

by Mozart to sing c in alt, three octaves above middle c (2,048 vibrations), while the lowest is that of Gaspard Forster, who gave a note nearly three octaves below the middle c (42 vibrations). Musical sounds begin with about 32 vibrations per second. These two voices, therefore, had a range of about six octaves, but the usual range between the lowest bass and the highest soprano of ordinary voices is three octaves. The human ear passes in range from 32 to 33,768 vibrations per second, or about eleven octaves, and it is interesting to notice that the range of the human voice occupies about the middle of that vast range. It is said that some have been able to hear tones produced by 40,000 vibrations per second. The tone of the 32-foot organ pipe is produced by about 32 vibrations per second, while the highest tone of the organ, that of the piccolo stop, is produced by about 4,000 vibrations per second. With reference to these figures it is interesting to compare the range of the human voice.

138. Loudness or *intensity* depends on the amplitude of the vibrations of the cords—the