In 1831, Michael Faraday discovered that if there was a change in magnetic flux though a surface, an electric current appeared in a conductor on the periphery of the surface. This great discovery triggered the second, major phase in the Industrial Revolution in England, and then in the world.

This discovery morphed into the assertion that if there was a change in magnetic flux through a surface, a voltage developed around the periphery proportional to the rate of change of magnetic flux. Indeed, this voltage was measured by Faraday and later by others. A further alleged advance in rigour was the restatement of Faraday's discovery in mathematical terms; v = d{phi}/dt.

Let us look at Faraday's Law of Induction in the light of today's high speed digital electronic systems.

A 10v battery is connected via two switches to two parallel perfect conductors in a vacuum. We close the two switches, and a Transverse Electromagnetic Wave {TEM} travels to the right at the speed of light, one foot per nanosecond.

After 20 nsec, a voltage should register on the voltmeter to the right, because of the changing magnetic flux in the conducting loop connected to it. However, the meter measures zero.

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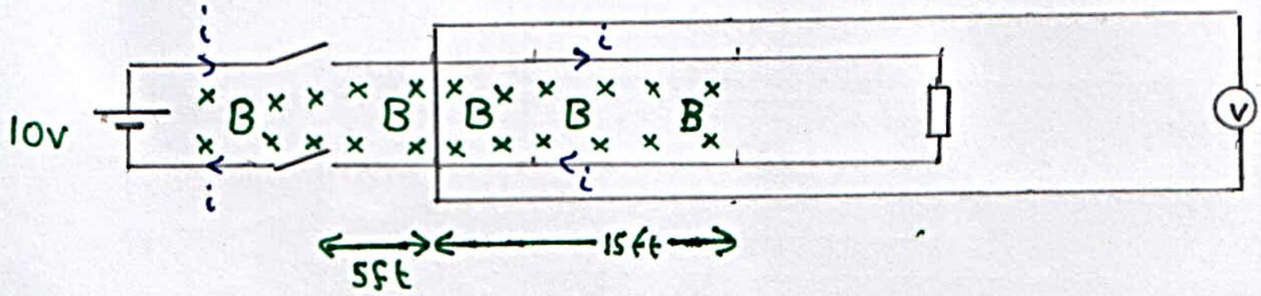
Faraday's Law of induction



t = 0   Switches close

t = 20nsec   →   t = 20nsec   v = 0

<u>But</u> $v = -\frac{d\phi}{dt}$