and sunk in position. There was some little trouble in plumbing the caissons, but, by excavating with an orange-peel bucket close to the high side and depositing the material against the low side, they were all readily brought to a sufficiently vertical and level position to be unnoticed by sighting along the edge from the shore.

The trusses were all constructed in the contractor's yard at Bridgeport, and were towed across the Sound on a scow. They were set up and braced temporarily by the derrick boat, and then the floor and deck were constructed in place.

On December 26th, 1909, a storm of unusual violence—unequalled, in fact, for many years—swept over the Sound from the north-east; the waves beat over the pier and broke loose some floor planks which had been only tacked in position, but otherwise did no damage, and did not shift the caissons in the least. The same storm partly destroyed a pier of substantial construction less than a mile from the one in question.

Unfortunately, the work was let so late in the summer, and the restrictions as to seasoning the concrete were enforced so strictly, that the work of setting the caissons could not be commenced until November 11th, thus the entire construction was forced into the very bad weather of the late fall and early winter. As this involved very rough water and much snow and wind, the work was greatly delayed and was not completed until the middle of January. The cost of the entire dock was about $14,000.

The writer believes that the cost was much less than for masonry piers by any other method of construction, under the existing circumstances of wind, tide, and exposure.

It would seem that for many highway bridges of short span, causeways, and similar structures, the use of similar caissons would prove economical and permanent, and that they might be used very largely to the exclusion of crib-work, which, after a decade or so, becomes a source of constant maintenance charges, besides never presenting an attractive appearance. Finally, in bridges requiring the most rigid foundations, these caissons might readily be used as substitutes for open wooden caissons, sunk on a prepared foundation of whatever nature, and still be capable of incorporation into the finished structure.

CONCRETE BARGES.

To those interested in transportation, lumbering, dredging, or contracting, the recent development in the use of reinforced concrete for barges, pontoons and scows is of especial interest, and the following has been compiled with a view to presenting what has been, and is being, accomplished along that line in a concise and accurate form.

The history of concrete boats dates back to 1850, when a Frenchman named Lambot constructed one, exhibiting it five years later at the Paris Exposition. This is supposed to be the first reinforced concrete structure of any kind. Lambot patented the invention, believing that the material was well adapted to boat building. From that date, however, no further development took place until in 1907, the Signori Gabellini, an Italian firm, took the matter up on a large scale, and constructed a concrete barge of 150 tons for use on the Tiber and the Coast. This boat has been in continuous service ever since and proved thoroughly satisfactory in every way. Since then concrete boatbuilding has made rapid progress in Italy and France, and there are now large numbers of barges and pontoons, of this construction and of all sizes, in use in these countries.

As an illustration of the adaptability of this material for marine floating structures, it may be stated that the Italian firm mentioned above have built six car ferries for the Italian State Railways, each 158 feet long, and each capable of transporting six freight cars.

Concrete boatbuilding, therefore, is a novelty no longer, nor an experiment, but a well defined industry in the two countries already named, and signs are not wanting of its adoption in other countries. During the past year three barges for dredging purposes have been built at Panama for work on the canal there, and have fulfilled every requirement. These boats were 64 feet long by 24 feet wide, and about 5 feet 8 inches deep, and each carried a dredging pump and other machinery of some 30 tons.

The advantages of boats of this construction are many, and, in the light of past experience, assured. While a concrete boat is somewhat heavier than a wooden one, it is far more economical to maintain, and, being capable of taking on a very smooth surface, presents less resistance to propulsion in water than either wood or steel. Further, as marine growths do not adhere readily to concrete, no painting is required for the top-side, nor anti-fouling composition for the bottom. The maintenance costs of concrete boats are practically nil, and they last forever; in the event of any damage to the hull, any necessary repairs can be cheaply and quickly effected, as some filling-in with cement or concrete is all that is required. Comparative estimates have been made of the first cost and maintenance of boats of wood and concrete, and it has been found that whereas a wooden barge, after five years work, requires repairs involving an expenditure of about 30 per cent. of the first cost, the concrete barge, after eight years' service, is in perfect condition.

With regard to the capability of such boats to withstand severe shocks, such as bumping against piers and other vessels, it may be said that they will stand very rough usage. An interesting experiment to test this point was carried out by the Italian Government some years ago, in which a concrete boat of 1,000 tons was rammed by a much larger steel boat, with the result that the concrete boat suffered less damage than the steel vessel. Another advantage the boats have over wood or steel ones, especially interesting to those engaged in transportation is: that as the concrete is non-absorbent, impermeable to humidity, and not affected by ordinary chemical reactions, there can be no complaints of losses in cargoes caused by such agencies during transportation. Further, from a hygienic point of view, they can be very easily maintained in a perfectly sanitary condition. No fire insurance for the hull is necessary. Of special interest to those engaged in contracting, lumbering, or dredging is the point that no expensive plant, special material, or expert workmen are required to build boats of this construction. Wherever there is sufficient water for launching, and wherever cement, sand, rock and reinforcing material can be got together, there the barge, pontoon, or scow can be built by unskilled labor under the supervision of any intelligent man, and they are easily and quickly constructed.

In any class of work necessitating the use of barges, pontoons and scows, and where low first cost and maintenance charges are the primary considerations, reinforced concrete boats will be found to be the most economical and satisfactory. This form of construction is worthy of attention, and those engaged in transportation, lumbering, dredging, or contracting would be well advised to give it their best consideration before placing orders for new craft in wood or steel.