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NEW YORK, SATURDAY, NOVEMBER 16, 1901.

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.

PROPOSED INCREASE OF THE NAVY.

The recommendations of the Naval Construction Board, which have now been laid before Secretary Long, call for the addition of no less than forty warships to the United States navy. The most important element is, of course, the battleships and the cruisers, the Board recommending the construction of three of the former, each to be of 16,000 tons displacement, and two armored cruisers of 14,500 tons displacement. The design of battleship recommended is practically that adopted by the majority report of the Board on Construction. It follows the general lines of that most admirable design the "Maine" the chief points of difference being the substitution of the new 7-inch for the 6-inch gun in the broadside battery, and the increase of the number of guns from sixteen 6-inch up to twenty 7-inch. It will thus be seen that we have returned from the "Georgia" type, with its much-debated double turret, to the simpler and more conservative arrangement of the "Alabama" and "Maine" classes. The two armored cruisers will probably carry as their main armament four 10-inch breech-loading guns in place of the four 8-inch which form the main battery of the "California" class. These vessels will unquestionably be the heaviest armed and armored ships of their respective classes in the world.

The Board also recommends the construction of six gunboats of about 1,200 tons displacement, six of 600 tons and six of 200 tons. The provision of these boats was prompted by the necessities of the naval situation in our foreign possessions, more particularly in the Philippine Islands, where there is a great demand for a handy, light-draft vessel for blockade and police duties. Another provision which cannot be too highly commended is that for two huge colliers of no less than 15,000 tons displacement each; while those friends of the navy who believe that our bluejackets should be sailors in the full sense of the term will be pleased to know that the construction of six training ships of about 2,000 tons displacement is also recommended. There is a call for four picket-boats of about 650 tons and four tugboats. When this programme of construction is submitted to Congress it will have before it the latest section of a carefully-thought-out scheme for providing the United States with a navy made up of the proper number and proportion of various units to compose a thoroughly harmonious and well-balanced whole. The recommendations have the indorsement of what is known as the General or Dewey Board, as well as that of the Board on Construction. We sincerely hope that when Congress comes to pass upon them, the members of that body will be satisfied to be guided by the judgment of men, who are qualified by their professional knowledge and long experience to have the last say upon the question of the types of ships and general make-up of the United States navy. The question of appropriations rightly belongs to Congress itself.

THE TUNNEL BETWEEN SCOTLAND AND IRELAND.

The proposed railway tunnel between Scotland and Ireland, judged as one element of the general scheme or schemes which are now being mooted for shortening the distance of the ocean passage between Europe and America, is placed in somewhat the same category as the late Austin Corbin's dream for the creation of a great terminal port at Montauk, at the eastern end of Long Island; there being this difference, however, that when judged on that ultimate basis to which all such schemes must come—financial practicability—the Scotland and Ireland tunnel is even less feasible than Corbin's project. The cost of the tunnel is estimated by the contractors at $50,000,000, exclusive of interest, and, as matters now stand, there is not nearly sufficient traffic, either freight or passenger, to enable the scheme, if completed, to earn interest on the cost of construction. Nevertheless, in view of the rapid growth of commerce and the vast accumulation of capital seeking investment, it is conceivable that conditions may arrive in some future day that will guarantee the construction of a 34½-mile tunnel such as this.

The engineering features of the tunnel were discussed recently in a paper read by James Barton, M.I.C.E., before the International Engineering Congress at Glasgow. Of the three possible locations for the tunnel, the one selected lies between Wigtonshire, Scotland, and the Irish coast, at a point where the distance from shore to shore is within 23 miles. The maximum depth of water varies, according to the line selected, between 480 and 900 feet. The route forms a through line between Carlisle and Belfast, and has the advantage of providing the best route from Scotland to the whole of Ireland, and from the North of England to Ireland. The survey for the tunnel proper commences five miles from Stranraer railway station and finishes five and a half miles inside the shore line of the Irish coast, the total length of the tunnel being thirty-four and a half miles. Leaving the tunnel, the line extends for ten and a half miles to the city of Belfast. The total length from Stranraer to Belfast is fifty-one and a half miles, thirty-four and a half of which is tunnel, and twenty-five of it beneath the sea. The roof of the tunnel will lie one hundred and fifty feet below the sea bottom. The proposed heading is seven feet high by ten feet wide. It is expected that the portion of it which is driven through the Silurian will be cut as rapidly as the Simplon tunnel, while progress through the Keuper marls is expected to be more rapid. It is estimated that the whole of the heading would be completed in less than ten years and the tunnel finished in about twelve years. This estimate is based upon a comparison of the speed of driving four notable tunnels. The Mont Cenis was driven at the rate of 6 yards a day, and at a cost of $1,120 per yard. In the St. Gothard the maximum speed was 10 yards a day, at a cost of $710 per yard. In the Arlberg the maximum speed rose to 12 yards per day, while the cost was reduced to $535 per yard; and it is expected that on the Irish tunnel, judging from the quality of the material to be passed through and the improved methods now being used on the great Simplon tunnel, the speed will be increased and the cost per yard reduced still further. As to the question of water entering the tunnel, although the uncertainty on this point is admitted, the author of the paper does not consider that the difficulty will be a serious one. No water leakage in any great quantity occurred during the construction of the Severn or the Mersey tunnel, at least in those portions of these tunnels that were immediately beneath the sea; and it is believed that the sea bed below the Irish tunnel has probably closed all faults in the rock sufficiently to keep out sea-water in any but easily-handled quantities. The line will be operated electrically from power stations located near the main shafts at each end of the tunnel; and it is proposed to run trains at a speed of from 60 to 70 miles, thereby reducing the time in the tunnel to about half an hour.

THE PROBLEM OF THE LOCOMOTIVE BOILER.

In the controversy over the respective merits of British and American locomotives, there is no point of comparison on which the two types have been found to differ so widely as on the most essential one of boiler capacity. It will probably be within the truth to say that in a comparison of a hundred locomotives of each type it will be found that fully one-half of the American locomotives has over a hundred per cent more heating surface in its boilers, and that the other half has from thirty-five to forty per cent more heating surface than that of the British engines. From an early day in the development of the locomotive our builders have realized that all improvements looking to an increase of power and capacity must begin with the boiler; and it is to the fact that our locomotives are never over-cylindered, that is to say, that the boilers are able at all times to supply an abundance of dry steam, even under the most excessive demands, that we must attribute, more than to any other cause, the much greater hauling capacity of the American type. The average express locomotives to-day on first-class American roads will have 2,000 square feet of heating surface, and the latest expresses for hauling fast trains carry not less than 3,000 square feet, the most powerful of them all; the new Atlantic type on the New York Central Road, having a total of 3,505 square feet. Comparing this with the latest powerful express engines in Great Britain we find that the most powerful freight engine has only 2,500 square feet of heating surface, as against 3,805 square feet in the big freight engines used in the ore traffic from the Lakes to Pittsburg, while there is an even greater discrepancy between the new six-coupled express engines on the North-Eastern Railway, England, and the New York Central express engine above mentioned. The British type has cylinders 20 by 26 inches and 1,700 square feet of heating surface, whereas the New York Central engines have cylinders 21 by 26 inches, with, as we have said, 3,505 square feet of surface. In comparing the last two, the American builder wonders how in the world the North-Eastern boiler can provide steam enough for its cylinders. Of course, the coal is superior, and there may be some advantage in the copper firebox, though this cannot amount to very much.

Enormous as the boilers of American locomotives are, it is certain that the demand for increasing power will continue, and our builders must be prepared to make some radical changes if they are to meet this demand. The present type of boiler has grown to such a size that it cannot be increased much further within the limits prescribed by the size of the tunnels and clearance of platforms. What is required is a boiler with a larger steam-raising capacity for a given bulk, and the indications point to the adaptation of a water-tube boiler as the only kind that can fulfill these conditions. The excellent results which have been obtained in some recent locomotives both here and abroad, by the use of water-tubes, either in the grates, in the arch, or transversely in the upper portion of the firebox, suggest that the time is ripe for building an experimental locomotive with a water-tube boiler. Such a boiler would open the way for an increase in steam pressures to 250 or even 300 pounds to the square inch. With steam supplied at such pressures we should look for the universal adoption of compound cylinders, and, in time, for the introduction of triple, and even quadruple expansion. As a concomitant of these features we shall see superheating introduced; indeed, there are locomotives on the continent of Europe that are already equipped with superheating devices that are giving excellent results. With these changes successfully worked out, there is no reason why the power of our locomotives should not be increased from 35 to 40 per cent within the next decade. There will, of course, be the problem of providing sufficient adhesion for the great cylinder power thus rendered possible; and it is likely that in spite of the great popularity of the four-coupled Atlantic type, in the most powerful express engines of the next decade we shall see a return to the six-coupled type.

NEW LONDON TELEPHONE SYSTEM.

The British Post Office has decided to adopt the toll system in connection with their new London telephone service, which will be in operation in the course of a few weeks. For this purpose a special meter has been designed. The number of the subscriber is inscribed upon the meter, and the instrument will record 10,999 messages. The machine is automatic in its action, the operator simply having to press a button at the close of each service to effect its record. The Postal Telephone Exchange is established in the building in Queen Victoria Street, hitherto utilized for the transaction of the business of the Post Office Savings Bank. It will be one of the finest and best equipped exchanges in the world when the work is complete. The Western Electric Company are fitting the exchange at a total cost of $250,000. The total capacity will be 14,400 subscribers. The telephone wires are conveyed into the exchange in 110 ducts laid in a tunnel. Each duct carries 434 wires. The ducts are paper-insulated and sheathed in lead. When they reach the sub-basement that has been provided to the exchange, the tubes decrease in diameter, silk insulation being substituted for that of cotton. The smaller tubes are employed to facilitate convenient handling on the testing frames. The exchange room is in the shape of the letter L, with the superintendent's desk placed in the center. This official can tap any operator's circuit, without the exchange operator's knowledge, and can overhear any conversations between the operator and subscriber. The arrangement will be of particular value in the investigation of complaints. The superintendent can also instantly connect the operator's apparatus with his own for the purpose of ascertaining obstructive or irregular working. The glow lamp system has been adopted. The switchboard is divided into sections with 180 subscribers to each, presided over by one operator. There are two sets of accumulators for providing the necessary current. Each set consists of eleven lead tanks, weighing two tons when filled.

THE BERLIN-ZOSSEN HIGH SPEED ELECTRIC ROAD.

A series of most important and interesting experiments in electric traction is about to be conducted on the military road between the two German cities of Berlin and Zossen by the two foremost electrical companies in Germany. The car, which has been already constructed, has attracted world-wide attention by reason of the fact that the unprecedented speed of 124 miles per hour may be reached, although the attainment of such high speed is by no means the primary purpose of the experiments.

Of the relative efficiencies of steam and electric