Telephony 101 – Electromagnets and the Telegraph November 4, 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.

Please read the first two paragraphs in the section on Magnetism in the Appendix (p. 227) and the first two paragraphs about the Morse telegraph in Chapter 1 (p. 12).

Electromagnets can be understood by starting with Oersted's observation. Current moving through a wire produces a magnetic field around the wire. Now take that wire and put a loop in it. At the place where there are two wires side by side, each wire produces a magnetic field and together the field is twice as strong as around a single wire. Next put 100 turns or 1000 turns in the wire forming a coil. The magnetic field is 100 times or 1000 times that of a single wire.

Finally stick a piece of soft iron inside the coil of wire and the magnetic field is enhanced perhaps another 1000 times. Amazing, but true. How this happens is described in the section on Magnetism in the Appendix. You won't have to remember anything about magnetic dipoles or domains, but you do need to keep in mind that soft iron is used in the core of electromagnets while steel (i.e., hardened iron) is used in permanent magnets.

You should now be able to understand the circuit in Fig. 1-2. The battery (symbols are defined on the first page of the Appendix) provides a voltage to push current around the circuit. When the key (switch) is closed, the current flows. When the current flows through the coil it produces a magnetic field, which is magnified many times by lots of turns of wire and the soft iron core. This strong magnetic field pulls the spring-loaded armature (a soft iron bar) off the stop and it goes "click" when it hits the core of the electromagnet. Let up on the key thus opening the switch, the current stops, the magnetic field collapses, and the spring-loaded armature bangs back against the stop with another "click." A telegrapher listens to the clicks.

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

Ralph