Engineering: Sea and Land

A MARVELLOUS INVENTION.

THE MURRAY MARINE STEADY FLOATING STEEL STRUCTURES

A REVOLUTION IN MARINE ENGINEERING.

WHEN Christopher Columbus got off the egg incident, we all know what happened. The remark of a prominent American naval commander after hearing an explanation of the Murray system vividly recalls the story. "Been sticking up in front of us all our lives," said he "and we have never seen it."

By taking advantage of this thing which has "been sticking up in front" of the whole world for centuries, the Scottish-American engineer Mr. Murray, claims that he has found out how to construct floating breakwaters, floating docks, coaling stations, lighthouses, wharves, forts, piers, every kind of construction known to the art of the marine engineer. He claims for them all perfect stability, as well as absolute safety in the most exposed situations; a comparative cheapness of cost which is phenomenal and must be revolutionary; and unfailing success by reason of their immunity from all vicissitudes of the usual conflicts with the ocean.

An American writer in the "Shipbuilder" describing this invention with force and clearness, says:—

"A great basic principle has been discovered, namely, how to use the enormous water pressure at a depth in the ocean to provide static resistance that counteracts the possible oscillation due to wave action at the surface. By going deep enough down with buoyant steel caissons into the tranquil lower waters of the ocean that lie below the comparatively shallow surface stratum of wave disturbance, and by constructing these steel caissons so that they have at their base a wide-projecting and heavily weighted flange on which the superimposed water rests with ponderous weight, exerting at 32 feet below the surface a pressure of 2,160 pounds per square foot, or at 60 feet down a pressure that exceeds two tons per square foot, Mr. Murray in effect secures a steady-floating foundation on which any superstructure, properly designed to minimise the wave blows, may be placed, be it lighthouse, breakwater or fortress. Such a foundation opposes the dead inertia of its own weight and the weight of the water resting upon it, to such a degree, that the wave blows above are powerless to disturb the equilibrium of the floating body as a whole. It is the familiar principle of the iceberg, but with important improvements on nature's plan, for there is only a light, buoyant air space at the top, nine-tenths of the weight is thrown to the base, and this base itself is widely projected beyond the central caisson, conditions all three of which mark gains towards stability. Thus we attain steady flotation, and can secure for a hundred and one uses decks or platforms rising from the surface of the sea that defy oscillation above because of the static resistance deeper down offered by their motionless and rigidly connected foundation."

A writer in a French magazine, who describes how he was sceptical at first and how he was easily converted into a strong believer, sums up thus:

"The constructions are intended to resist all the perturbations which are produced on the surface of the ocean. It might seem at first sight that not only are these results impossible to attain, but that they are in contradiction with what has been admitted up to the present in oceanography. However, Mr. Murray has triumphed over the difficulties simply by submerging his floating structures

W. E. MURPHY, INVENTOR OF THE STEADY FLOATING STRUCTURES.

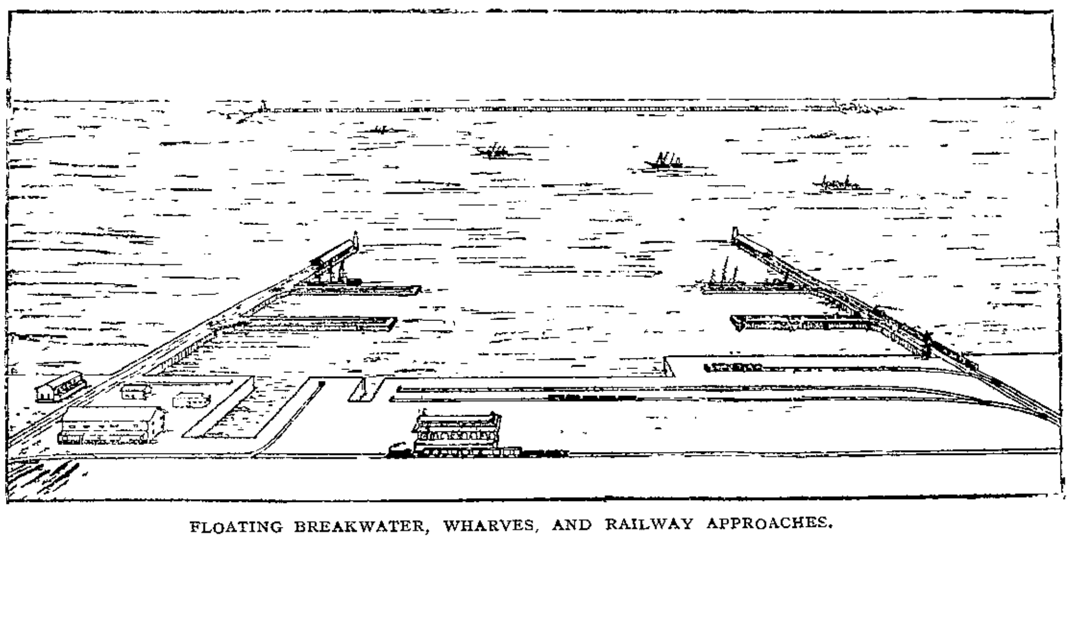
to a depth where the waters are absolutely stable and are not subjected to any action by the oscillation of the ocean surface. It is sufficient to understand the efficiency of the operation by recalling that the action of the billows on the superstructure is annulled by resistance of the deeply submerged portion of the floating structure. The deeper this submersion the greater the resistance, for the increase of depth itself increases the weight of the water, with the result that the lower structure suspended in this medium becomes more and more immobile. This theory is supported by numerous demonstrations."

Take the case of a district wanting a harbour to which a railway can be made without any of the expense incidental to the approaches to a natural harbour, such as the tunnel at Lyttelton, for example. How such a case is provided for is shown in our illustration. There you have a breakwater out in the offing, and railway wharves floating out from the shore, and inside these structures there is perfectly calm water. Thanks to the basic principle, the breakwater and the other structures are doubly anchored. First, they are anchored naturally by the deep water, which so neutralises the shocks of the sea at the surface, that there is no "pull" on the structure: secondly, they are anchored artificially to the bottom, resisting the set of the currents, tidal and otherwise. In the second respect, the anchorage, these structures have the advantage over a floating ship, that they can use any number of anchors that may be desired. As a matter of fact, they are anchored by blocks of 50 tons (and more) of concrete: anchored to the solid rock, practically, the rock being of the engineer's making, being part of the construction.

How long will they last? As long as steel endures. This may be ensured by regular painting of the surface between wind and water, a process easily compassed in fine weather, after pumping out the water-ballast in the caissons. The heavy portion below gets crusted thickly with barnacles and such growths of the sea, which have the effect of preventing rust, consequently the more the barnacles the better for the life of the structure.

When the trade demands extension there is no difficulty at all. All that the authorities have to do is to tow the breakwater further out and, building others, as many as may be required, to anchor them in the proper places. Of course they need not be continuous, for with a hundred feet of space between these the big waves, after passing, tumble harmlessly to pieces. Moreover they may be anchored in any formation: line or echelon, or any other, and at angles suitable for minimising the effect of tides and currents.

Much of the current passes underneath, it must be borne in mind, and when there is travelling shingle and sand—those bugbears of all modern breakwaters—they pass by harmlessly in the ordinary way as if there



FLOATING BREAKWATER, WHARVES, AND RAILWAY APPROACHES.