

of the axial line, causes it to strike and erode the bank in front and deepen the water, and to transfer the sand or earth removed by the erosion to the opposite bank of the stream for a sand-flat; and it thus commences a curve in its course, which may become a deep bend; and this bend may continue the action and be the occasion of a succession of such windings. The length of the Mississippi between the mouth of the Ohio and the head of the passes at the Gulf of Mexico is 1080 miles, while the actual distance in a straight line is about 500 miles. Cutting off a bend to shorten the distance along the stream increases at the place the pitch, and thereby the velocity, and gives the waters greater eroding power. The flow, consequently, would deepen the channel. But it is likely also to erode the banks, and may carry away all the farming land the cut was intended to gain or make accessible. During great floods, a stream may cut off one or more of its bends, as has happened in the Mississippi, along which narrow loop-form lakes and dry channels have thus been made.

Many examples are on record of gorges, hundreds of feet deep, cut out of the solid rock by only two or three centuries of work. Lyell mentions the case of the Simeto, in Sicily, which had been dammed up by an eruption of lavas in 1603. In two and a half centuries, it had excavated a channel 50 to several hundred feet deep, and in some parts 40 to 50 feet wide, although the rock is a hard solid basalt. He also describes a gorge made in a deep bed of decomposed rock, three and a half miles west of Milledgeville, Ga., that was at first a mud-crack a yard deep in which the rains found a chance to make a rill, but which in 20 years was 300 yards long, 20 to 180 feet wide, and 55 feet deep; and Liais describes a similar gorge, of twice the length, in Brazil, made in 40 years.

5. *Eddies, Pot-holes, Kettle-holes.* — Flowing water gathers into its current any still waters alongside, to fill the void behind, which the flow tends to produce, and thus *eddies* and *eddy currents* are made. When alongside of a rapid current, any obstruction or shallowing causes there a diminished velocity; eddies become whirls, and the whirling waters bear around stones which abrade the rock beneath — new stones being carried in to replace old ones as they wear out. This kind of boring often goes on with hardly more change of center than in a carpenter's work with his augur, and deep cylindrical holes have been bored into the hardest rocks. Under a waterfall a broad basin may be excavated in like manner. Pot-holes are usually from 1 to 6 feet in diameter, and 2 to 20 feet deep.

Kettle-holes are nearly circular basin-like holes 50 to 150 feet and more in diameter, in stratified or unstratified sands, gravel, or drift. For some reason they have failed to become filled up to the level of the region around. With regard to some, at least, of those in stratified terrace formations (see page 299), the facts appear to indicate that the spots were originally holes of moderate size and depth in the surface beneath; and that in the rush over the spots by the flood waters that deposited the stratified material, the waters kept them free of detritus by the whirl occasioned by the depth.