

remarkably free from surface moraine; and for the same reason, viz, that the mountains above are almost wholly mantled with ice. We must believe that the old epoch moraines, in spite of their immensity, were accumulated and brought forward under the ice and by its margins.

In my report of 1903 it was shown that considerable mountain movement took place apparently between the first and second glacial epochs. The northern flank of the Trans-Alai is truncated by what appears to be a fault-scarp, displacing the first-epoch moraines and broad-trough valleys and dissected by the narrower trough valleys of later glaciation. The Kizil Art valley, principal Trans-Alai tributary, has the twice-troughed form due to uplift, from its heading cirque nearly to its mouth in the Alai; there the bottom of its lower trough sinks under the flood-plain of later alluviation, half-drowning the great second-epoch moraine that rises at the mouth of the valley to stretch 10 miles out into the Alai.

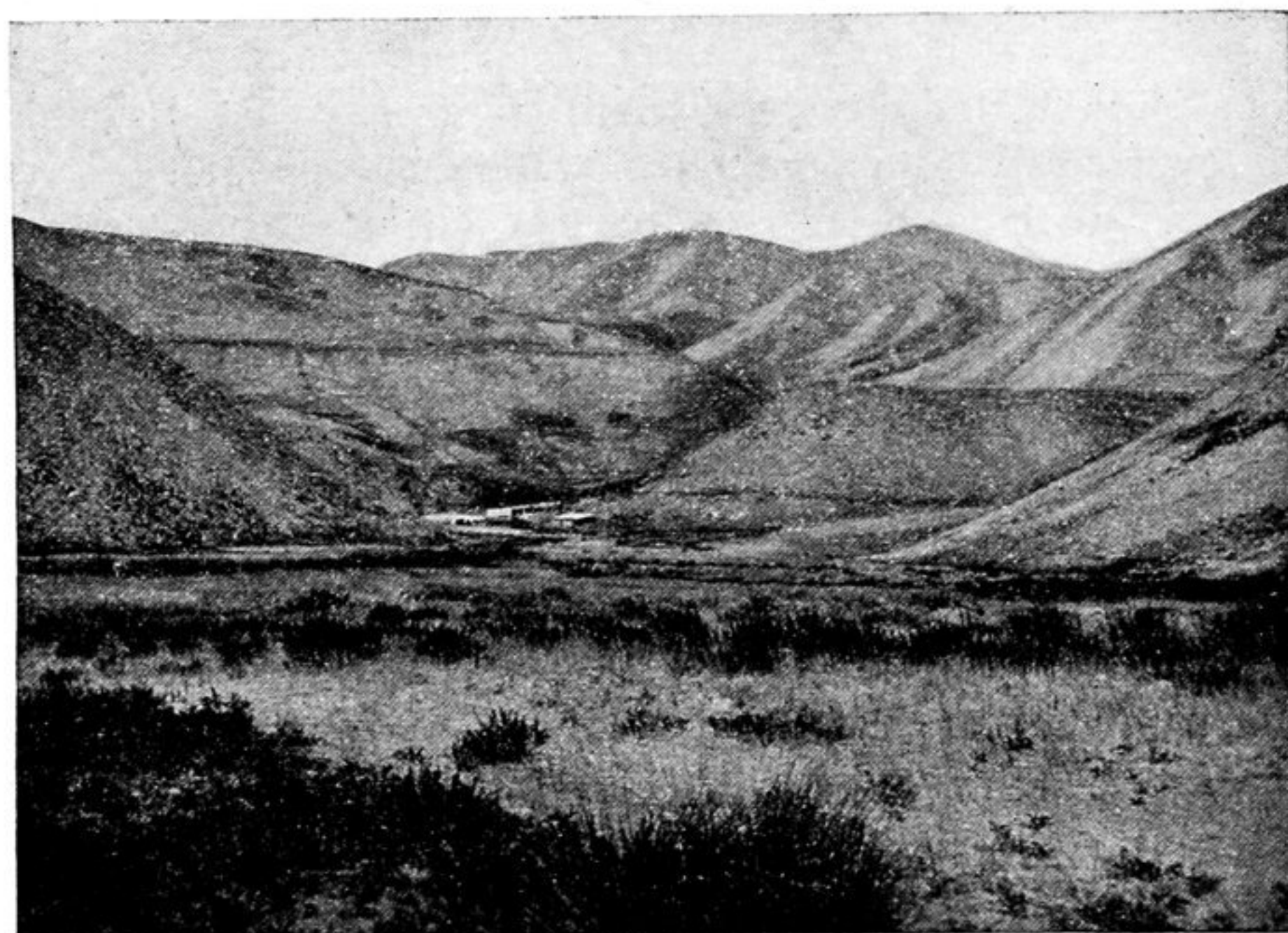


Fig. 441.—Alluvial Terraces in the Lower End of the Alai Valley.

Portions of its second-epoch moraine lie apparently faulted up on the terraces of its upper, broad-trough stage. Half-way down the Alai there is an uptilted mass of alluvium jutting out from its northern side as though more complicated deformation took place. In the eastern half of the valley tributaries from the north are deeply drowned in alluvium, as contrasted with those from the south, uplifted Trans-Alai, which have been canyoned postglacially. Terraces begin to flank the Kizil Su toward the outlet of the valley; and of these the higher are, as shown above, the result of cutting down since the first glacial epoch, while the lower appear to have been since the second. By early explorers these were taken for shores of an ancient lake; but they incline gently downstream, diverging somewhat above it, ascend into tributary valleys from the north as characteristic alluvial terraces, and in no way resemble those of a lake. It is, therefore, obvious that the Alai valley has suffered two distinct periods of mountain movement—