THE RADIO RECORD

Published Weekly

REGISTERED G.P.O., WELLINGTON, N.Z., AS A NEWSPAPER.

Vol. II., No. 41. WELLINGTON, FRIDAY, APRIL 26, 1929.

Earthquakes, their Cause and Effect

THE recent severe local earthquake at Arthur's Pass prompted the request by 3YA to Mr. H. T. Skey, Director of the Magnetic Observatory, Christchurch, to deliver a talk on Earthquakes, their cause and effects. As earth tremors and volcanic action are of general interest to New Zealanders, this paper is reproduced for the benefit of permanent record and the interest of those who did not hear it.

WHAT is an earthquake: also why? Well, most of us have felt one: things move, there is some noise, and we are glad it is over, for us; and next morning we look at the papers to see whereabouts it did most damage, and we naturally conclude that near there the trap went off, in the upper rocks of the earth's crust, and that there a large amount of "potential," or stored energy, suddenly became freed, or "kinetic," and had to spread out and distribute itself throughout the earth. Energy, we know, is the capacity of doing work, and so when the energy stored at a point becomes freed it immediately sets about doing work. How, then, does the energy become fixed, and how does it become freed?

MODERN science teaches us that the earth is almost entirely solid, with the exception of the sea on its surface. On the land, elevations are formed with mountains and valleys. The mountains have weight and must be supported by their stiffness and the stiffness of their surroundings. At the bottom of a large mountain such as Mount Rolleston the stress in the rock is tremendous, and it is not until a depth of about sixty miles below the surface is reached that the stress is uniform: this is called the depth of compensation, or the depth of the isostatic layer, because it is found that the total mass of rock above every large block of it is practically the same. Hence, under mountains the density of the material is less than under low plains or large valleys, and as the mountains become lower through denudation they must tend to rise, but to a less extent than they are denuded: hence denudation is a great cause of stress changes in the rock in mountainous country, and when in any part the stress exceeds the strength of the rocks that bear it and are elastically strained by it, even as the wound-up spring of a clock is strained, then the breaking point is reached, and an earthquake occurs. Very often the release of strain is accompanied by a marked dislocation of the strata, forming what is known as a fault, and in some cases the relative levels of the rocks on either side of a fault or crack may be altered by many feet, and the fault may extend to a length of over a hundred miles. In the great Californian earthquake of 1906 the fault movement occurred along the northern half of an already existing fault line, the San Andreas fault, which had been traced to a length of over six hundred miles.

IN the case of the recent earthquake near Arthur's Pass, and its aftershocks, the actual fault movement could not be identified on the surface, and can only be located precisely by the aid of field seismographs. The actual damage sustained at Arthur's Pass was confined to chimneys and fireplaces: one large concrete building sustained some cracks; the railway ballasting settled in parts and had to be made up; cracks appeared in filled-in roadways, and there were numerous rockfalls where the material had been insecure, along the valley of the Bealey river. There was no structural damage to the Arthur's Pass—Otira tunnel. In the Riviera earthquake of 1887 the shock was very weak, or not felt at all in the tunnels of the Nice to Genoa Railway, and none of the tunnels was damaged in the slightest degree, which is very reassuring.

AT Arthur's Pass the settlement is built largely on filled-in or made ground and in this an earthquake wave would have a much larger amplitude of movement than in the solid rock. It is this fact that contributed largely to the damage that did occur. At Otira, almost no structural damage was caused, and it is quite possible that the settlement was shaded from the earthquake waves, as frequently happens, even in railway cuttings of fair depth.

IN the largest earthquake shock at Arthur's Pass the energy was set free at 10hrs. 50min. 30secs. p.m. on March 9 last, while at the Observatory here (Christchurch), nothing happened till 10hrs. 50min. 42secs., and we know that the earthquake effect took about 12 seconds to travel from the origin to Christchurch, travelling through the earth just as a sound travels through a substance; and like the sound it travelled as a wave through the earth, in fact the first effect to reach us from an earthquake origin is just sound waves, mostly of extremely low pitch and mostly too low to be heard by us (except by the way objects are moved against one another), but near the origin higher pitched waves are heard as a roaring or rushing sound. But in an earthquake besides the sound waves produced at the origin, there are other kinds of waves produced in the earth. Chief

—Continued on page 2.