this means the growth of the natural protecting medium of defence can generally be so fostered as to obviate the necessity of massive works fronting the beach.

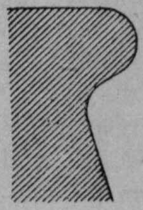

Fig. 36.—Bull-nose Coping

The question of a bull-nose coping to a parade wall is also one which has given rise to much discussion (fig. 36). This design is intended to throw back the spray tangentially from the crest of a wall, and thus prevent its sweeping over the parade. It is obvious that in so doing the blow of the sea is largely resisted by the coping, which action must set up severe stresses in the wall. By dumping, if a sufficiency of shingle or sand does not exist, and a well-devised system of groyning to hold the accumulation, the momentum of the sea can be, to a large extent, absorbed before the waves actually strike the wall, and thus the whole *raison d'être* of the bull-nose coping disappears.

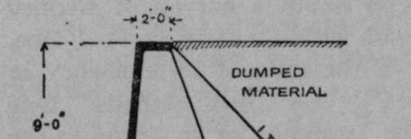

Fig. 37.—Carnarvon Sea-wall (Reinforced Concrete)

Recent investigations on wave impact[1] have brought to light the fact that, where fissures or open joints exist on a sea-wall, the dynamic pressure of a wave may multiply the force of the blow fifteen times. A dynamometer pressure of 2 tons per square foot would, on this basis, be equal to a pressure of 465 lb. per square inch, a force which would severely stress an ordinary masonry joint.

The introduction of reinforced concrete is revolutionizing marine construction. Fig. 37 represents the section of a sea-wall recently erected on the North

[1] "Wave Impact on Engineering Structures" (Professor Gibson), *Proc. Inst. C. E.*, Vol. CLXXXVII, pp. 274–91.