in some circumstances or effects, when the things are otherwise entirely different. But the respects in which these two instruments differ, are such that the action of the one is, it seems to me, no explanation of the action of the other.

In the telephone the loose carbon particles constitute a poor connection between the two ends of the wires, and so the current that passes is weak. The voice causes the disk, in which one of the wires terminates, to vibrate, and by its backward and forward movement, alternately to increase and decrease its pressure on the particles of carbon, and consequently to increase and decrease the compactness of these particles. The more compact the particles are, the better will the connection between the two wires be, and the stronger will be the current that will pass. To each vibration, consisting of a backward and a forward movement of the disc, correspond a strengthening and a weakening of the current. When the current is strengthened at the transmitter, it is strengthened all along the circuit, and therefore also at the receiver or ear-piece, the magnetism of the electromagnet in the ear-piece is increased, and the disc is jerked towards the magnet. When the current weakens, the opposite happens ; the magnet loses part of its attraction for the disc, and the disc regains its former position. In this manner the disc of the ear piece follows all the movements of the disc in the transmitter, and reproduces the sound of the voice. But the Morse telegraph is an altogether different instrument. Its action is not due to slight increases and decreases in the strength of a current already circulating, but to makes and breaks in the circuit of a current. The explanation above quoted, might account for slight variations in the strength of a current that would already be circulating through the filings, for the Hertzian waves have a slight mechanical action, and might, to some extent, pack the filings. Hertz detected this mechanical action of the waves, by causing them to strike against a small tube of gold paper, very delicately suspended in their path. But the mechanical pressure of the waves is not sufficient to account for changes in the conductivity of the filings, so great as to produce complete makes and breaks in the circuit of the relay battery.

Besides, if the action of the waves were simply mechanical like the action of sound waves on the transmitter of the telephone,