acid and bases are set free. These combine with more magma, and form acid and basic silicates. Further addition of water then sets up new decompositions, but some water always remains free in the magma, although on account of its relatively small amount it has a very low vapour-pressure, in accordance with Raoult's law. The process can go on till a great part of the magma is decomposed. The magma must also increase in volume on taking up water, by very nearly the volume of the water absorbed.

The swollen magma, which has also become more fluid, exerts pressure on all sides, and the column rises still further in the vent which is in connection with the magma-basin. On rising, the magma is cooled in the narrow vent, the water continuously becomes a weaker acid, and is displaced by silicic acid from the hydrates; the pressure of the aqueous vapour rises in spite of the fall of temperature, and if the watery layer comes near enough to the surface, and therefore under sufficiently low external pressure, steam explosions will occur.

According to this theory a volcano acts very like a geyser. As the water rises in a geyser, so it does in a volcano, though in this case it is mostly in chemical combination with the magma. At great depths, and therefore under high pressures, the water in the geyser and the watery magma in the volcanic vent are under higher pressures than those corresponding to the maximum tension of the water-vapour, and no explosion is possible. When a magma enters the vent of the volcano and rises in it, it at last reaches a point where, on account of separation of water from the magma through cooling, the pressure of the water-vapour exceeds the external pressure. Then an explosion occurs, blowing a passage through the overlying layers, and thus leading to renewed explosions by relief of pressure. This goes on till so much water has separated from the magma that the remainder cannot overcome the external pressure. Then ensues a period of temporary quiescence, with slow loss of water-vapour by diffusion, until after a sufficient lapse of time so much water penetrates into the magma-basin that the process begins anew.

REVIEWS.

I.—New Geological Survey Maps and Memoirs.

1. The Geology of Falmouth and Truro and of the Mining District of Camborne and Redruth. By J. B. Hill, R.N., and D. A. MacAlister, A.R.S.M., F.G.S.; with Petrological Notes by J. S. Flett, M.B., D.Sc. 8vo, cloth; pp. x and 336, 24 plates. Pages 1–112 form Part I, Geology; pp. 113–314 form Part II, Mining; pp. 315–324 are Bibliography; and pp. 325–335, Index. Price 7*s.* 6*d.*; in explanation of colour-printed map, Sheet 352, 1*s.* 6*d.* (E. Stanford: London, 1906.)
2. The Geology of the Country near Newquay. By Clement Reid, F.R.S., F.L.S., F.G.S., and J. B. Scrivenor, M.A., F.G.S.; with contributions by J. S. Flett, M.A., D.Sc., W. Pollard, M.A.,

https://doi.org/10.1017/S0016756800131747

D.Sc., and D. A. MacAlister, A.R.S.M. 1906, price 3*s*., 9½ inches by 6 inches; pp. iv + 131, with 6 plates (photographic process) and 23 figures. Pages 1–90 are devoted to Geology; pp. 91–119 form Appendix I, Mines; pp. 120–122 form Appendix II, Bibliography; pp. 123–131, Index. In explanation of Sheet 346.

AMONG the recent publications of the Geological Survey are Sheets 346 (Newquay) and 352 (Falmouth) of the New Series of one inch to one mile ($\frac{1}{63360}$) colour-printed maps of England and Wales, both dated 1906, price 1*s*. 6*d*. each. The area comprised in Sheet 352 extends from Gerrans Bay on the east to (and inclusive of) Camborne on the west, from Porthtowan on the north to Falmouth Bay on the south. The formations represented are in ascending order. I. The Mylor Series; in the south-west of the map it occupies almost two-thirds of the area represented, if we disregard the great granite masses intrusive in it. The Mylor Series encloses the various greenstones, the greater portion of the elvan dykes, and, in conjunction with the granites, almost the whole of the mineral lodes. II. The Falmouth Series occurs in several minor and three considerable areas—(1) between Porthtowan and Reskajeage Downs; (2) between St. Day and Truro; (3) on the coast of Falmouth Bay. III. The Porthscatho Series occupies a large area in the east and extends in a mile-wide band along the north of the area. IV. The Veryan Series is restricted on the map to a triangular tract of about half a square mile on Gerrans Bay.

In the legend of the map the preceding formations are merely bracketed together as Lower Palæozoic, but in the corresponding memoir they, together with the Lower Devonian Grampound Beds, which form a mile-wide strip along the northern margin of the map area, are grouped together as Killas, viz. slate deposits.

A deposit of quartz gravel, occupying an area less than half a mile in length and about a quarter of a mile in breadth, occurs near Polcrebo, in the heart of the granite district, and is mapped as Pliocene. "Raised Beaches, Head, Alluvium, and Blown Sand" complete the list of sedimentary formations. Perhaps the most interesting feature of the map is the rudely circular Carnmenellis boss of muscovite-biotite granite, about 9 miles in diameter, which occupies the south-west of the map. Like the two smaller adjacent granite masses of Carn Brea and Carn Marth, it is surrounded by an aureole of metamorphism. Intrusions of greenstone (largely referable to the group of epidiorites), elvan, or quartz-porphyry dykes, the latter generally trending about east-north-east (like the mineral lodes), and mica traps or minettes are also shown. The numerous mineral lodes of the area are almost entirely confined to the western district, and are mainly restricted to the neighbourhood of the granite, but continue to occur for a distance of 4 miles eastward of the granite.

A section below the map shows the structure of the country along a line from west-north-west to east-south-east, from Reskajeage Downs through Dolcoath Mine, Carn Brea, and Carnmenellis granite to Falmouth and Pendennis Point.

Sheet 346 (Newquay) shows the country immediately to north of that represented in Sheet 352, and includes Watergate Bay, Newquay,

Perranporth, and St. Agnes. About half the area represented is sea. In ascending order the formations shown are: (1) Dartmouth Beds (Lower Old Red Sandstone), purple and green fine-grained sandy micaceous shales or slates, with occasional bands of grit, and containing fish-remains (*Pteraspis cornubicus*, etc.). They occur in a faulted and much broken anticline which has its crest in Watergate Bay and measures 4¼ miles from east to west by 2 miles from north to south. (2) Lower Devonian Meadfoot Beds, which occupy about one-half of the land area shown, chiefly to south, but also in a narrow band to north of the Dartmouth Beds. The Meadfoot Beds consist of shales, slates, and thin limestones, and seem to rest quite conformably on and to pass gradually down into the Dartmouth Beds. (3) Lower Devonian Staddon Grits on the north, Ladock Beds (basal Devonian) on the south. These consist of silts, sandy slates, sandstones, and coarse grits. The Staddon Grits (so far as shown) occupy an area 3½ miles from east to west by 1¼ from north to south in the north-east corner of the map. They strike east-south-east, and this strike if prolonged would make them meet and be continuous with the similar grits of Ladock on the south side of the anticlinal axis (of Dartmouth Beds and Meadfoot Beds). The continuity, however, is broken by the intrusion of the St. Austell granite (not in map), so the southern area is treated separately. The Ladock Beds are continuous with the Grampound Beds of Sheet 352, and occupy an area 13½ miles from east to west by 4½ miles from north to south at the south of the map 346. Pliocene beds termed St. Agnes Sands and consisting of unfossiliferous sands and clays, forming an old shore-deposit, almost surround St. Agnes Beacon near the south-west coastline. They cover a crescentic area 1½ miles long along the curve by ¼ mile broad. Raised Beach deposits, Valley Gravel and Head, Alluvium and Submerged Forest, and Blown Sand are the remaining deposits shown. Granite occurs west of St. Agnes Beacon and at Cligga Head, and is surrounded in each case by an aureole of metamorphism. Elvans or quartz porphyries, lamprophyres or mica traps, and greenstones are shown.

A section below the map shows the structure of the country between Denzell Downs on the north-east cutting across the anticline of Devonian rocks, by Perranporth to St. Agnes Beacon on the south-west.

B. Hobson.

II.—Memoirs of the Geological Survey, England and Wales. Explanation of Sheet 311: The Geology of the Country between Wellington and Chard. By W. A. E. Ussher, F.G.S.; with contributions by H. B. Woodward, F.R.S., and A. J. Jukes-Browne, B.A., F.G.S. 8vo; pp. vi and 68. Price 1*s.* 3*d.*; colour-printed map, 1*s.* 6*d.* E. Stanford, 12–14, Long Acre, London, 1906. (Issued February, 1907.)

THE Geological Survey have issued (price 1*s.* 6*d.*) Sheet 311 (Wellington) of the New Series of one inch to one mile ($\frac{1}{63360}$) colour-printed maps of England and Wales. The area comprised in the map includes the southern suburbs of Taunton at the northern margin, Ilminster close to the eastern border, Chard 3¼ miles from the