

## THE DENT DU MIDI LANDSLIDE.

BY J. W. WYATT.

THE eastern slopes and precipices of the Cime de l'Est are drained by the St. Barthélemy torrent, which flows into the Rhône a little above Lavey-les-Bains. This torrent is divided into four distinct portions, a knowledge of which helps to appreciate both the causes and the results of this disaster.

On leaving its source, the outlet of the Plan Névé glacier, at about 8500 ft., the torrent falls down a very precipitous gorge with a drop of about 3000 ft. in a length of 1 km. Thence it has cut its way in a deep V-shaped trough through the alluvial and moraine-like soil of Jorat d'en Bas, falling a further 1500 ft. in  $1\frac{1}{2}$  kms. Here it enters a very narrow and precipitous gorge which it has carved for itself in the rocks for a distance of about 2 kms., with a fall of 2000 ft., to where it enters the valley proper at La Rasse. From this point it has, in the course of ages, spread out and formed a large river cone, known as the Bois Noir, roughly  $2\frac{1}{2}$  kms. long, with a fall of 700 ft., diverting the Rhône in a big bend from the Valais to the Vaudois side under the rock buttresses of the Dent de Morcles massif. A short distance above its junction with the Rhône both the railway and road bridges cross the torrent.

The primary cause of the disaster at first was thought to be a large pocket formed in the Plan Névé glacier, which finally burst and caused the slide; this, I think, has been disproved, as the snout of the glacier looks quite normal and the gorge below it is free of debris. On Friday, September 17, two days before the first great slide, large falls of rock were heard coming down from the Cime de l'Est, and a heavy cloud of dust was observed rising from the valley; it is surmised that this rockfall caused a barrage somewhere in the bed of the torrent till the water burst through and brought down an enormous volume of mud, detritus, and boulders. This swept through the Bois Noir, broke the road and bridge at La Rasse, carried away the trees by hundreds, and formed a lake of mud and boulders, in some places 300 to 400 yds. wide, and estimated from 20 to 50 ft. deep. This time it passed safely under the road and railway bridges, but filled up so much of the bed of the Rhône as to reduce it to half its proper width. Some of the blocks were as large as a small cottage or shed.

On September 25 we had thirty-six hours of heavy rain, which caused the second and much more serious disaster of the 26th. The flooded torrent completely carried away the railway bridge, broke the electric current, and embedded an engine and two carriages of a train caught by the mud stream owing to the cutting off of the power. It filled up the whole bed of the Rhône to a depth of 40 to 50 ft., thus diverting the river, then in flood, in the form of a huge inverted D; this carried away the high road to Moreles for a distance of 100 to 150 yds., as well as trees, meadows, a portion of the promenade of Lavey-les-Bains, and damaged the pumping station of the baths. I went up there the following day, and the scene was a remarkable one; the old bed of the Rhône looked like a flow of molten lava; there was no trace of railway or bridge, and the mass of mud and boulders was piled up in front of the train as high as the roof of the carriages; from time to time trees and soil were falling into the river, which was a raging torrent. Fortunately the road bridge was then intact, and passengers were transferred by a fleet of Government motor-buses and lorries, the through traffic being diverted over the Lötschberg line.

In about a week, by working night and day under the search-lights of the forts of St. Maurice, they were able to clear a single line, to erect a temporary bridge, and to run temporary steam trains. The larger blocks floating on the mud were blasted; but an attempt, by blasting, to cut a way for the Rhône failed completely.

Then, in the early morning of October 10, after more heavy rain, the mud stream started for the third time and broke this time the main-road bridge, but the temporary railway bridge was saved by a great mass piled up above the remains of the road bridge to a height of 9 to 10 ft. and fully 20 ft. deep to the torrent bed.

The stream has now cleared a deep channel for itself, which they are improving, and, granted reasonable weather, they may be able to cope with the situation without further disaster till the melting of the snows in the spring. Meanwhile parties of climbers, engineers, and experts are exploring the whole gorge and the slopes of the Cime de l'Est to see what can be done.<sup>1</sup> With colder weather the Rhône is not likely to give further trouble.

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<sup>1</sup> Their detailed report is to be issued later under the auspices of the Groupe de St. Maurice of the Monte Rosa Section of the Swiss Alpine Club.

I have been up three or four times, once to the foot of the Gagnerie at Jorat d'en Haut under the outlet of the glacier, and also up the gorge itself from La Rasse so far as it was safe or possible to go.

So far as I am able to form an opinion, I think the first cause was a barrage formed by the rockfalls from the Cime de l'Est, thus blocking the stream somewhere along the trough of moraine detritus near Jorat d'en Bas, and possibly also lower down in the gorge itself. When I was up there on October 4 the snout of the glacier looked quite normal, but the deep trough in the second portion had evidently been freshly cut into; the depth of the trough I estimated at from 100 to 150 ft., and boulders and detritus were falling down the sides the whole time, and on my way up, before leaving the wood, a very large avalanche went down the bed of the torrent below me with a noise of thunder. I could distinctly see two large light-coloured patches under the arête of the Cime, at a height of roughly 9000 ft., where presumably the falls had taken place, and small stonefalls were even then coming down now and again.

The causes of the second and third disasters seem fairly obvious and due to the stream, swollen by the rain, bringing down the mass of mud and rock spread throughout the Bois Noir.

The flowing mass, when it came down the first time, must have been a remarkable spectacle, for, when I went up the bed of the gorge, the remains of debris and mud were to be seen on the rocks, and on the bushes and trees on the edge of the ravine to a height of quite 30 to 50 ft., and even more in places. Also the forest high above the gorge on both sides was coated thickly with a white dust like dirty hoar frost.

The mud is now settling down or has been partly washed away by the rain, and the scene down the Bois Noir is an indescribable wilderness of boulders and silt, with broken and splintered fir trees sticking out in all directions, which the peasants are now digging out for firewood.

The weather during August, and especially September, has been exceptionally dry and warm, and I never saw the Dents du Midi with so little snow upon them; such conditions, I think, often cause rock and stone falls.

Gregory of Tours and Bishop Marius both record in detail similar disasters from this torrent dating as far back as the sixth century, and a peasant at La Rasse told me he remembered in 1877, as a lad, a bigger landslide than the present one, which carried away all the bridges but then stopped and did not recur. He also said there was a much smaller one twenty years later.