The function of the ballast chamber, on the other hand, was to handle the water ballast and to control the caisson in the submerged condition.

These chambers were not convertible or interchangeable in their functions, as Mr. Taylor tries to intimate; e.g., in actual operation the caisson could not be sunk by admitting ballast into the buoyancy chamber.

As stated in my last letter, the Halifax caisson, for work on the harbor bottom, had to be submerged or sunk completely below the surface of the water, except the air locks; this necessitated the controlling device which the writer called the "ballast chamber."

The Hamilton caisson, which "actually floated at all times," was designed so that its depth of flotation could be varied for a few feet by the regulation of water ballast. But it was not possible to submerge the device; i.e., to sink it with its deck or roof below the water surface.

If this requirement had entered into its design or operation, a new type of problem would have presented itself; viz., the disposition of the water ballast to give stability, and a means of controlling the rate of sinking after the deck was submerged.

It would not be sufficient, as Mr. Taylor states, to merely prolong the air shafts so that the lock would remain above the water surface.

Again, in the Hamilton device the buoyancy chambers were actually used as ballast chambers by elevating the water level in them above the outside water surface. Hence Mr. Taylor rightly calls them convertible ballast and buoyancy chambers.

This principle did not enter into the design or operation of the Halifax machine.

In other words, the Hamilton device was designed to work while afloat with its deck above the water surface. The depth of its draft and working plane was varied by admitting water into compartments or forcing it out as required, and weight to resist the air pressure in the working chamber was provided partly by actual water ballast; i.e., water in compartments above the outside water level.

The Halifax caisson was designed for work under its own weight as an ordinary caisson on the foundation bottom. While at work, water ballast, in the sense that Mr. Taylor used it, played no part. The machine was simply under water, or submerged, except the working chamber and air shafts.

To make the caisson mobile, it was necessary to provide for its flotation, submerging and raising. This was done by the adoption of a special arrangement of compartments or chambers for the handling of water ballast in a special way; i.e., the flotation, submerging and raising of the caisson had to be taken care of by distinctly separate compartments and processes.

The character of the work to be done and the conditions under which the plants were to operate being quite different, so also the problems of design for the two devices were inherently different, and so logically enough the two types of plants were developed.

Yet Mr. Taylor asserts that the "principle and system" of the two devices were the same and that only slight structural modifications were required in order to transform the Hamilton device into a caisson for use at depths up to 55 feet below the water level. The inference from this statement is that by using the same system of handling water ballast, his machine could have been increased in depth so that work could be done at this level with the plant still floating and the difficulties of tidal variation taken care of. This is possible, but the resulting machine would have been very different from the Halifax caisson in construction and operation.

It is amusing to note how Mr. Taylor considers the application of buoyancy and ballast chambers in the case of sliding gates for dry docks, etc., so different in principle from the application in his floating caisson, on account of differences in detail, etc., and how easily he would brush aside the differences in application and detail of the systems of control by water ballast in the caissons of the two devices under consideration.

Re scows carrying construction plant in tidal waters, for Mr. Taylor's information I would cite the case of the scow used on the outer end of the dumping bridge used in the construction of the breakwater at the Halifax Ocean Terminals by the Cook Construction Co. and Wheaton. This breakwater was built by side dumping from a track carried by a steel span from the construction end of the fill to the scow. The tide variation here was from 5 ft. to 7 ft., and the track on the span was kept approximately level by the operation of the system referred to. This work was begun in 1913.

Mr. Taylor, in the second paragraph of his letter, states that my intimation that the means he used for the *"regulation of draft"* in his device were not novel, is incorrect. Then, in the third paragraph he states that Mr. MacDonald asserts that *"any change in draft was impossible."*

My letter was explicit in this connection, as I referred to "regulating or changing the depth of flotation." It is evident that Mr. Taylor was writing very hurriedly here.

As to the first statement, it would be interesting to know wherein Mr. Taylor claims novelty for this method of changing draft, and wherein it differs fundamentally from the method used in the case of a sliding gate for a dock or the scow cited above.

Mr. Taylor expresses doubt as to the basis for the writer's statement that the problem of flotational stability *while in the submerged condition was absent in the case of his (Mr. Taylor's) design.* Inasmuch as Mr. Taylor's device was designed to *float* at all times and *could not be submerged,* i.e. sunk, until the deck was under the water, this condition of its stability *after submergence* would scarcely require extensive calculations.

Again, Mr. Taylor states, "Mr. MacDonald says the use of water ballast was not an essential principle of the device used here." This is a misquotation. My statement was, "the use of water ballast was not an essential principle of the plant so far as its use as a floating caisson was concerned." In ordinary conditions, a heavier scow, or the use of movable kentledge, would have answered the purpose instead of water ballast. In this particular case, the circumstance that the device required an extremely shallow draft in order to get into position, made the use of water ballast advantageous, but Mr. Taylor will scarcely argue that this circumstance was a matter of fundamental principle for apparatus of this type. As a matter of fact, it would be necessary for Mr. Taylor to use iron weights, or similar ballast, in order to work his machine at a depth of 7 ft. (see his original article in the Engineering News of April 23rd, 1914.)

However, Mr. Taylor asserts that the *use* of water ballast was a prime necessity when in operation, but goes on to say that the writer was in error in stating that the *use* of water ballast was necessary to regulate the draft of the machine so that it would pass over the piling, and he divulges the secret that it was the *absence* of water ballast which was required;—and in several passages in his letter Mr. Taylor would fain accuse the writer of juggling with terms!

It may be of interest to note that my original statement was, "the real purpose of the water ballast in this case was to regulate the draft of the float," etc.

In conclusion, it appears to the writer that this controversy has arisen largely on account of misunderstanding and misinterpretation of terms, due perhaps to erroneous preconceptions. Perhaps the writer has been somewhat to blame for a lack of clearness of definition.

But between the Halifax and Hamilton caissons, plants of related types but independently evolved to suit their respective requirements, there is no real quarrel. Mr. Taylor is the claimant in this cause. It remains for him to prove his case.

J. J. MACDONALD.

Moncton, N.B., January 29th, 1919.