

into the darkness and smoke and steam-obscured atmosphere of the tunnel itself. In saying this we are still in perfect agreement with the findings of the Grand Jury, who had to deal simply with the legal technicalities of the case and the expert evidence as presented. What we claim is that where a signal system that depends on visibility ceases to be visible, it is time to apply some automatic, contact system, which shall be independent of atmospheric conditions, and shall stop a train with the certainty with which any other well-designed automatic appliance performs its functions.

Having said this much, however, we hasten to state our gratification with the very prompt and unmistakably sincere pledge which the Directors of the New York Central Railroad Company have recently given to the Mayor of New York city, that just as soon as they can obtain the proper legislative sanction they will proceed with the electrifying of the local suburban service and the construction of the tunnel-loop terminals beneath the present Grand Central Depot. This pledge has been given in the form of a letter signed by Messrs. Vanderbilt, Depew and Morgan and a half dozen other prominent Directors. The letter opens by stating that the writers have been informed that the Mayor has given his support to a bill pending in the Assembly, the object of which is to name a fixed date on and after which the use of steam in the Park Avenue tunnel shall be forbidden; that the Directors are advised that, while it is practicable to operate the suburban service electrically by using the side tracks and an underground loop at the terminal, in the present stage of the art it is not practicable to operate electrically the heavy through trains which carry distant as distinguished from local traffic; and that the company is ready to undertake this work of construction as soon as the requisite consents from State and municipal authorities are obtained. At present there is a law existing which forbids the use of any power except steam in the tunnel.

The letter, deprecating the fixing of a strict time limit, proceeds as follows: "In lieu of such legislative action, the company herewith pledges to the city its good faith to proceed with the substitution of electricity for steam upon the side tracks immediately upon the grant to the company of the necessary authority to do so, and to carry the work forward as rapidly as possible. In addition the company also pledges itself to substitute electricity for steam in the operation of the central tracks, as soon as and whenever a practical plan can be prepared which gives reasonable promise of producing satisfactory results. This pledge on the part of the company is intended to carry with it the good faith of the individual Directors who compose its Board."

On receipt of the letter, Mayor Low communicated with the Chairman of the Assembly Committee on Railroads in Albany as follows: "In any private relation of life the personal assurance of these gentlemen (the signers of the letter) would be considered as being in every respect as good as their bond. The letter, therefore, seems to me to lay a good foundation for the waiving of a fixed date to be named in the bill for the prohibition of the use of steam in the tunnel, provided that in other respects the railroad company meet the views of those most interested." We do not doubt that the great majority of the public will agree with the Mayor in accepting the pledge of the New York Central Directors as being given in perfect good faith. There is every commercial reason why the company should desire to ameliorate tunnel conditions, to say nothing of the humanitarian side of the question. Unquestionably the interests of the company in the past have suffered enormous injury because of the "tunnel nuisance," as it is very aptly termed, and the recent accident is bound to have a most serious deterrent effect upon home-seekers who, but for the tunnel, would be disposed to locate in the many charming suburbs along the Sound and in Westchester County. The ordinance prohibiting the use of any other power than steam in the tunnel should be repealed at once. As to the question of fixing a time limit, we think that as a mere question of business policy it should be done. Tunnel building and the electrical equipment of suburban lines are not new and untried arts; and it would not be difficult to name a date for the completion of the New York Central changes which would cover all possible contingencies. The anxiety of the company to have the time limit clause waived, is easily explained. The problem of electrical equipment of large systems is passing through a critical stage, and there are some questions that a delay of a few years would see satisfactorily solved, such, for instance, as the relative value of the steam turbine and the reciprocating engine for central power plants, or the superiority of the direct-current (American) or alternating current (Ganz) systems of motors. The immediate adoption of one or the other system might ultimately prove to be a costly move to the company. This, however, is a risk that the company must be prepared to take; for it is out of the question to ask the public to wait for an indefinite period, while the question of the best

system of electrification of steam roads is being solved. There is a good system available for suburban railroad traffic now. Let the company use it; and let the Legislature by all means fix a reasonable time limit for the completion of the work.

THE BRITISH NAVAL PROGRAM FOR 1903— REORGANIZING THE FLEET.

BY OUR ENGLISH CORRESPONDENT.

According to the naval program of the British government for 1902 many important changes are advocated in the construction and armament of future battleships. This decision is the result of the recent progressive developments in explosives and projectiles. The vote for the navy for the present year aggregates \$156,275,000, which is an increase of \$897,500 over the estimates for the year 1901. Of this total sum \$45,290,000 is to be expended upon the construction of 27 new warships of all types, comprising: 2 battleships, 2 armored cruisers, 2 third-class cruisers, 4 "scouts," 9 destroyers, 4 torpedo boats, 4 submarines. Although the sum voted for new vessels is smaller than was anticipated, the Admiralty, following the example of France and certain other European powers, intend to devote a large sum of money to extensive rearmament and overhauling of the largest and comparatively recent vessels of the present navy. This scheme of modernization affects 25 vessels in all. The plan of reconstruction is as follows:

Eight battleships of the "Royal Sovereign" class to have secondary batteries on upper deck (comprising six 6-inch quick-firers each) placed in armored casemates.

Battleships "Barfleur" and "Centurion," each to have her ten 4.7-inch guns firing a 50-pound shell replaced by 6-inch quick-firers firing a 100-pound shell.

Cruisers "Powerful" and "Terrible," each to have four more 6-inch quick-firers in casemates added, increasing the total number of these weapons to 16.

Thirteen cruisers of the "Arrogant" and "Talbot" classes, each to have six 6-inch quick-firers in place of 4.7-inch weapons.

During 1902 the construction of 60 new vessels will be completed and 27 new vessels commenced, and by March 31, 1903, the navy will be augmented by the following strength: Battleships, 13; cruisers, armored, 22; cruisers, second-class, 2; cruisers, third-class, 2; sloops, 4; auxiliary vessels, 2; destroyers, 10; torpedo boats, 5; battleships authorized in 1902 program, 27; total, 85 vessels of all types.

The decision of the Inquiry Committee into the recent mysterious loss of the torpedo-boat destroyer "Cobra" in the North Sea, due to frailty in construction, and also the numerous accidents, such as buckling and starting of plates, that have befallen other destroyers when encountering heavy weather, has not proved unavailing with the Naval Department. The designs for this type of vessel and the work it is to accomplish have been considerably modified. When destroyers were first designed it was not contemplated that they would be frequently used otherwise than as working from a fixed base. Experience, however, has shown that vessels with greater sea-keeping power are required for service with the fleets, and, accordingly, the Admiralty has decided both materially to strengthen the type of future destroyers and also to create a new class altogether, to which the name "scout" has been given. The Admiralty do not propose that the naval designer should initiate a design for this new class of vessel, but invite the private ship-builders of the country to give the navy the benefit of their creative ingenuity by submitting designs to fulfill certain stated conditions.

Moreover, a special committee has also been appointed to advise the Admiralty in respect of the strengthening of some of the existing vessels. The Naval Department has often been urged to build large numbers of destroyers at a time; but this is not considered an advisable policy. In the first place, the destroyer is a type of warship which is still in process of rapid evolution; in the second place, it must by its nature be a short-lived type; and to build large numbers in the same year would inevitably result in large numbers becoming obsolete at the same time.

A new departure is also to be made in connection with the disposition of the armor, in the armor-clads, as an offset to the vast improvements that have recently been made in high power explosives and shells. This arrangement of the armor is to be made upon the three new first-class battleships, which will be named, respectively, "King Edward VII.," "Commonwealth" and "Dominion." When completed these vessels will be far ahead of any of the battleships in the British navy, so far as the armor protection and its scheme of disposition is concerned. Indeed, the only vessel to compare with them is the Japanese battleship "Mikasa," built by the Vickers-Maxim Company, whose design is stated to be the result of this innovation in the British practice of armor protection. As in the "Mikasa," the main broadside armor of the new British ships is to be carried to the upper deck, so that all broadside guns on the main deck will

be completely protected by the armor of the citadel. The new British ships will excel the Japanese "Mikasa" in the thickness of plating, owing to their larger total displacement, for while the "Mikasa" is 15,200 tons, these new vessels are to be of 16,350 tons. This main belt will, as in the "Mikasa," be between 21 feet and 22 feet deep, extending 5 feet below the water line, so that in the event of the ship's rolling there will be no chance of the unarmored bottom being exposed, even momentarily, to hostile fire. Over 70 per cent of the total length of the new ships will be protected by belts, whereas in the "Majestic" class the proportion of the length armored is 55 per cent, in the "Admiral" class 43 per cent, and in the "Inflexible" 34 per cent. The water line belts in the new ships will be 9 inches thick in the citadel, reduced by stages to 4 inches at the ends. For the length of the citadel the thickness will be 8 inches from the main belt up to the level of the main deck, and from the main deck to the upper deck 7 inches. The division bulkheads between the 6-inch guns on the main deck and the longitudinal armor wall behind the guns will be of hardened steel.

The new armored cruisers are to be of a modified "County" type. They will be 450 feet in length, 67 feet beam, and 10,200 tons displacement, whereas the "County" class measure 440 feet in length by 66 feet beam with a displacement of 9,800 tons. The new vessels, however, will have the same draught of 24 feet 6 inches. The slight increase in length is to enable a different type of boiler to be used, and also to allow of 7.5-inch guns to be used in each turret at the forward and after end of the vessels, instead of twin 6-inch guns as in some of the preceding ships.

Another new departure is to be the inauguration of coal depot vessels for torpedo-boat destroyers, of two distinct characters, to be utilized accordingly as the destroyers are, or are not acting from a fixed base. One class of depot ship is being prepared for the flotillas at the home ports, and the "Leander" is being prepared as a depot ship for the destroyers in the Mediterranean. From this experience the Naval Department hope to learn more clearly what is exactly required in this direction; but if the new "scout" class should prove a success, these depot ships would not be wanted for them to the same extent. In the case of distilling ships, one has been bought and fitted which should be in service within the year, and experiments have been made with others. But in this connection it is suggested that far more satisfaction would be attained if by improvements in the boilers ships were to distill their own water, and to be rendered independent of auxiliary distilling vessels.

In connection with fuel, the Admiralty are continuing their experiments with the Temperley-Miller apparatus for coaling battleships while in motion, and are also studying the possibility of utilizing oil fuel. An engineer has been specially detailed to superintend the latter experiments, so that the trials may be conducted thoroughly, and exhaustive information obtained as to the feasibility of employing liquid fuel upon a sufficiently extensive scale. Reserve stocks of patent fuel have been deposited at the several naval depots abroad also.

Although the unfortunate disasters to the "Viper" and "Cobra" prevented the Admiralty from obtaining sufficient data regarding the possibilities of utilizing the Parsons turbine for the propulsion of war vessels, the Naval Department intend to experiment further with these turbines. For this purpose two torpedo-boat destroyers and one third-class cruiser are to be engined with the Parsons turbine. The fitting of the turbine in the latter vessel will afford a splendid opportunity for effectively testing its qualities as compared with reciprocating engines, for in this case, in view of the high speed to be developed, the weight available for the machinery has to be minimized. The speed for 3,000 tons displacement on a draught of 14 feet 6 inches is to be 21¾ knots, and yet only 548 tons is allowed for machinery; so that even with water-tube boilers of the express type only 2.65 square feet of heating surface is allowed per horse power, and the boilers are required to develop 20 horse power per square foot of heating surface.

An important alteration has also been made with regard to the letting out of contracts and the supervision of naval construction in private yards. Hitherto this duty has been performed by the Department of Naval Construction. It is now considered, however, owing to the magnitude of the fleet, that this department is sufficiently occupied with the duty of designing. This responsibility of supervising private naval work is to be vested in a new department, the chief of which is to be officially known as the Controller of the Navy. The qualifications of this official are a thorough knowledge of Admiralty practice and an exhaustive technical knowledge of ship construction. It is anticipated that naval construction in private yards will, as a result of this change in the Admiralty administration, considerably facilitate and expedite the execution of Admiralty contracts, which will result in a greater efficiency and economy.