is placed in the hands of the army engineers. Simultaneously comes the startling announcement that the chief engineer, John Stevens, who not so very long ago went down to the Isthmus apparently in a "do or die" attitude of mind, has suddenly tendered his resignation.

At the present writing, the causes which prompted Mr. Stevens's desertion of this work, just when we all thought that he had perfected an organization and was ready to make some solid impression upon the vast job of excavation, have not been officially made known. We do not suppose it matters very much to the nation whether they are known or not. We could have wished, for the credit of the great body of civil engineers as a whole, that it had proved less difficult to find an engineer of prominence who had sufficient of the traditional professional spirit, to take hold of this great national work and see it through, with less concern for personal and private considerations and more concern for the prestige of the great nation which honors him by calling him to the work.

After the experience that has been had with civilian engineers, it is gratifying to realize that the control of the work has now been placed in the hands of military men, with whom there will be no thought of ever turning back until the job is completed. There is an end of resignations, once and for all; for the military man cannot desert the work if he would, and his pride of place is such that he would not if he could. The SCIENTIFIC AMERICAN is on record as believing that the best results would have been secured by letting the canal be built by contract under the supervision of a civil engineer of wide, practical experience, the advantage of letting by contract being that the large contractors know exactly where the right classes of labor and the particular force of skilled mechanics and foremen can be found; that they have the plant, or a large portion of it already in hand; and that they have back of them long years of experience in the handling of large bodies of men in the execution of works of magnitude. In professional ability, theoretical and executive, however, there is no finer body of engineers in the world than those of the army. Through all the many decades in which they have been planning and superintending the construction of great national works, there is scarcely an instance to be found of collusion between the engineer and the contractors, and these few cases have been visited with speedy and condign punishment. Under the army engineers, the work will be executed with the highest professional intelligence, with the thoroughness which characterizes all the army engineer's work, and with the most scrupulous fidelity in the handling of the national finances. That it may take somewhat longer than if it were executed under contract and civilian professional oversight is probable; but the nation may at least have the satisfaction of knowing that it has seen the last of these all too-frequent resignations and the frequent and demoralizing changes of base and policy which have so delayed the progress of the canal.

## SIDE-DOOR CARS AND RAPID TRANSIT.

In providing the equipment for the New York Subway, there was one disastrous blunder committed, from which the system has suffered from the first day of its opening, and will continue to suffer as long as the present cars are in use. We refer to the adoption

of the obsolete and altogether inefficient end-door car—absolutely the very worst type of car that could have been selected for expeditious loading and unloading of passengers. After building the roadbed of the most solid and expensive construction, equipping the cars with motors capable of giving the trains an acceleration of as high as 1.25 miles per hour per second, providing the most up-to-date system of signals, all with a view to securing high speed and handling the biggest number of people possible within the shortest time, the company have effectively undone much of this costly work of preparation by using a car which renders absolutely impossible the rapid unloading and loading of passengers. It is the long delays, due to the congestion at the doors of the cars at stations, and this alone, that prevents the Subway from a more expeditious handling of crowds during the rush hours of travel.

If some visiting engineer, let us say, from a distant planet, with intelligence to comprehend mundane affairs, were to be shown our Rapid Transit Subway, and have it explained to him that its ultimate object was to handle the greatest number of people in the least possible time, he would be moved to astonishment, if not to mirth and laughter; at the anomaly presented by the splendid speed between stations and the ridiculous and altogether unnecessary delay when the stations are reached.

The large sliding door at the center of each car, such as is used on the Brooklyn Bridge and the Boston Elevated Railways, is a partial solution; but the provision of a separate door opposite each pair of transverse seats is the only absolute solution. This system is indorsed by fifty years of satisfactory experience in heavy suburban travel in England and on the Continent. On the multiple side-door system, each door has to discharge only the few passengers seated on the pair of seats adjacent to it; and the writer has frequently seen a trainload of a thousand commuters emptied onto the platform of a London station within a few seconds of the arrival of the train. That the side-door car is suited to American conditions has been proved by the success of some of this type that have been built for the Illinois Central Railroad. The sliding doors of the Illinois Central cars are operated by the guards; but an improvement on this method, designed to protect the passenger from injury, is to be adopted on the new tunnel cars to be used in the McAduo system. All of these are to be provided with center doors; and both the end and center entrances are to be operated by compressed air under the control of the guards at the end of each car. The air pressure used to close the door will be just sufficient to bring it shut, but not sufficient to prevent a passenger stopping its progress temporarily, should he not be clear of the entrance. These tunnel cars will be a great advance upon those in use in the present Subway, particularly as they are to be used in conjunction with separate loading and unloading platforms; but we believe that the tunnel companies would add greatly to the carrying capacity of their new line in the rush hours, would they go one step further and adopt the system of separate side doors to each pair of seats.

## GOVERNMENT TEST OF SUBMARINES.

At the last session of Congress an act was passed authorizing the Secretary of the Navy to contract and spend for submarine torpedo boats \$1,000,000. A special naval board has been appointed for the purpose of handling the matter, and it has just completed the regulations to govern the comparative test of such vessels.

The trial course will be in Narragansett Bay, and will be one mile in length. The relative capacities and values of the competing vessels will be reached by comparative tests, as the board has decided that it will not be practicable to conduct all tests simultaneously. The speed trials will be made under three conditions of the contesting boats, viz., cruising, with all ballast tanks empty; vessels not showing more than half of the conning tower above water and ready for instant diving; and in submerged condition, with the top of the conning tower not less than ten feet below the surface and the top of the observation masts at least three feet above the surface. Three runs at maximum speed will first be required, to be followed by five or six runs back and forth at progressively reduced speeds, to be determined by the trial board. The board will take into consideration also the habitability of each vessel, its construction, condition, and outfit at trial, endurance, plans and specifications, strength and workmanship, mining, countermining, sea trial, and torpedo firing.

In the last named, the boat, carrying a full complement of torpedoes, must make a submerged run, during which she shall discharge at a suitable target about 300 feet in length. The first torpedo must be fired when the boat is at a distance of 2,500 yards from the target. Such reloading as may be necessary must be done while the vessel is submerged and under way. Observation of the target must be taken without coming to surface except in the case of the last torpedo fired.

## NEW YORK CENTRAL SIX-TRACK SUBWAY.

The Rapid Transit Commission of this city and the New York Central Railway Company have come to an agreement as to the best disposition to be made of the freight tracks of the company which extend down the western shore line of Manhattan from Spuyten Duyvil and along Eleventh Avenue and West Street to the freight terminus on Beach Street. The railroad company has agreed to place its Eleventh Avenue line underground and has arranged to abolish every grade crossing along the North River water front from Spuyten Duyvil, at the mouth of the Harlem River, to Seventy-second Street, all to be done without expense to the city. In return for this concession, the Rapid Transit Commission has agreed to give the company a six-track subway in Eleventh Avenue in place of the two tracks it now operates on the surface, and to allow the company to operate six tracks along the Hudson River from Spuyten Duyvil to Seventy-second Street, instead of the four tracks which it now has. The subway will extend from Sixty-fifth Street south to Thirtieth Street.

Another most important question which is under investigation by the commission is the problem of traffic south of Thirtieth Street; and it is likely that this will be solved by the construction of a large elevated structure along the entire shore line between West Street and the water front which will be owned by the city and leased to such railroads as care to make use of it, connections being made to all piers and various warehouses. In its report upon the subject the committee points out that so many large problems affecting the lower section of Manhattan enter into the planning of this structure that further time must be given for its consideration before a final report is made.

## BRIDGING THE HUDSON RIVER.

It is merely a question of time and money when the long-talked-of project of throwing a bridge across the Hudson River between New York and New Jersey will be an accomplished fact; for the necessity of this bridge has long existed and becomes more pressing with the passing years. It is true that the urgency for a steam railroad bridge disappeared, or rather was temporarily relieved, when the Pennsylvania Railroad Company and the Hudson Companies began the construction of their six tunnels below the river. These tunnels, however, will provide passage for steam railroads only—or, to be more accurate, for electric railroad traffic. They make no provision whatever for the vast amount of vehicular traffic which now crosses by way of the ferry boats between the opposite shores of the river. This class of traffic grows larger every year, and particularly during the past decade has it been increased by the introduction of the automobile and the desire of its owners to have access to the splendid highway system of New Jersey.

In recognition of the fact that the time is ripe for once more agitating the question of bridging the Hudson, and that a work of this magnitude, being too onerous for private enterprise, could best be put through by the two States that would be benefited, a committee was appointed to investigate the question, select a site or sites, and determine the scope of the enterprise, the distribution of responsibilities, and the best means of financing it. This committee has recently reported to the legislature under the name of the New York Interstate Bridge Commission. It recommends the construction of three bridges, one across the Hudson at some location between 14th and 72d Streets, and two others to span the Kills which flow between Staten Island and New Jersey. The commission believes that the expense should be borne either equally or in just proportion by the States of New York and New Jersey. It further recommends that in view of the large space needed for terminals, if they were to include transcontinental trunk lines and passenger and freight traffic, the bridge should be designed primarily for vehicles, foot passengers, and trolley lines, the trolley lines to include, however, a high-power line crossing and connecting with all the trunk lines in New Jersey. It is estimated that the cost of the main Hudson River bridge would be not less than \$25,000,000 and might easily run to \$35,000,000; but we are of the opinion that these figures are much too low and that a bridge of this magnitude could scarcely be built for less than \$45,000,000. The cost of the two bridges connecting Staten Island with the mainland would be about \$500,000 each.

An American company is building for the Mexican Central Railroad a number of oil-burning freight engines of an unusual type. They are eight-coupled engines with a leading pony truck. The boiler has 2,168 square feet of heating surface. The total weight available for adhesion is about 110 tons, the ratio of tractive effort to adhesive weight being 1 to 4 $\frac{1}{4}$ . A boiler pressure of 200 pounds to the square inch is used. The fuel is crude petroleum, which is vaporized by a steam jet, and deflected against a soapstone arch in the firebox.