

been brought down from the interior in a given time, and consequently a deduction would have to be made from the number of centuries above stated on that account. But, on the other hand, if it could be shown, by more accurate experiments and calculations, that the quantity of water in the above computation was greatly deficient, say even one-third less than the real quantity, I do not imagine that any exaggeration has been made in the time supposed to have elapsed since the rivers began to transport their earthy ingredients to the alluvial plains of Louisiana. The delta is, after all, a mere fragmentary portion of a larger body of mud, the finer particles of which never settle down near the mouths of the Mississippi, but are carried far out into the Gulf, and there dispersed.

The description which I have given of the great distance to which the yellow and lighter streams of fresh water are seen extending, from the various mouths, in the flood-season, into the Gulf; and still more, the destruction of the banks and bars of mud and sand caused by the tide scouring out the channels when the river is low,\* and the strength of the marine current, running ten miles an hour, and the stories of anchors and heavy ballast cast up by the breakers high and dry on the shifting shoals near the extremity of the delta, make me doubt whether

delay. Such experiments as Mr. Sidell's, which give the velocity at various depths and at different distances from the banks, are the more needed, because it seems doubtful whether any correct mathematical formulæ have as yet been furnished for calculating the mean rate at which so deep a river as the Mississippi flows, from observations made simply on its superficial velocity. I placed all the data given me by Messrs. Riddell, Forshey, and Carpenter, in the hands of my friend, Mr. George Rennie, F.R.S., to whom we are indebted for many valuable papers on the application of the science of hydraulics to rivers (see Report of British Association, vol. iii. p. 415, 1834), and, after examining them, he came to conclusions which did not vary materially from those which I had previously announced. Mr. James Nicol, Assistant Secretary of the Geological Society of London, before he had seen Mr. Sidell's experiments, had expressed to me his belief that the quantity of water carried to the Gulf by the Mississippi, must be greater than I had assumed from Mr. Forshey's calculations, judging from the amount usually assigned as the annual discharge of rivers having hydrographical basins smaller than that of the Mississippi.

\* See ante, p. 121.