

I'm reading Tesla's [Colorado Springs Notes](#) and was wondering if you could clarify a couple of points. Are there any pictures of his rotating coherers? Also, what would allow electricity to be transmitted through the earth to great distances as Tesla proposed without loss of power?

The coherer is the component in Tesla's receiver circuits which 'detects' the energy of incoming surface waves and space waves. It is actually called a "detector." Another early detector, invented by B.F. Miessner, is the "cat's whisker" detector used in older crystal radios. The introduction of the Audion triode vacuum tube detector was the next major improvement in receiver design. Tesla wrote about the application of vacuum tubes for this purpose stating, "this is undoubtedly the most delicate wireless detector known" [[The True Wireless](#)].

I'm not aware of any photos of the rotating coherer. The best image I know of is the drawing on page 99 of the [Colorado Springs Notes](#), a copy of Tesla's drawing. The term "coherer" relates to the manner in which such devices function. Their operation depends upon the creation of an imperfect connection between two or more electrical conductors. The construction can be as simple as crossing two oxidized copper wires one on top of the other. As an increasing voltage from a battery is placed across the two conductors, a point is reached at which the imperfect, high-resistance junction abruptly changes to a low-resistance junction, the junction (or junctions) "cohere" together, and much greater current flows. The form of coherer used for wireless communications typically consisted of a glass cylinder partially filled with small metal particles, with electrical terminals at both ends. The trick to making a coherer sensitive to wireless signals is to set the battery voltage at a level just below the point at which the device shifts to its low-resistance state. Connect a ground and an antenna, one on either side of the coherer, and an incoming signal of sufficient strength will make it conduct. The additional current flow can be used to close a relay, thus indicating the presence of the signal. The act of restoring the junction to its high-resistance state--decohering--involves creation of a mechanical disturbance of the device. This can be done by simply tapping it, or, as Tesla apparently conceived, rotating it.

See [Tesla's Colorado Springs Lightning Observations](#) for a short write up on Tesla's July 4, 1899 electrical-storm observation and the receiver that was probably used. See also Tesla's July 28 diary entry for a description and drawing of what appears to be a preferred receiver configuration.

It should be noted that Tesla called his method of wireless transmission and reception the "disturbed charge of ground and air method." The implication is that the electrical influence of the transmitter in both the earth as well as the space above it is involved in the propagation of the signal.

About Tesla's claim for transmission by earth currents with only minimal losses, he made a point of describing the process as being much the same as sending electricity through a wire. In his system the physical conductor is the earth itself. Compared with, say, copper wire, one might not think that dirt, rock, etc. would make a very good electrical conductor. Actually, the Earth's vastly greater cross-sectional area provides a remarkably low resistance path for the flow of earth currents. The greatest losses are apt to occur at the points of connection of the transmitting and receiving apparatus with the ground. This is why Tesla stated,

"You see the underground work is one of the most expensive parts of the tower. In this system that I have invented it is necessary for the machine to get a grip of the earth, otherwise it cannot shake the earth. It has to have a grip on the earth so that the whole of this globe can quiver, and to do that it is necessary to carry out a very expensive construction." [[Nikola Tesla On His Work With Alternating Currents](#), p. 203, Appendix II, Foreclosure Proceedings]