The formation of the beaches is referred to the waves of a lake confined on the south and on either hand by existing highlands and divides, and on the north by the retreating ice-sheet of North America; the deposition of the Red River silts is attributed to the mud-charged waters of the glacial lake; and the excavation of the Big Stone-Traverse gorge is ascribed to the corrosion of the effluent which conveyed its surplus waters toward the Gulf of Mexico—corrosion which was not uniform, and whose temporary cessations are recorded in two shore-lines, while its final termination is marked by the lowest of the beaches. The departure from horizontality of the terraces is referred to the gravitational attraction of the ice-sheet upon the waters of the lake. The late General Warren first observed that the Big Stone-Traverse Valley (with its extension through which the Minnesota River meanders) was manifestly excavated by a great river, and suggested that Lake Winnipeg formerly overflowed into the Gulf of Mexico through this channel; but Mr. Upham justly insists that the recent subsidence of the northern part of the continent assumed in this hypothesis is disproved by the southward inclination of the shore-lines.

The general hypothesis that the superficial stratified deposits of northwardly sloping glaciated regions were laid down and arranged in lakes confined between the ice-front and south-lying divides, was broached and prominently advocated a decade ago by Belt in Europe, and N. H. Winchell in America; and it is to the survivor of these geologists that we are now indebted for the inauguration of the detailed survey by which complete verification of the hypothesis, as applied to a particular region, was rendered possible.

W. J. McG.

CORRESPONDENCE.

SECTION AT HORDWELL CLIFFS.

SIR,—In the discussion upon the paper "On the Section at Hordwell Cliffs from the top of the Lower Headon to the base of the Upper Bagshot Sands," by the late Mr. E. B. Tawney and myself, which was read before the Geological Society, June 20th, 1883, *Professor Judd is reported to have said*,

"That the paper seemed to be a critical one, and the criticism was rather of the nature of a statement that the authors had not seen what several distinguished observers, such as Mr. F. Edwards, Mr. Searles Wood, Dr. Wright, and others stated they had distinctly seen. He himself had seen a portion of the bed in question. This bed, which had been seen *in situ* by so many observers, we were now asked to believe was only a squeezed-out mass. It was remarkable that one of the authors of this paper [meaning myself] had assisted most of the geologists mentioned above, when either he failed to persuade them that his present view was the right one, or his memory had failed him as to what he then thought on the subject."

Now I wish to assure Prof. Judd that my memory does not fail me, and that I have seen the fossiliferous patch of stuff in question

many hundreds of times, just in the same position that Mr. S. Wood, Mr. Edwards, Dr. Wright, and the Marchioness of Hastings had seen it, and I always believed it to be nothing more than a slipped mass, which I subsequently obtained complete proof that it was.

The patch in question when described by Mr. S. Wood was only to be found close to the beach, just above high-water mark and only extending some 20 yards in length and 9 inches in thickness. It was a sandy layer rich in fossils, and naturally it soon became all worked out, and the greater part of it carried away by collectors. It was not until after this that I considered it worth my while to seek permission for opening a pit at the place. This having been obtained, I commenced the work, with some pecuniary assistance from the Marchioness of Hastings, and on the third day I succeeded in finding the bed, from which the fossils had come, *in situ*, just in the sequence as I had always expected to find it, namely, close under the gravel, with all the Lower Headon Freshwater beds below it, showing clearly that all the previous authors were wrong in putting these freshwater beds above it.

The reason why I was unable to convince the geologists named by Prof. Judd is simply this, that although I had stated the opinion I had always held to some of them, yet I had not, at that time, had any means of corroborating my view, inasmuch as I had not then seen the bed in its true position; and it was only by constantly visiting the locality and after much close observation, that I was able to find the proper spot to dig down upon it; but this I eventually did, and ask no credit for it.

I cannot help thinking that Prof. Judd's remarks were quite uncalled for, and I much regret that I was not there to reply, but I did not think it worth while to go to London for the reading of the paper, expecting that on account of the press of papers at the last meeting of the Session there would be no discussion upon it.

The Professor further stated that "the coast had receded greatly at this point." This statement I strenuously deny; and I will undertake to find the very excavation made there by myself more than twenty-seven years ago, which would clearly prove that the coast had not receded since that time. In fact, it is protected by the accumulation of the beach which terminates in the spit on which Hurst Castle stands.

I think it a pity that so much wordy discussion should be raised on a point which could easily be settled on the ground. I have already offered to meet Prof. Judd at Colwell Bay and Headon Hill, and I now again offer to meet him at the Hordwell Cliffs; and if he is as good a geologist as I give him credit for being, I will undertake to convince him of the true position of the bed in question in less than twenty minutes.

The bed in dispute I wish to be distinctly understood to maintain is the marine Middle Headon of the Geological Survey, and equivalent to the Middle Headon of Colwell Bay, Headon Hill, White Cliff Bay, and Brockenhurst in the New Forest.

H. Keeping.

Woodwardian Museum, Cambridge.