

the total weight of boat and cargo, to be moved, is less than 1,500 tons, it is quite another matter when a ship 450 feet long and 52 feet beam, with a total weight of 12,000 tons (7,500 tons cargo and 4,500 tons ship) is to be lifted or lowered. In the latter case, the lock must have several supports, placed at considerable distances apart. It was found that there must be no less than six pistons under one ship; that these must be placed in two parallel rows, three in each row; that the transverse distance between the rows must be 40 feet, and that the longitudinal between the central and end pistons could not be less than 150 feet.

If the whole load were to be carried upon one central piston, the tremendous overhang, fore and aft, each of 235 feet, could not be supported, because the weight of water and the enclosing lock, inclusive of ship and cargo, would not be less than 32,000 tons, besides the piston.

Obviously, such a load must be carried upon a series of supports.

The question then arose whether such supports could be made to move synchronously. If unequal pressures were to supervene, derangements of the mechanism would be probable—with resulting disaster.

The problem of providing means for keeping six pistons in alignment proved to be unsolvable, when the expansion or contraction of the lock structure was taken into account. The result must be, that either the pistons would become cramped and stuck in the cylinders, or else something must break, with consequent wrecking of the apparatus.

After more than five years study of these difficulties, without finding any satisfactory solution, the writer was forced to recur to the earlier studies of the Marine Railway methods, wherein it became possible to overcome every obstacle, and to lift or lower these great loads through heights varying from 130 to 335 feet, in a single operation, successfully.

Even if it were possible to confront the foregoing difficulties with a balance hydraulic lock, the very great heights through which movement would be required render it impracticable to make and operate pistons and cylinders of such tremendous length.

If the lifts were to be divided into shorter ones, the detentions incident to the locking and the unlocking of ships so many times would add materially to the disadvantages of such a system.

It has been objected to the Marine Railway, that shipmasters and ship owners, or their customers, would not take the risks.

But the answer to this is to be found in the plan of special insurance against such risks. Such insurance must be provided by the canal corporation, directly or indirectly.

It is a small wonder that they did object to the Chignecto Railway. There was too little attention given to making the track and carriage safe. The methods adopted seemed to invite disaster.

In our case, all four of the lifts, on the two routes combined, the length of movement would be only one third of the distance proposed on the Chignecto, and the precautions against accident are very much greater than those that were apparent in that project.