

latter opinion is very emphatically expressed by Bacon.¹ "The collision or thrusting of air, which they will have to be the cause of sound, neither denotes the *form* nor the latent process of sound; but is a term of ignorance and of superficial contemplation." Nor can it be justly denied, that an exact and distinct apprehension of the kind of motion of the air by which sound is diffused, was beyond the reach of the ancient philosophers, and made its way into the world long afterwards. It was by no means easy to reconcile the nature of such motion with obvious phenomena. For the process is not evident as motion; since, as Bacon also observes,² it does not visibly agitate the flame of a candle, or a feather, or any light floating substance, by which the slightest motions of the air are betrayed. Still, the persuasion that sound is some motion of the air, continued to keep hold of men's minds, and acquired additional distinctness. The illustration employed by Vitruvius, in the following passage, is even now one of the best we can offer.³ "Voice is breath, flowing, and made sensible to the hearing by striking the air. It moves in infinite circumferences of circles, as when, by throwing a stone into still water, you produce innumerable circles of waves, increasing from the centre and spreading outwards, till the boundary of the space, or some obstacle, prevents their outlines from going further. In the same manner the voice makes its motion in circles. But in water the circle moves breadthways upon a level plain; the voice proceeds in breadth, and also successively ascends in height."

Both the comparison, and the notice of the difference of the two cases, prove the architect to have had very clear notions on the subject; which he further shows by comparing the resonance of the walls of a building to the disturbance of the outline of the waves of water when they meet with a boundary, and are thrown back. "Therefore, as in the outlines of waves in water, so in the voice, if no obstacle interrupt the foremost, it does not disturb the second and the following ones, so that all come to the ears of persons, whether high up or low down, without resonance. But when they strike against obstacles, the foremost, being thrown back, disturb the lines of those which follow." Similar analogies were employed by the ancients in order to explain the occurrence of Echoes. Aristotle says,⁴ "An Echo takes place, when the air, being as one body in consequence of the vessel which bounds it, and being prevented from being thrust forwards, is reflected

¹ *Hist. Son. et Aud.* vol. ix. p. 68. ² *Ibid.* ³ *De Arch.* v. 3. ⁴ *De Anima*, ii. 8.