

promotes abrasion on sea-borders in a way not possible on the shores of lakes. The flow up the coast and the tidal rivers sets back the river waters, gives them increased depth, and floods the tidal flats.

Passing up large bays which gradually narrow inward, the mass of water becomes forced to quicker movement or greater height, or both, to keep time with the advance behind; and in such cases, coasts, against which there is friction, may be worn, and if shallow, some stirring up of the bottom may be produced. And if, further, the waters are held back by obstructing banks until nearly at full tide before they move in, they may rush forward, as in the eager, with greater destruction. When the eager of the Tsien-Tang is approaching Hang-Chau-Fu, the boats along the shore are quickly rowed to the middle of the stream and placed with the bow to the wave; they rise and fall as it passes,—about 20 feet,—and in a few minutes are back at their shore traffic,—facts evincing that the waters are those of a wave, and not of a current. But along shores that obstruct the movement artificial embankments or dykes are often torn up.

The eager or pororoeca of the Amazon has the action of an enormous plunging wave. The forest-covered land, as Branner states, is torn up to great depths; forests are uprooted and swept away, the trees left matted and tangled and twisted together upon the shore, or half buried in the sands, “as if they had been so many strings or bits of paper,” and the region inland over which the flood has swept is loaded with the debris. Moreover, new islands of large size and new shoals and bars and channels are left behind it. Branner adds that this is the work of the tidal wave, not of a tidal current.

2. *The outflow.*—By the inflow of the tidal wave a great body of water along a coast is raised some feet above low-tide level, and acquires thereby an amount of energy depending on the height of the tide. The energy is expended during the outflow in abrasion, transportation, deposition, overcoming friction, and in other ways; and sometimes it is utilized for impounding a portion of the water at high tide, and making it turn a water-wheel for a mill or a pump. As has been remarked, it may become an important source of heat to man when coal-beds are burnt out.

It is the source of tidal currents. The ebbing waters lie on the bottom of shallow bays and necessarily follow the lowest channels; and they thus become divided into many workers, which may severally abrade or scour the bottom, though generally more or less combined in their work of transportation and deposition. Along the deeper middle portion of Long Island Sound the mean velocity of the outflow is 2.8 feet per second, and of the inflow 3.2 feet (Haskell).

The force of the outflowing waters through bays is augmented where rivers add to the depth, and also by the additions to the waters of a bay by storm-winds.

The denuding or scouring action of the movement, added to that of the inflow, is manifest not only at harbor entrances, but also over the sea-bottom in its shallower parts. In Long Island Sound wherever there is any narrow-