

Such, in its outline, is the Marconi system of wireless telegraphy. Some details still however require attention.

One end of the coherer is connected with the earth, and from the other rises a long vertical wire *w*, similar to the one already described as being attached to one of the spheres of the sender. These wires greatly increase the distance at which it is possible to telegraph. It has been found that the distance, to which the message can be transmitted, varies as the square of the height of the vertical wires. If wires forty feet high are required to telegraph a distance of four miles, wires eighty feet high will telegraph sixteen miles. It seems that the advantage afforded by these wires consists in this, that the oscillating discharge, between the two spheres of the sender, causes the whole of the wire attached to one of the spheres to vibrate, and then the whole wire radiates Hertzian waves. Similarly, the whole wire attached to the coherer is affected by the Hertzian waves, and the effect on the coherer is greater than if the filings alone were exposed to the waves. A horizontal wire, used alone or with the vertical wire, adds nothing to the effect. The reason is, it seems, that the motion of the waves is perpendicular to the direction of the wire. Thus, if the wire is horizontal, the waves will have an up and down motion, like the waves on the surface of water. Consequently, they will be reflected upward when they strike the surface of the earth, and, meeting with other waves coming directly from the sender, will produce phenomena of interference, similar to the interference of light, and the effect will be greatly diminished. But when the wire is vertical, the waves have a horizontal motion and glide along with a serpent-like movement over the earth.

These wires radiate Hertzian waves in all directions, so that any person provided with a receiver can read the message. When it is desirable to send messages exclusively to one station, the vertical wire and earth connection are omitted in the sending apparatus, and two larger spheres are placed between the two small spheres. A parabolic metal mirror is placed behind the spheres, and reflects the Hertzian waves in one direction. Any metallic surface reflects the rays. A similar mirror is placed behind the coherer of the receiver, and the vertical wire and earth connection are replaced by short strips of copper that protrude from each end