

edly does, of a mixture of earth and loose rock, the debris of the solid strata beneath.

In the deep cuts adverted to, the slope of the rock has been fixed at 1 foot horizontal, to three perpendicular. At the top of the solid rock a berm has been allowed of two feet: the earth sloping thence at the usual slope of $1\frac{1}{2}$ to 1.

The deep cuts pertaining to the tunnels are all situated in the valleys of small streams in the channels of which there is a constant flow of water, the amount of which during the spring and winter must be quite considerable. To protect the canal from the surface water which supplies these streams, it would be necessary to form water channels beyond the tops of the slopes of the deep cuts, of considerable magnitude. I have estimated these to be situated at least 25 feet from the top of the slopes, to be 15 feet in width, at the surface and 5 feet in depth—the stuff removed in forming them to be placed in the form of a bank between the channel and the top of the slope,—the channels to be paved throughout.

In estimating the masonry I have been governed by the prices paid at present on that portion of the Chesapeake and Ohio Canal now in course of construction, and furnished you for that purpose by Mr. Fisk, the Chief Engineer of that work. It is true that a sufficient number of instances have not been given to enable me to apply them in detail to every instance presenting itself in the estimates before you: the prices given have nevertheless been sufficient to enable me to judge of the rates applied there. The culverts and water-ways are estimated at prices varying with their dimensions and the extent of arching, of from \$4 to \$8 per perch.

The locks, as recommended by you, have been estimated at the fixed price of \$2,500 per foot of lift, and this price has been assumed to include the waste weirs necessary to the locks.

There are two extensive aqueducts estimated, one on the canal route at the crossing of Rock Creek; the other on the Haulings River feeder route at the crossing of the valley of that river. The masses of Masonry on these two aqueducts have been estimated at \$12 a perch, time not permitting my entering into a detail of the different descriptions of masonry which would obtain on such works.

In the long level reach existing between the two tunnels, four stop gates have been assumed necessary, as usual, to reduce the losses or damage due to breaches and accidents as well as to admit of repairs. I have estimated also for occasional waste weirs.

The bridges necessary for road crossings and for the accommodation of the farming interests, have in all cases been assumed to consist of two abutments upon which rests a strong frame bridge instead of an arch. These bridges to maintain nearly the common width of the canal, reducing it only 10 feet; thus offering no obstructions to the rate of the speed of the boats.

The amount per lineal foot at which the tunnelling has been estimated in its proper place is grounded on a width of tunnel sufficient