Telephony 101 – Bell's Receiver November 28, 2012

Hello All,

As always, please send any questions about the reading assignment directly to me at oldtimetelephones@goeaston.net. I will bundle questions if necessary, repeat the questions, and give answers in an e-mail to the TCI List Server before moving on to the next reading assignment. This way everyone will benefit from these questions and answers. By sending questions directly to me, we will avoid unnecessary clutter on the List Server. Previous reading assignments, notes, questions, and answers are available in the TCI Library at http://www.telephonecollectors.info/telephony-101/.

Please start reading Chapter 3 on p. 25 and continue to the bottom of p. 27. We'll take up the acoustic and electrical properties of receivers in the next reading.

I'd like to focus on general concepts first and then get to the fine points next. If you haven't gone over this before, you are probably going to be surprised.

Go back to Bell's patent drawing in Fig. 1-10 and just ignore the speaking funnel (A) and the listening funnel (L). The transmitter and the receiver in Bell's original concept are absolutely identical! You will see in Chapter 3 that essentially all future receivers operate on the principle shown in Fig. 1-10. So you can build two of the same devices and use one for a transmitter and one for a receiver, which was done with the Butter-stamp telephones on the Williams' "coffin" set (we'll get to all this in later chapters).

What's even more surprising is that these "telephones," as Bell called them, operate by completely different principles when transmitting and when receiving.

When transmitting, the principle involved is the observation of Faraday and Henry. The moving metal armature (c, same as h) alters the magnetic field and this changing field induces a current in a nearby wire (coil b, same as f).

When receiving, the principle involved is the observation of Oersted. A current through a wire (coil f, same as b) creates a magnetic field. This magnetic field pulls on an armature (h, same as c). So a receiver is an electromagnet, which is similar to the receiver in Bell's multiple telegraph except that the geometry is changed so you can listen to the vibrations of the reed (now a diaphragm).

Although I have known about this for years now, I don't think I ever actually tried it. So yesterday, I took two U1 receivers off the shelf, removed the varistor to avoid any complications (probably wouldn't have been any), and connected them to the ends of a pair of wires about 75-ft long. With my wife at one end and me at the other, we were able to converse easily with each other – no other circuit components, no batteries, nothing else – just as Bell described to Hubbard in his letter of June 2, 1875.

Now to the finer points. Why is there always (well, almost) a permanent magnet in a receiver? The answer to prevent doubling the frequency, and this is described pretty well on p. 26. I was really surprised when I learned about this doing research for the book. To me, the patent Bell filed in January 1877 – less than a year after his original patent – shows again how much Bell understood the physics of what he was doing and how quickly he was learning. Amazing.

If there are any questions about the current reading assignment, we will deal with the questions before moving on to the next reading assignment.

Ralph