

hold them at a minimum. The extra weight is advantageous, but security against compression and re-arrangement with resulting temporary quicksand conditions, can be best reached in this way.

A strict application of these principles may reduce the number of hydraulic-fill dams that are built by eliminating that method of construction from consideration where the available material contains too many very small particles. It may also increase considerably the volume and cost of those that are built. It would seem, however, that following them to a logical conclusion, with such testing as can reasonably be done, will result in eliminating present uncertainties and in putting a most useful method of dam construction on a definite and safe basis.

"CEMENT-GUN" REPAIRS CONCRETE SHIP

FOLLOWING is a letter written April 21st, 1920, to the Cement-Gun Co., Inc., Allentown, Pa., by Godfrey L. Smith, head of the civil engineering department of the Newport News Shipbuilding and Dry Dock Co., Newport News, Va.:—

"We had occasion a short time ago to repair one of the Shipping Board ships, the 'Cape Fear,' and this work was done with a cement-gun. It appears that this ship, which was built at Wilmington, N.C., was sent to New York for a cargo. While in that port, she suffered some damage by collision, either with a pier or with some watercraft, the net result being that there were three holes punched in her port side, one just aft of the collision bulkhead, one in the fore hold and one abreast the boiler room in way of a bunker.

Attempted Repairs With Concrete

"An attempt was made to make repairs in New York harbor, but not very successfully. Apparently, the method of procedure pursued was to chip out a large hole, approximately 4 ft. square, clear through the shell, in way of the bunker and in way of the second hole referred to as being in the fore hold. No attempt was made to repair the hole just aft of the collision bulkhead.

"The last-named hole was not much larger than a man's hat on the outside of the hull and about the size of a dishpan on the inside of the hull. The concrete was shattered, but was still held in place by the reinforcement. The other two holes had been repaired by placing forms inside and outside of the hull and pouring wet concrete between the forms. There was considerable shrinkage, particularly at the top of these patches, but also on the forward and after edges.

"The vessel then came to Newport News to receive a cargo of coal. After a portion of her cargo was loaded, the captain decided that the patches were leaking too much for comfort and insisted on having repairs made. Inasmuch as this work is in my line, and inasmuch as we had on hand what I considered the proper apparatus for making the repair, the job was turned over to my department. We proceeded by cutting out all of the concrete that had been placed in New York and cleaning out the shattered material in the hole in the after collision bulkhead, after which we placed a form on the inside of the ship, about 3 ins. clear of the inside of the shell, and proceeded to build up the patch with gunite.

"Our reason for adding this thickness on the inside was that the captain very much desired an added thickness shell in way of these holes, although I assured him that we could make a perfectly satisfactory patch on the original thickness of the hull, which was a little over 3 ins. thick for the forward holes and slightly more for the after ones.

Reinforcement Closely Spaced

"The reinforcement of the shell, which consisted of two networks of small rods, one near the outside of the thickness and one near the inside of the thickness, was so closely spaced that it was necessary for us to stop gunning twice and cut the gunite off the reinforcement with trowels in

order to get the necessary amount inboard of the reinforcement. We finally completely filled the hole and built it up about ½ in. outside of the hull, after which we trimmed it down to a fair line by means of sharp steel trowels and rubbed it to surface by means of a wooden float.

"Inasmuch as the captain was in a great hurry to get away, I then decided to hurry up the hardening process, which was done by dropping a canvas screen over the side of the ship, well over the patches, holding it in close against the ship around the edges and turning live steam into the space between the canvas and the hull. This steam was kept on all one night. The following morning the steam was shut off, the canvas screen raised and the surface rubbed down smooth with a carborundum brick and water. The canvas screen was then replaced and steam was left on all of that day and night. The following morning, it was evident that the job was an entirely satisfactory one, as there were no cracks anywhere in or around the patch. We then painted the patch with 'Granolith,' a special concrete paint, which we use for such purposes, and after this was dry, with a coat of black asphaltum varnish.

Tested Under 150 Lbs. Pressure

"For our satisfaction, as well as to demonstrate to the captain that he need have no further fears from leakage, we arranged a hose test on all of the patches, using a 1½-in. nozzle with 150 lbs. pressure at the nozzle and holding the nozzle within 12 or 15 ft. of the patch. We applied this stream all over the patches, particularly around the edges. The stream was strong enough to blow all loose concrete from the surface adjacent to the patch and to strip off a considerable portion of the paint, which had not had time to harden properly. Not a drop of water leaked through any of the patches; in fact, anyone on the inside of the ship would not have known that any water pressure was being applied to the outside. We then repainted the patches, and the ship left the following day to be loaded with coal at the Newport News coal-piers. I have not heard from the ship since leaving here, and I understand that no trouble of any kind has been experienced.

Salt Water for Mixing

"We had some little trouble in getting the cement-gun to work just right. This was not the fault of the gun, but was due to the water holes in the nozzle being partially stopped up, to an insufficient water pressure and to an excess air pressure. When these troubles were corrected the gun worked perfectly. It may be of interest to you to know that we used salt water, instead of fresh, for moistening the sand and cement. This may safely be done when the cement possesses certain chemical characteristics, although I would not advise its use with all cements. The cement used was Old Dominion and the sand was a moderately coarse, well-graded quartz sand, carefully screened and free from dirt."

The head office of Westinghouse-Church-Kerr & Co., Inc., has been moved from 37 Wall St., New York City, to 125 East 46th St. Pending the completion of the merger with Dwight P. Robinson & Co., Inc., which was announced in the April 8th issue of *The Canadian Engineer*, the W.C.K. firm will be continued under the present name.

Addressing the Toronto branch of the Engineering Institute of Canada last Thursday evening, W. E. Bonn, of the Canadian Stewart Co., Ltd., stated that 192 acres would be reclaimed in Toronto Harbor between the Humber River and the western ship channel by the material which his company is placing back of 20,000 ft. of breakwater; that 200 acres would be reclaimed in the harbor proper and 700 acres in the Ashbridge Bay district, which is now known as the Eastern Harbor Terminal District. This reclamation will require the placing of approximately 30,000,000 cu. yds. of material, about half of which has already been dredged. It will require another six years to complete the work, said Mr. Bonn.