the partial tones change in pitch with every change of vowel effect. The loud fundamental is due to the vibration of the vocal cords, and the "partial tones" are caused by the resonance of the air in the cavities of the mouth.

"What do you mean by 'the resonance of the air in the cavities of the mouth?" I fancy some of you ask. In order to answer this question I have brought a few empty bottles from the diningroom table and from the kitchen of the hotel. Here we have a pepper-pot, a pickle-bottle, a mustard-pot, a vinegar-bottle from the cruet-stand, and a few other bottles of different shapes and sizes. Now let me blow into the mouth of one of these bottles. At once you hear a musical tone something like that produced by an organ pipe. I shall now blow into the mouths of the others. You observe that each bottle has a resonance tone of its own. In some cases the pitch is high, in others low. Observe the pitch of the bottle I hold in my hand. I shall now pour in a little water so as to reduce the air space within. The bottle produces a tone of higher pitch than it did before. I pour in a little more water and again the pitch rises. In fact, the smaller the cavity is made the higher does the pitch become. Now you have in your mouth a bottle-shaped cavity, and in this case also the air within has a tendency to vibrate at a definite rate so as to produce a musical tone. When the size of the cavity is reduced by elevating the tongue and bringing it further forward in the mouth, the pitch becomes higher, just as the tone produced by the bottle rose in pitch when I poured in water. I am afraid you would hardly like me to demonstrate the truth of this statement by blowing into your mouth as I did into the bottle! If you are anxious to make the experiment you can blow into your own mouth with a pair of bellows! A still simpler way, however, of testing the effect is to blow air through the mouth from the lungs. For example: whistle. The pitch of the whistle rises as the tongue is advanced in the mouth.

Let me direct your attention once more to the bottle. The pitch rose when I poured in water, and of course I can lower it again, if I choose, by pouring out the water. Instead of doing this, however, I shall change the pitch in another way, without varying the size of the air space within. While I blow into the bottle I shall gradually cover its mouth with my hand. The tone, you observe, falls in pitch as the orifice is reduced. You see from this that you can vary the pitch; (I) by varying the size of the cavity, and (2) by changing the size of the opening into it. Allow me to illustrate these two ways with my mouth.