

canal—the velocity and towing power remaining the same in both cases. Comparing, now, this ratio of 130 to 109 with that of the times employed to travel respectively each canal, viz: 189 hours to 146, it is found that these ratios are equal. Therefore, on either of these canals, and notwithstanding a difference of 2558 feet lockage, an equal weight will be transported during the same time, and with an equal towing power—a result entirely due to a larger transverse section having been assigned to the canal, whose lockage is greater.”\*

\*After the enlarged dimensions of sixty feet by six feet, for the volume of water in the canal were recommended to the Committee of the House of Representatives on Roads and Canals, by the Chairman, he addressed a letter of inquiry to General Bernard, on the comparative resistance of the motion of a boat of given structure and burthen, on such a canal, and on one of the dimensions recommended by the Board, over which that officer presided. The annexed letter contains his answer to this inquiry:

*Letter from Gen. Bernard to Hon. C. F. Mercer.*

WASHINGTON CITY, February 17, 1827.

SIR: I have the honor to forward to you the result of the calculation you asked for in relation to a canal 60 feet wide at the water line, 45 at the bottom, and 5 feet deep.

The cross section of the boat remaining as assumed in the report of the Chesapeake and Ohio Canal, such a boat would, for the reason set forth in this report, move at moderate velocities, on 60 feet canal, as on an indefinite extent of water.

The resistance proved, in this case, by the boat being expressed by 1, the number 1.21 will represent the relative resistance in a 48 feet canal, and 1.58 that in a 40 feet canal. Thus, with a towing power of 100 horses, the same work will be performed on the 60 feet canal, as with 121 horses on the 48 feet canal, and 158 on the 40 feet canal: these two latter canals being here supposed to retain the respective cross sections assigned to them in the aforesaid report.

Now, assigning to these two canals the same comparative length and amount of lockage as alluded to in the report, they become on the same footing as to towing power. But the 60 feet canal has the same length and amount