CLAIMS

What is claimed is:

1. An electromagnetic ranging source that comprises:

a tubular body having a circumference, wherein the tubular body forms part of a drill string;

a ferromagnetic core conforming to the tubular body and extending at least halfway around the circumference to define a gap with circumferentially-spaced poles;

one or more current-carrying windings around the core to induce a magnetic field between the poles; and

a downhole power source that drives the one or more current-carrying windings, wherein the ranging source provides a time-varying magnetic field as a ranging beacon to guide drilling of a second well relative to a first well.

2. The ranging source of claim 1, wherein the tubular body comprises a non-magnetic steel.

3. The ranging source of claim 1, wherein the gap extends no more than 90º of the circumference.

4. The ranging source of claim 3, wherein the gap has a circumferential dimension of at least 2 cm.

5. The ranging source of claim 1, wherein the gap has a long dimension parallel to an axis of the tubular body.

6. The ranging source of claim 1, wherein the gap has a long dimension that is angled with respect to an axis of the tubular body.

7. The ranging source of claim 6, wherein the core is angled with respect to the axis of the tubular body.

8. The ranging source of claim 1, wherein the downhole power source provides pulsed or alternating current.

9. The ranging source of claim 1, wherein the downhole power source is a flow-powered electrical generator.

10. An electromagnetic ranging method that comprises:

deploying a first drill string in a first borehole, the first drill string having an electromagnetic ranging source having a ferromagnetic core conforming to a circumference of a tubular body and extending at least halfway around the circumference to define a gap with circumferentially-spaced poles, the source further having one or more current-carrying windings around the core to induce a magnetic field between the poles, wherein the ranging source provides a time-varying magnetic field as a ranging beacon;

deploying a second drill string with sensors in a second borehole; and

determining distance or direction between the first drill string and the second drill string based on magnetic field measurements obtained by the sensors in response to the ranging beacon; and

extending the second borehole based on the determined distance or direction.

11. The method of claim 10, further comprising causing a downhole power source to drive the one or more current-carrying windings with pulsed or alternating current.

12. The method of claim 10, further comprising circulating a fluid through the first drill string, thereby powering a downhole electrical generator that is coupled to the one or more current-carrying windings.

13. The method of claim 10, further comprising rotating the first drill string to modulate the magnetic field.

14. The method of claim 10, wherein said drilling a second borehole includes intersecting the first borehole.

15. The method of claim 14, wherein prior to their performance, said assembling and drilling were contingent upon occurrence of a well-control problem in the first borehole.

16. The method of claim 14, further pumping a kill fluid into the first borehole via the second borehole.