

flood at the same time, will have its mouth filled with sand-bars by the greater river, and often, also, in spite of its floods. This subject is well illustrated in Reports on the Mississippi and its Tributaries by General G. K. Warren.

Sand-bars; obliquely laminated structure.—A sand-bar, as shown by General Warren, has usually a slight pitch up stream and a *steep one* at the down-stream extremity. The sand is carried on until the crest is reached, when it falls over and stops in the still water below. The stratification will correspond with the surface; and as the sand-bar extends itself down stream by the additions to its extremity, the pitch of the down-stream extremity will determine *oblique* bedding parallel with it. The pushing of detritus along the bottom of a river must result in similar oblique bedding. But in both cases, oblique deposition will be followed by deposition in horizontal beds when the floods are declining, so that combinations of the two, often of a very irregular character, should exist in such deposits.

(2) **Over the flood-grounds.**—The flood-grounds or river-flats are under water only in times of floods. As the water rises in the channel, the velocity slowly increases; finally, where too great to be further withstood by the earthy banks, the waters spread laterally to the limits of the flats. They lose in velocity, and drop more or less of the material transported, resting long after the flood ceases for such deposition wherever the surface is low. At the same time, the upper or surface portion of the flood-waters may shear off any accumulations above the general level, left by a former higher flood, or may work with the outer margin to extend the limits of the flood-grounds. The flood-grounds may thus lose from their surface, and, in parts, be cut away to open new channels; but they generally gain as much as they lose or more. Along the sides of the channel they are often built up higher than elsewhere, thus making high banks which may be emerged during an ordinary flood. This raising of the margin takes place because of the deposition from loss of velocity by friction against the banks, and because logs and debris of other kinds are here stranded; the debris serves to impede the velocity still more and thus is buried by the sediment. Further, an emerging bank often catches floating seed and grows shrubbery. These raised banks are most common along the lower, less vigorous portions of a river. They give the flood-plains a slope outward on one or both sides. Along the lower Mississippi the pitch from the river amounts, on an average, to seven feet for the first mile. (H. & A.) As above explained, the deposits of the flood-grounds may be the finest of silt, or the coarsest of gravel and stones, according to the region and the pitch of the stream. The course of a tributary from a mountain region over the flood-plain of the main stream may throw into and across the earthy or sandy flats of the latter a wide thickening bed of stones or gravel.

A flood-ground is properly the surface of a terrace; and it is the lowest of the terraces where a valley has several. Terraces occur along nearly all