In this account the author has purposely stressed the difficulties which arose in the different parts of the meteorological work at Maudheim. However, the difficulties were never greater than expected, and as a whole the work proceeded in a very satisfactory manner. When the final results are worked out they will provide valuable meteorological information about a part of the world about which little was previously known.

THE 'CHAINS' OF EXMOOR

By S. H. Burton

Author of 'Exmoor'

THE terrible flood that devastated Lynmouth on the night of 15 August 1952 was born on the lonely 'Chains' of Exmoor, 1,500 feet above the little town. Here the West Lyn and the principal tributaries of the East Lyn rise, and here, at Longstone Barrow, nine inches of rain were measured in the twenty-four hours of 15–16 August. Such a downfall is, of course, phenomenal and the meteorological aspects of the disaster are discussed elsewhere in this issue of *Weather*. Given such rainfall, however—or, indeed, anything approaching it—then certain topographical and geological features of the Chains make severe flooding inevitable and the purpose of this article is to throw some light on these.

The Chains is the name given to the north-west plateau of Exmoor. This plateau lies above the 1,500 foot contour, its higher points such as Chapman Barrows, Wood Barrow and Chains Barrow being nearly up to the 1,600 foot line. It is the watershed between the rivers flowing south and west—the Barle and the Exe and their tributaries, and the rivers flowing to the north—Farley Water and Hoaroak Water, the main tributaries of the East Lyn, and the West Lyn with its numerous feeders.

The soil of Exmoor is of two kinds. The dry-land soil is loamy on top and clayey below and drains rapidly. It is to be found mainly in the valleys of Exmoor and though it is deficient in lime, heavy dressings make it fertile. The wet-land soil is peaty. Just below the surface a thin ironstone pan occurs which prevents drainage until the pan is cracked by subsoil ploughing. Throughout the pioneering efforts of the Knight family (in the nineteenth century) to bring Exmoor under cultivation, this problem of drainage was uppermost. John Knight dug long drainage channels at the northern extremity of the Chains in an attempt to carry the water off the plateau and down into the lowlands. These gutters were quite ineffective; picks and spades made no impression on the iron pan. His son, Sir Frederic Winn Knight, employed steam ploughs in his attack on the wet-land soil of the moor, and by this method broke through the pan, bringing thousands of acres to good pasture. He did not, however, attempt to subdue the Chains which remain to this day the wettest and wildest region of the moor.

Very few of the thousands who visit Lynmouth every year have seen the Chains, though the heights of the moor hang over the little town. To reach the Chains from Lynmouth involves a climb of fifteen hundred feet in four miles, and that is not the worst part of the journey. No roads cross the Chains and the explorer must trust to ill-defined tracks. Even in a good summer the route is wet, and for yards at a time the walker must stride or jump from tussock to tussock to avoid the bogs where black water oozes sluggishly over sphagnum moss and under the white heads of cotton grass. It is hard going to reach Chains Barrow from the summit of which the structure of the watershed is plain. The northern and southern extremities of the plateau are jagged by the steep-sided combes in which the rivers rise; in between, a barren upland, open to the full force of the west winds and sparsely covered with forest grass, rolls drearily away.

Such is the setting in which Nature prepared the devastating blow that overwhelmed Lynmouth. The vast downpour that descended on the Chains was refused by the waterlogged, impervious land. Down every gully and natural depression, down the channels dug by John Knight, down the northward running combes, the thousands of tons of water flowed into the East and West Lyn rivers. Farley Water and Hoaroak Water joined the already swollen East Lyn at Waters Meet. Half a dozen streams converging at the head waters of the West Lyn brought the deluge from the western Chains, and at Barbrook Mill another influx from Woolhanger Common joined the raging torrent, sweeping bridge and houses away before starting the last deadly descent into Lynmouth.

Both the East and the West Lyn fall 1,500 feet in less than four miles. Even in times of normal rainfall the rush of their waters down the precipitous valleys is a fearful sight. In summer, it is true, in a dry spell, there is no more than a trickle at the bottom of the deep combes, but rain over the Chains transforms this trickle into a torrent very quickly: a torrent made dangerous by the great velocity imparted to the streams by the sharp declivity of their courses. The enormous rainfall of 15 August, the impervious Chains and the steepness of the terrain produced a flood that no barrier could resist. Boulders so huge that even bulldozers could not shift them, full-grown trees from the wooded Lyn gorge, were hurled with unbelievable violence at banks and bridges, battering them prostrate.

Down on the coast, where the East and West Lyn rivers meet, Lynmouth lay helpless in the path of the water. The valley in which the town stands is very narrow and the floods did not fan out until they had passed right through the town and reached the harbour. The houses and hotels huddling under the precipitous hills and crowding close to the river bank were exposed to the full fury of the torrent and the trees and boulders.

The culvert which piped the West Lyn under part of the town and into the East Lyn, became choked with debris. Impatient of the least restraint, the river swung back into its old course, mowing down the houses as a child

might sweep aside its building-bricks when the game had become tedious. I knew Lynmouth well, but when I visited the town soon after the disaster, I could not find my way about. Combined bombardment from the sea and air could not have wrought more fearful devastation than these twin rivers in that dreadful night.

We have records of previous flooding at Lynmouth ; the 1769 flood, for example, caused great damage to the town and the harbour, and the fishermen petitioned the Lord of the Manor to repair the quay in words sadly reminiscent of our description of the 1952 flood :

> 'The river at Lynmouth by the late rain rose to such a degree as was never known by the memory of any man now living, which brought down rocks of several ton each and choked up the harbour. . . . .'

In any scheme for the rebuilding of Lynmouth the menace of the moorland heights must be kept in mind, though, mercifully, it would seem very unlikely that a rainfall of this magnitude will occur over the Chains again for a very long time. Yet wisdom would, perhaps, dictate that the possibility of a recurrence should bulk more largely than its unlikelihood in the planners' blueprints.

THE EXMOOR CATACLYSM

By L. C. W. Bonacina

ON the evening of Saturday 16 August 1952, when news reached London of the sad disasters at Lynmouth, Dulverton, South Molton and other places in the Exmoor region, I remarked to a friend that some eight inches of rain must have fallen on the watershed, and next day there came the official announcement of a measurement of nine inches at Longstone Barrow. The *Daily Weather Report* showed a warm front, reported to be unstable to a great height, and a cold front not far behind it. The geographical location of these fronts, soon to be occluded, over the south-west of England was such that the air currents within the slow-moving depression saturated with vapour from the warm August seas, were being impeded and uplifted on their eastward course by the elevated ground of Dartmoor and Exmoor.

From the fact that four inches of rain were recorded at both Plymouth and Okehampton it is fairly evident that there was excessive rainfall also over Dartmoor, though there is a chance that this tableland could have taken nine inches of rain, had this amount actually fallen, with less tragic consequences to the surrounding country. Dartmoor is larger than Exmoor with more rivers near their sources to share the discharge of storm waters, and none of its flanks bears down on the sea coast, as does one side of Exmoor, in high ramparts of grand precipitous cliffs, with villages at their feet obviously at the mercy of any streams which might become unruly. So it is against such a physical background that one must picture those lovely Exmoor rivers Exe, Barle, Lyn and Bray, all cradled near one another amid the exquisite glens of the Lorna Doone country suddenly roused by a gigantic storm to dispense death and destruction all around.