Earthquakes

(Continued from cover.)

among these is the "transverse" wave, which also travels out from the origin to carry away the energy that is freed. In this wave the movements of the earth particles in the advancing wave are at right angles to the direction in which the energy is travelling, while in the sound wave, or the "longitudinal" wave, as it is called, the relative movements of the particles in the advancing wave are to and fro, but in the same direction as the energy is travelling, so that it is a wave of compression, whereas the action in the transverse wave is a shearing action. Now, in all ordinary matter the resistance offered by the matter to a shearing action is less than the resistance offered to a compression, and thus it comes about that in the earth the transverse wave travels at a lower velocity than the sound wave does, in fact, at little more than half the velocity. At any observatory the times of arrival of these two waves of energy is observed on an earthquake recorder or seismograph, and from the time-difference, or the length of time elapsing between their respective arrivals, a very close estimate may be made of the distance of the observatory from the earthquake origin.

A THIRD kind of wave is also generated when an earthquake occurs. This is the "Long Wave," and its action is manifested at the surface of the earth, just like an ocean roller manifests itself on the surface of the sea, but with this difference: that the principal oscillatory motion occurs horizontally in the earth's surface, instead of vertically, as in the ocean roller. Now, these "long waves" on the surface of the earth travel outwards from the origin at even a slower speed than the transverse waves travel through the earth, and also help in the same way in obtaining an estimate of the distance of the observing station from the earthquake origin.

NOW for a few figures. It is found that the longitudinal or sound-wave takes nearly 23 minutes to go through the earth from one side to the other or along a diameter of the earth; they can go through anything, solid, or even liquid, hard or soft. But it is found that the transverse wave cannot go right through the earth in the same way, that is, through the earth's centre, because about two-fifths of the way down from the surface to the centre there appears to be a layer of matter that is too plastic or soft to resist a shearing action, so that the transverse wave cannot get through it; what happens to a transverse wave when it somewhat obliquely reaches this layer is that the wave is broken up; part of the energy of the wave is reflected and carried upwards again, and part of the energy is refracted down through the soft layer as a sound wave which travels on past the centre of the earth again encounters the soft layer, and, in passing through it the second time, is refracted and goes on upward through the harder material, partly as a transverse wave, and it ultimately reaches the surface and can be recorded there by a seismograph. The time it takes to travel is, of course, reduced because it has travelled through the earth's central core as a longitudinal or sound wave.

THE surface "long waves" from an earthquake origin take, it is found, nearly three hours to go right round the earth and return to their starting point; this they sometimes do repeatedly in the same earthquake. When an earthquake shock has occurred, we have these three sets of waves which go out from the origin, and among them carry away nearly all of the energy set free by the earthquake, and we naturally want to know what happens to them. Fortunately, the earth's material is not perfectly elastic, and it is not all the same; hence it happens that the waves die down; through friction and heat dissipation by conduction during the wave action in the earth, the whole of the energy of the waves becomes gradually converted into heat, and ultimately is spread throughout the earth; the earth becomes warmer ever so slightly, but this is hardly an adequate compensation for the loss of fifty thousand lives and immense damage to property, such as happened in the great Lisbon earthquake of November 1, 1755, which was severely felt over a great part of Europe. Three shocks and three sea fluxes occurred within about seven minutes of time. The shocks actually were felt over an elliptic area extending from the Canary Islands to Finland, with a width stretching from the north-west of Ireland to the Adriatic Sea.

Contrast this with New Zealand, where only two or three persons have lost their lives through earthquake action since the arrival of the European on these shores.

BESIDES faulting or fracture of the rocks, other causes of earthquakes are earth-slips and volcanic activities. Earth-slips strike a blow by the fall of the great mass of the slip; they are especially liable to happen at sea off the mouths of great rivers, which bring down matter denuded from the land and deposit it in the relatively still water of the sea, forming deltas, and often steep banks are formed under the surface of the sea, which easily break away.

VOLCANIC action is itself due to pressure movements in the earth's crust as a rule, and so is only a secondary cause of earthquakes. Volcanic earthquakes usually have origins quite near the surface of the earth; it is almost certain that the main volcanoes are a kind of insurance against the growth of immense stresses in the earth's crust, which ultimately would cause earthquakes of extremely disastrous extent.

The late Dr. Omori, a great Japanese seismologist, from an immense number of observations drew a graph of the precipitation on the western ranges of Japan; he also drew a graph of the frequency of earthquakes in a certain large area in Japan, for the same time; the parallelism of the two graphs was astonishing, and showed definitely that earthquake occurrence is determined very largely by the unequal loading of the earth's crust and the consequent tendency to isostatic action therein.

FROM earthquake data contributed by observations at a great number of places on the world's surface, Professor Turner, of Oxford, with his assistants, has determined the depths of origin of many large earthquakes of recent years; he finds that some appear to originate at depths up to one twenty-fifth of the earth's radius, much below the proved depth of compensation in the earth's crust. One would hardly expect the earth's substance below the depth of compensation to be fragile or breakable, or that stresses could accumulate in it, as it becomes of importance that, in civilised countries, any earthquakes occurring should have their depths of origin determined as accurately as possible on the spot, by the use of proper seismographs of modern type.

Baird Television

Visit of an Expert

An interview at Fremantle with Major J. M. Maclulich, of London, suggests the great possibilities of television. Major Maclulich, who reached Fremantle on the liner Orama from London, is a wireless and television expert. He is nominee director of Baird's Television Co., and will organise television in Australia.

Returning from the war a wounded man who would never enjoy perfect health again, Major Maclulich, under medical advice, took up a hobby. With wireless telegraphy he occupied his time on the Riviera, in Spain, and in Italy. His hobby grew until it became his business, and he became known after his return to England as an expert in wireless telegraphy and television. His mission at the present time is to place television in several of its phases into operation in Australia and New Zealand.

"At present," Major Maclulich said, "my plans are very nebulous. The Commonwealth Government's action in entering the broadcasting field is one which I must study carefully before I announce any plan of operation, but I feel certain that before long television will be in operation in Australia."

Commenting on the latest developments in television, Major Maclulich said that tremendous strides had been made in the last few months. The value of the invention was so tremendous that private experiments were being made secretly in London in order to effect improvements. It was now possible to sit quietly at home and listen to a famous opera singer, and at the same time watch him as he acted his scene. It was possible, though it wasg not actually done, to telephone to a store hundreds of miles away, see, select the goods required, and place an order without leaving home. A furniture dealer could select tapestry or a society woman an expensive frock by telephone. There were no limits to the possibilities of the invention.

Commenting on the invention the Melbourne "Argus" asks: "What is television? Can it be kept within bounds as a good servant, or will it eventually become a bad master? Thoughts such as this are provoked by the arrival at Fremantle of Major Maclulich, an expert in television, who has come to explore the ground with a view to introducing the invention to Australia. Doubters would like to be assured just how far the system will go. Will one be able to ring up, or otherwise conjure up, an unwilling 'televisee,' just as the person with an ordinary telephone can unexpectedly call anyone to-day? It is one thing to be called; it is another to be seen. One may compose one's voice over a wire, no matter what one's state of deshabille, but it would be both embarrassing and undignified to be seen actually thus unprepared. It is always proper for little children to be seen and not heard, though modern children never are; but there are times when adults would fain be heard and not seen. And what of one's privacy at home or in the office if any and every caller by television could instantly see everything going on within range of the person called! This new industry is pre-eminently one in which 'safeguarding' is called for.'