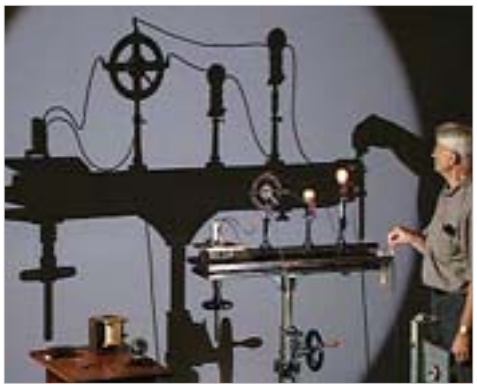
The Physics Experiments of Robert Wichard Pohl (1884–1976)

For decades, Robert Wichard Pohl taught his famous lectures of introductory physics in the old lecture hall of the Physics Institute at Goettingen University. These lectures became the foundation for three volumes entitled „Introduction into Physics". Now, using Professor Pohl's original instruments in the same lecture hall in which he taught, this set of videos captures his extraordinary ingenuity and once more brings to life Pohl's great experimental skills.



Rotating magnetic field

Video title: Rotating magnetic field

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Series title: The Physics Experiments of Robert Wichard Pohl (1884-1976)

Abstract: A rotating magnetic field results from the superposition of two magnetic fields oriented perpendicularly to each other, which vary sinusoidally with equal frequency , but with a phase difference , ideally of 90 degrees.

Source: Pohls Einführung in die Physik - Elektrizitätslehre und Optik. Lüders, Klaus; Pohl, Robert Otto (Hrsg.) 22. Aufl., 2006, Springer Berlin Heidelberg New York; p. 129

Key words: Electromagnet, alternating current, choke, capacitor, phase difference

Goal of the experiment: Generation of a magnetic field which rotates around an axis.

Experimental setup: Four electromagnets are radially arranged on a circle.Alternating currents flow through them, with the two electromagnets opposite to each other connected in series. In the space between the electromagnets, an iron disk can rotate around an axis which is perpendicular to the circle. If the two currents have equal amplitudes and phases, the resulting magnetic field will be linearly polarized, oscillating under 45 degrees. A phase difference will lead to a rotating field which will rotate the disk.

Experiment: First, a resistor is inserted in the circuit driving the two horizontal electromagnets. The resulting field is linearly polarized, the iron disk remains at rest (the two light bulbs indicate that the two currents are nearly equal). Then, the resistor is replaced with a choke. The disk begins to rotate clockwise, indicating that the current flowing through the horizontal magnets trails the one through the vertical ones. When the choke is replaced with a capacitor, the disk begins to rotate counter-clockwise, since the horizontal current now leads. If the currents have equal amplitude, the magnetic field will rotate with constant amplitude.

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