

and it took some live hustling to discharge them all without having to pay demurrage.

A very annoying circumstance arose about 1885, when an individual stopped our work by an injunction, claiming that he had a patent on the log mattress that we were using. Fortunately, some time previously I had thought out a design of mattress, composed of fascines of brush and other small growth, that might answer the purpose just as well as the logs, and save a great deal in the cost. The opportunity to test it out was now at hand, and shortly afterward we laid the first fascine mattress foundation. It proved a perfect success, and from that time the Government used the design in all foundations for jetties thereafter, and the plan is now in universal use wherever jetties are built on sand or mud base.

About this time we made a change from New York stone to the hard flint-surface stone found around Ocala. It was hauled by teams to the various stations and shipped to Jacksonville, where it was loaded on the barges and towed to the jetty work at the mouth of the river. This stone was used for the submerged portion of the jetties and answered the purpose well. At this stage of construction, Capt. W. M. Black, engineer in charge of the work at that time, devised a plan of two ridges of stone with a space between, built up to the level of low water. The space between the ridges was then filled in with oyster shell and a layer of stone placed on top. The shell made a solid hearting when covered over with stone; being mixed with Florida limestone, they both found their natural element in the ocean where shell-fish had something to cling to, thus cementing the whole into a solid breakwater below the low water level. The oyster shell hearting was used only where the water was deep and still. This kind of construction has proven satisfactory.

The original plans were for submerged jetties (i. e., built up to the level of low water) and this phase of the work was practically completed in June, 1893; but in the meantime the plans were amended to include a superstructure seven feet higher. Work on this superstructure was commenced in 1893-4. Granite boulders, averaging five tons each, were brought down from South Carolina and placed on top of the submerged work. This building up of the jetties progressed satisfactorily, though it was slow work and took years to complete. The length of the jetties was extended from time to time, and there were some unforeseen developments that required attention. The western end of the north jetty was extended on the low beach back to high land, a distance of about 1000 feet. While this work was progressing, a heavy northeaster, attended by an unusually high tide, caused a serious washout and much damage. This extension was finished in the spring of 1921. So it may be said that the building of the jetties stretched over a period of forty years, not continuously throughout the last twenty years, but at irregular intervals, as necessity required.

It is interesting to note the changes that took place in the river,