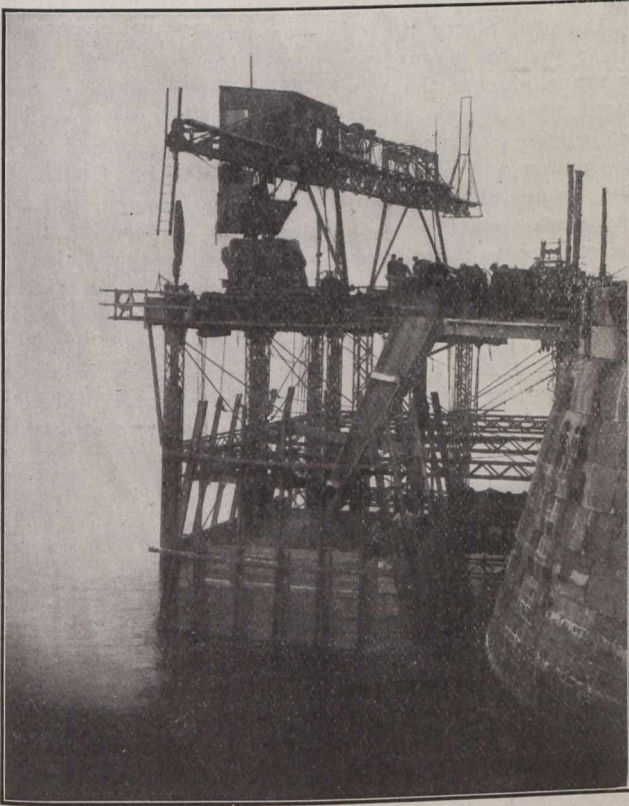


sive temporary stagings on false works and can also take the place of costly floating plant required for carrying any sort of appliances used in such work.

This locomotive stage rests firmly on the sea or river bed on hard bottom under silt or sand and can be easily moved without removing a single bolt or connection in all



**Locomotive Stage made secure and carrying temporary staging.**

directions—ahead, backwards, sideways and around corners. Though so mobile it is perfectly safe and rigid under all conditions of weather and is neither affected by heavy waves, strong tidal or other currents, nor by the swell of the tide and is not affected by blasting or other disturbance immediately below it.

This result is obtained by supporting the stage on two or more pairs of spuds. Normally, while work is proceeding, or when stage is made secure, all the spuds are down and also contribute to the support of the stage. When it is required to move, each group of spuds is successively lifted and moved horizontally, while the whole structure rests on the other group or groups of spuds. The horizontal movement of the spuds is made possible by the special construction of the stage, which consists of a number of parts, never less than two, movable relatively to each other in a horizontal direction, but immovable vertically and therefore supporting each other in any position. Both parts if there be only two, or not less than two parts if there are more than two, are provided by spuds worked in the ordinary way. With a few rollers, pulleys and ropes, a number of hand wrenches or crabs, the necessary timber and bolts, a cheap stage can be rigged up on shore in the dry and then marched out to its position in the water and subsequently moved from time to time as may be necessary. For large works, where specially heavy and durable plant is essential, the most elaborate, mechanically perfect and well equipped power-driven stages can be constructed and moved within limits with almost the same ease as a floating plant. Any amount of

variations can be made in the general form and arrangement of the stages.

The Locomotive Stage will carry sea dredges, excavators, steam shovels, submarine rock boxing and blasting plant, rock breakers, diving bells, pile drivers, cranes, conveyers and materials for building breakwaters, piers and getties. By means of it caissons, dolphins and stages can be moved out to sea or into the middle of a river and placed exactly where they are wanted for foundations. The Locomotive Stage will do the most difficult wreck salvaging work and will provide movable landing stages for temporary traffic, troop transport or ferries. Its great advantages beside the matter of cost lie in the facts that it will not sink when run into, as would a barge, and it will not sway up and down with the movement of the water. The first stage was conceived and erected in 1908 at Peterhead, on the northeast coast of Scotland, to carry out a scheme for the removal of 10,000 cubic yards of solid granite rock in front of the Peterhead Harbor, spread over a fairly large area, to a depth of about 24 feet below high water. The position was so exposed that any slight change in the wind would bring up a heavy sea quickly. During nearly a year's work, in which no expense was spared to hustle the work, little more than 1,000 cubic yards were removed. It was then that Mr. Percy invented the Locomotive Stage and it was brought into operation with most successful results.

This first stage was of a size as follows: The outer frame was about 35' 0" x 24' 0" and the inner frame was about 24' 0" x 15' 0" and these frames or stages were 26' 0" high. The spuds were 45' 0" long by 14" x 14". Five heavy Ingersoll drills were mounted on the inner frame and the total weight of the frame with the boring gear complete was 55 tons. Holes were drilled five feet apart each way, eight pounds of dynamite was used for each charge and fired without moving the stage. The saving in cost and time at Peterhead is represented by the following figures: When using barges and etc. 1,500 cubic yards of rock was moved in 18



**Men may be conveyed in baskets to the stage in rough weather.**

months, cost \$15,000.00; when using locomotive stage 8,500 cubic yards of rock was moved in 8 months, cost \$20,000.00. This stage at Peterhead cost \$3,000.00 so the saving effected was over \$35,000.00.