

substance on which it is delivered with the rapidity of *sound* in that substance. Perhaps it may be new to many who hear me to be told that sound is conveyed by water, by stone, by iron, and indeed by everything, and at a different rate for each. In air it travels at the rate of about 1140 feet per second, or about 13 miles in a minute. In water much faster, more than four times as fast (4700 feet). In iron ten times as fast (11,400 feet), or about 130 miles in a minute, so that a blow delivered endways at one end of an iron rod, 130 miles long, would only reach the other after the lapse of a minute, and a pull at one end of an iron wire of that length, would require a minute before it would be felt at the other. But the substance of the earth through which the shock is conveyed is not only far less elastic than iron, but it does not form a coherent, connected body; it is full of interruptions, cracks, loose materials, and all these tend to deaden and retard the shock: and putting together all the accounts of all the earthquakes that have been exactly observed, their rate of travel may be taken to vary from as low as 12 or 13 miles a minute to 70 or 80: but perhaps the low velocities arise from oblique waves.

(23.) The way, then, that we may conceive an earthquake to travel is this,—I shall take the case which is most common, when the motion of the ground to-and-fro is horizontal. *How far* each particular spot on the surface of the ground is actually pushed from its place there is no way of ascertaining, since all the surrounding objects receive the same impulse almost at the same instant of time, but there are many indications that it is