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Danish scientist Hans Christian Orsted discovered in 1820 that electric currents create magnetic fields. British scientist William Sturgeon invented the electromagnet in 1824. His first electromagnet consisted of a horseshoe-shaped piece of iron that was wrapped with about eighteen turns of bare copper wire The iron was varnished to insulate it from the windings. When current was passed through the coil, the iron became magnetized and attracted other pieces of iron; when the current was stopped, it lost its magnetic property. Sturgeon displayed its power by showing that although it only weighed seven ounces, it could lift roughly 4 kilogramâ€™s when the current of a single-cell battery was applied.

Since 1827, US scientist Joseph Henry methodically improved and popularized the Electromagnet. By using wire insulated by silk thread he was able to wind multiple layers of wire on cores, creating powerful magnets with thousands of turns of wire, including one that could support 936 kg. The first major use for electromagnets was in telegraph sounders. The magnetic theory of how ferromagnetic cores work was first proposed in 1906 by French physicist Pierre-Earnest-Weiss and the detailed modern quantum mechanical theory of ferromagnetism, which was worked out in the 1920s by Warner Heisenberg, Lev Landau, Felix Bloch and others.

The direction of magnetic field through a coil of wire can be found from a form of the right hand rule; the fingers of the right hand are curled around the coil in the direction of current flow (conventional current flow of positive) through the windings, the thumb points in the direction of the field inside the coil. The side of the Electromagnets that the field lines emerge from is defined to be the North Pole. The main advantage of an electromagnet over a permanent magnet is that the magnetic field can be rapidly manipulated over wide range by controlling the amount of electric current. However, a continuous supply of electrical energy is required to maintain the electric field.

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