

into ordinary noise, pleasant music or intelligible speech, according to the manner and instrument of production — all this is the object of the present essay.

Before we can hope to attain to a fundamental knowledge of the method in which sound is produced, we must be acquainted with three conceptions of general physics:—(1) the pendulum and its motion; (2) the atomic formation of matter; (3) the property of elasticity in bodies. Hence a few words on each of these will not be amiss.

A pendulum, forced from its ordinary vertical position, will swing to a certain height until the force imparted to it is expended. But then by virtue of its position and under stress of the attraction of gravity, the pendulum descends at a speed that constantly accelerates until the original vertical position is reached. In this position the speed is at its maximum, and the momentum of the pendulum is sufficient to carry it past the vertical position to a certain height where the acquired force is spent. The same proceeding now follows again and in an exactly similar way. The to and fro movement is called an oscillation and the great law of the pendulum as deduced by Galileo is that the oscillations are isochronous; or, in other words, that, for the same pendulum the time occupied in an oscillation is independent of the extent of that oscillation, a fact which may easily be demonstrated by actual experiment, and indeed was first noticed by Galileo in a swinging chandelier.

As regards the second conception, that of the atomic formation of matter, it is necessary only that we should know that all matter consists of minute particles called atoms, which are free and independent of each other, and are at liberty to move without disrupting the body they compose.

By the third conception, the elasticity of bodies is meant the property in the atoms of some bodies which causes them to return to a position of equilibrium after oscillating on either side of it under strain of some force applied.

We may now pass to the application of these conceptions to the production of sound. I wish to show that sound is the result of vibration and must therefore show the possibility of vibration in bodies. Now regard each atom—or molecule, if you wish—of a body as a pendulum which may be forced from its natural position of equilibrium by some force. It travels a certain distance until the force is expended: then the cohesive force—or elasticity of the body—asserts itself (replacing gravity in the case of the pendulum) and the atom returns at a constantly increasing speed, passes its natural original position and travels a certain distance on the opposite side. Now these oscillations