

much to be done to attain that condition which is absolutely essential in every smallest detail for the successful carrying-out of active offensive and defensive submarine warfare. The colony has at large expense provided itself with an extensive equipment of the latest and most approved appliances, and has established an efficient Torpedo Corps to use them, who would be supplemented by trained Naval Volunteers in time of war. But to have excellent qualities both in the corps and their matériel is not in itself sufficient to command the full and proper value of those qualities, even in training, and still less in active operations. The depôts must be further developed in buildings, jetties, and working appliances, so as to provide all those station facilities the absence or shortcomings of which may seriously retard the orderly and methodical embarkation of men and material on active operations at a moment's notice. Improved sheds for the torpedo-boats are very advisable, and last but not least in the list of station-requirements comes the necessity for some of the recognised special vessels required for the carriage and laying of mines. The rapid developments of recent years in submarine work have gone far to show that the utilisation of improvised ordinary lighters, launches, or crafts for these purposes is waste of time, energy, and skill.

This brings the submarine warfare to the scene of operations, where everything must be perfectly supplied and in order—both on the adjoining land and on the water—that is required to enable the mines to be dropped to the established plan in their assigned places expeditiously and securely, and with the sure and certain hope of the speedy sinking of any hostile vessel endeavouring to cross them, while providing a safe channel for all friendly vessels: on land, the observing, testing, and firing stations, protection of the cables, permanent surveys and landmarks, casemates of the electric light engine and dynamos, and stations for the light-projectors themselves; on water, a perfect knowledge of the sea-bottom and all other marine features of the mine-field. Although so deadly in its mode of action and perfect in its scientific and electrical development, the submarine mine requires a host of accessories in unassailable order to enable it to produce its formidable effect; and incompleteness or defect in any one of these may render it harmless as a harbour-buoy. Here also comes in that co-operation of the land defences generally without which submarine work is very largely deprived of its full power of offence and defence, and of playing that important and decisive part in harbour warfare which will always in future fall to it. The guns, mines, torpedoed, and torpedo-boats must act in and form part of a combination to provide efficient protection. It is very evident, therefore, that in not one link of the whole chain should any avoidable weakness be permitted, and that one and all of the works requiring to be undertaken and completed to attain that capability of defence which the colony has aspired to must be provided for if it is to do so. Hence, notwithstanding the advanced stage already reached, it can only be repeated that there is much responsible and difficult work yet to accomplish when funds are available.

Submarine Defence Extension.

As with artillery, so with submarine mining—the strides made in advance are great and constant, and even the period that has elapsed since the colony ordered its equipment has witnessed many improvements. In locomotive torpedoes, the Whitehead, of which the colony has an equipment, still holds its own. The Brennan torpedo is now a proved success, but is, though well adapted to New Zealand harbours, a very costly weapon to install. An American torpedo bids fair to come to the front of its numerous rivals, and would, if it attains the results expected, be a desirable addition to the defences. Submarine torpedo-boats of various deadly designs have been brought into the field of practical warfare, and are now established in several navies, notwithstanding the attitude taken up as regards the first of the kind as far back as 1820, of which it is recorded: “This was a submarine boat carrying a torpedo on its back, to be fastened to the bottom of a hostile vessel. The trial proved successful, *but the English Government refused to sanction the project as being too diabolical.*” In this connection it may be mentioned that, although such boats have not been contemplated for our defences, one has been designed by a New Zealand inventor, which may prove to have sterling merits, if developed by the Imperial authorities, to whom it has been submitted.

Stores.

The whole of the valuable submarine stores and equipments in the colony are in the charge of the Torpedo Corps at the various stations, and are inspected at periodical intervals by Captain Falconer, the officer in command of the submarine mining branch, and are all kept in excellent arrangement and condition.

The steam-launches, and all other plant, gear, stores, and appliances employed in and for the general carrying-on of the defence-works, have been maintained in an efficient and satisfactory condition throughout the year.

The guns, magazines, artillery-stores, ammunition, &c., are under charge of the Permanent Artillery, and are reported on by the Staff Officer.

Maintenance of Batteries.

The completed batteries and works when handed over cease to be under my immediate charge, and are reported on by the officers of the Artillery, except as regards general maintenance or other works required, which are executed by the construction branch. One of the defective magazines referred to in last year's report has been dealt with during the summer on a new plan, involving no disturbance of the fort at all, and the leakage and dampness has been overcome by the application of the process invented by Major Moore, R.E. This having proved a successful experiment, there will not in future be any serious trouble in dealing with that great difficulty of buried works—keeping them dry without in any way disturbing their earthworks or overhead earth protection. In the best works ever constructed, dealing with the dampness or leakage that will find its way through at times is a constant item of maintenance, and recognised as inevitable. The fact should not be overlooked that there will always, and necessarily, have to be expenditure upon maintenance,