

“There are four great breaks in the mountain-fringed continent, which we call its great commercial doorways—the Orinoco, the Amazon, the La Plata, and the deep indentation of Bahia Blanca—one in Venezuela, one in Brazil, and two in Argentine. The three river-basins occupy two-thirds of the entire area of South America.

“The two with which we are most interested are the La Plata and Amazon, which have areas respectively of about 1,200,000 and 2,722,000 square miles. But if we deduct from the latter the valley of the Tocantins, which has no direct connection with it, the valley of the Amazon is 2,368,000 square miles; its principal branch, the Maderia, has a volume of discharge nearly equal to the Amazon itself, and at the falls, which I shall refer to later, it carries annually a volume equal to that of the La Plata, which has a minimum flow of about 534,000 cubic feet per second and a maximum of over 2,000,000—a river 80 per cent. larger than the Mississippi, the Father of Waters, if we compare their mean annual discharges, the former being about 288 cubic miles and the latter 156 cubic miles. The Paraná (the ‘Mother of the Sea’ in Indian language), the principal affluent of the La Plata, is itself 46 per cent. larger than the Mississippi, its mean annual discharge being about 230 cubic miles.

“What a river the La Plata must have been in ancient times, when it had a maximum discharge of 4,000,000 cubic feet per second, well up towards the modern Amazon, estimated to be 5,297,000, and greater than the ancient Amazon!

“I have described the ancient conditions of the Mississippi—the Gulf of Mexico as a great estuary and a deep shore-line extending well into the heart of the North American continent. The same conditions existed in the contour-line of South America in the La Plata estuary. It extended fourteen hundred miles into the continent, and was four hundred miles wide, eleven times greater than the Empire State. It was the great Pampean Sea, receiving the drainage not only of the present Paraná and its tributaries, but of the great Maderia River, with its immense discharge of waters and sedimentary matters—the source of great alluvial formations discharging into a sea two-thirds the size of the Mediterranean.

“When, in the processes of nature, the great under-water plains of rich soil has been formed during the comparatively short period of less than one hundred thousand years, a dam was thrown across the Madeira by the rivers Grande and the Parapiti coming down from the Andes, and a deposit more than 170 ft. deep occurred forming this dam, which produced the ancient Lake Mojos with an area of about 115,000 square miles, larger than that of the Great Lakes of North America combined, which is less than 94,000. The remarkable action of these rivers and the changes caused by it are graphically told by Colonel Church in his paper upon ‘Argentine Geography and the Ancient Pampean Sea.’

“The Grande and the Parapiti entered the plain with a northern trend to contest with the great river of the north the possession of the gap. They struck it almost at a right angle, and slowly pushed their rival eastward over against the Chaco base of the ‘Chiquitos Sierras.’ Here the final conflict must have taken place, as the Grande and Parapiti threw their dam across the outlet of the Mojos River, thus cutting off its exit into the ancient sea. No doubt the giant stream waged fierce war for thousands of years to keep its channel open, alternately sweeping away the barrier and again yielding to the ceaseless volume of sand and clay, which, visible to-day, confirms the victory of the Grande and Parapiti. The dam having finally become permanent, the formation of the ancient Lake Mojos was assured. When it reached the level of the lip of Guajará-mirim its waters commenced to tumble over it and carve their way to the Amazon. Since then huge volumes of alluvium have poured down the northern slopes of the Bolivian Andes; the ancient lake is now almost loaded with material, but it is not yet entirely obliterated. The muddy silt which covers the surface of the basin is so fine that when an Indian goes up stream to the mountains his friends ask him to bring back a stone that they may see what it is like. Since forming the dam the Rio Grande has slowly been returning westward down the counterslope which its own alluvium creates.’

“During the process we have described the ancient lake and the Pampean Sea were connected, and their relation was similar to that of the Black Sea and the Mediterranean. Traces of it are still observable, notably the great, low, flooded morass of Xarayás, on the upper Paraguay River, and the ancient delta of the Paraná, including the Ybará Lagoon. The Selina Grande was also an arm of it—a great inland fiord. The sea, moreover, must have covered large areas of the provinces of Paraguay, Corrientes, Entre Ríos, and Uruguay, and before the uplifting of the country it extended south-west to the Rivers Chadi-Leofu and the Colorado, lapping round the southern slope of the Ventana Range until the curved rim, concave to the north-east, which connects this with the Sierra de Cordova, was sufficiently elevated to completely cut off its south-western extension.

“This range was high enough to lodge the glacial rocks coming from the Andes, one of which, at Tandil, is so poised and delicately balanced that the hand can rock it, but it cannot be dislodged. This range later prevented the entrance of the destructive sea, protecting the great area from its waves.

“Then came another factor into the beneficent problem of the Creator. Instead of draining the waters from the great deposits under the Pampean Sea, as He did in North America, He lifted the Andes higher, and with them their Atlantic slopes, until the latter were ultimately lifted to their present level, forming the ‘Plains of the Pampas,’ the soil of which is 50 ft. deep and of surpassing richness—an area of 600,000 square miles, one-fifth the size of the United States and five times that of Great Britain. Thus by cyclic changes in the Northern Hemisphere, and by fluvial and sedimentary action and seismic changes in the Southern Hemisphere, have been formed the great interior agricultural regions of the United States and Argentina.

“Let me now quote from Mr. Revy’s work on ‘Hydraulics of Great Rivers’ (Argentine rivers which he surveyed), where he compares the rivers as we now find them with others well known,