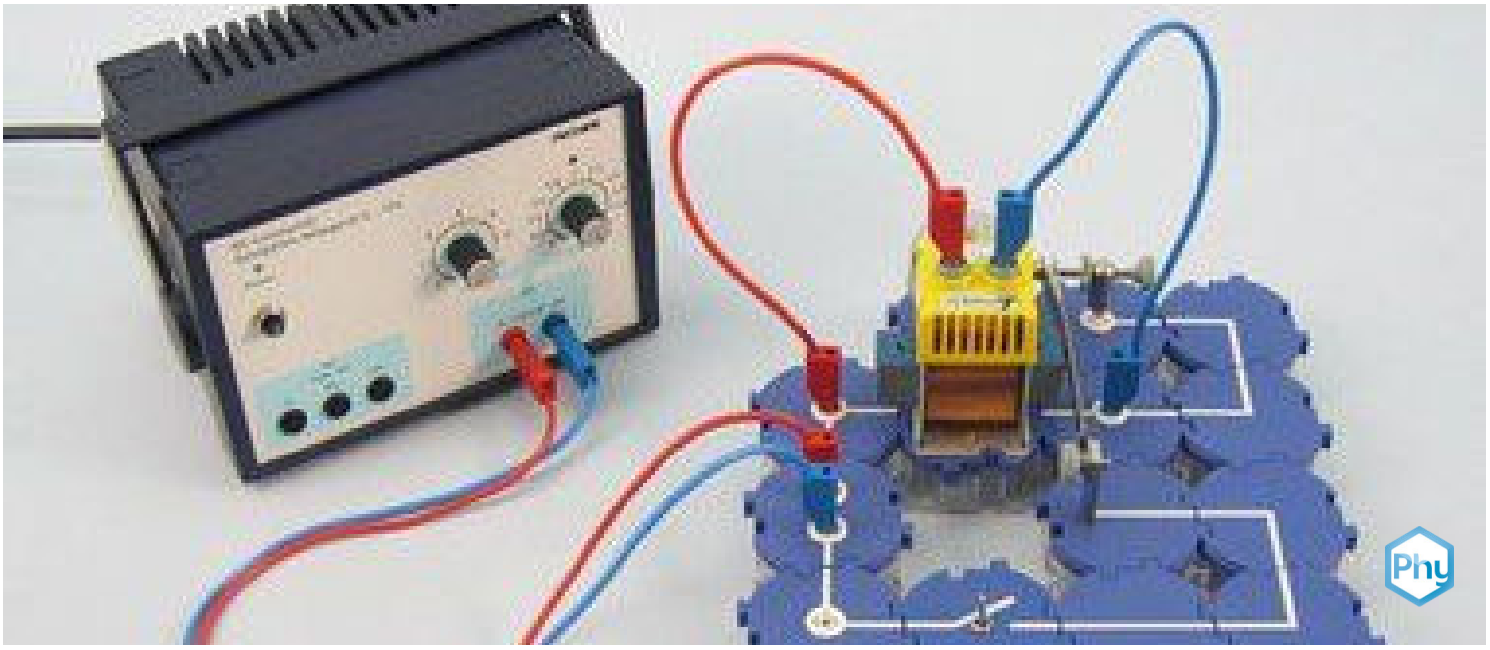
The electric bell



The principle of operation of the electric bell is clearly shown to the students in this experiment.

Physics > Electricity & Magnetism > Electromagnetism & Induction

Difficulty level	Group size	Preparation time	Execution time
medium	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/63139802971a9300037ff55b

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Teacher information

Application

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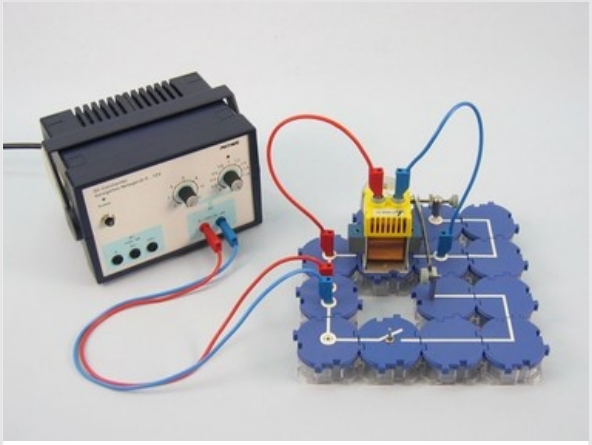

Experimental setup

Electric bells and common car horns work on the principle of Wagner's hammer.

This generates - with the help of an electromagnet - an oscillating movement.

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Other teacher information (1/2)

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Prior knowledge

The students should have first gained experimental experience in using the power supply unit.

Principle

A Wagner hammer consists of an electromagnet, an armature moved by it and a switching contact (normally closed contact) attached to it. When the hammer is switched on, one contact is closed and the armature is attracted by the current flowing in the coil of the electromagnet. The switching contact opens and thus interrupts the current. The magnetic field then collapses and the switching contact closes again - it is pulled into the rest position by a return spring. The process then begins again periodically. This is a self-excited or feedback system.

Other teacher information (2/2)

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Learning objective

The principle of operation of the electric bell is clearly shown to the students in this experiment.

Tasks

The students build a model of the electric bell and use it to investigate how it works.

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Safety instructions

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- The general instructions for safe experimentation in science lessons apply to this experiment.

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Student information

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Motivation

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Many everyday applications require oscillating movements, which are generated with the help of electromagnets.

Such applications are, for example, bells, horns or inductors. In this experiment, a fully functional bell is built.

Electric bells work on the principle of Wagner's hammer.

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Equipment

Position	Material	Item No.	Quantity
1	Straight connector module, SB	05601-01	1
2	Angled connector module, SB	05601-02	4
3	Interrupted connector module with sockets, SB	05601-04	1
4	Straight connector module with socket, SB	05601-11	2
5	Angled connector module with socket, SB	05601-12	2
6	On-off switch module, SB	05602-01	1
7	Universal holder module, SB	05603-00	1
8	Coil holder module, SB	05672-00	1
9	Contact spring with armature	05673-00	1
10	Contact element on 4-mm-plug	05673-01	1
11	Bell gong on 4-mm-plug	05673-02	1
12	Coil, 400 turns	07829-01	1
13	Iron core, I-shaped, laminated	07833-00	1
14	Connecting cord, 32 A, 250 mm, red	07360-01	1
15	Connecting cord, 32 A, 250 mm, blue	07360-04	1
16	Connecting cord, 32 A, 500 mm, red	07361-01	1
17	Connecting cord, 32 A, 500 mm, blue	07361-04	1
18	PHYWE Power supply, 230 V, DC: 0...12 V, 2 A / AC: 6 V, 12 V, 5 A	13506-93	1
19	Junction module, SB	05601-10	1

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Set-up and Procedure (1/3)

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- Set up the experiment according to Fig. 1 and Fig. 2.
- Place the coil on the coil holder, insert the iron core (yoke) and then connect the coil via leads to the building blocks (angled with socket or straight with socket) next to the coil as in Fig. 3.
- Plug the bell cup onto a connection module. Clamp the contact spring in a universal holder.
- Insert the contact component into a connection module and turn the screw until it makes good contact with the armature spring (cf. fig. 4).

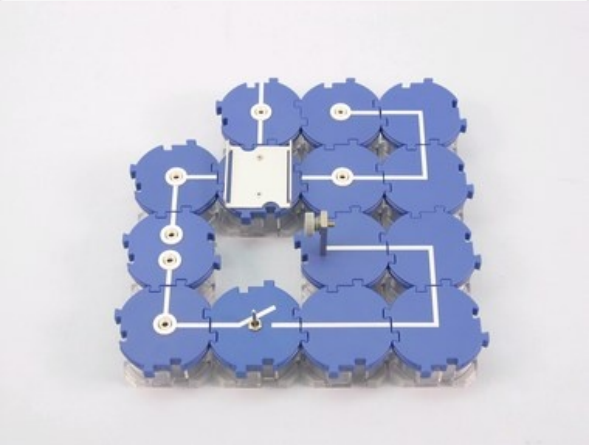

Fig. 1

Set-up and Procedure (2/3)

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- Set the power supply to about 5 V and switch it on.
- Close the switch. If necessary, optimise the screw of the contact component or the distance of the iron core from the armature spring so that the bell is struck.
- Open and close the circuit several times and observe the process. Write down your observations in the report.
- Set the power supply unit to 0 V and switch it off.

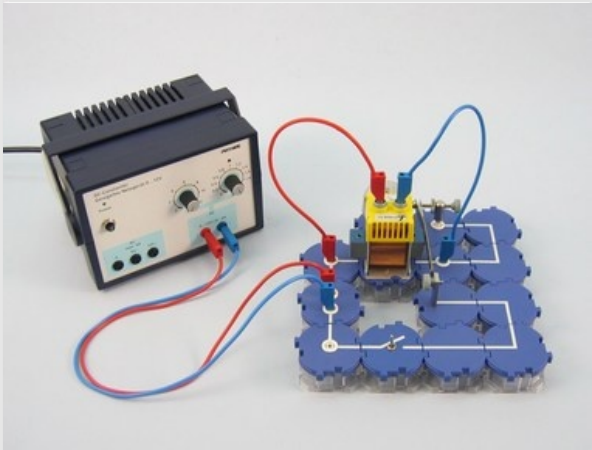

Fig. 2

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Set-up and Procedure (3/3)

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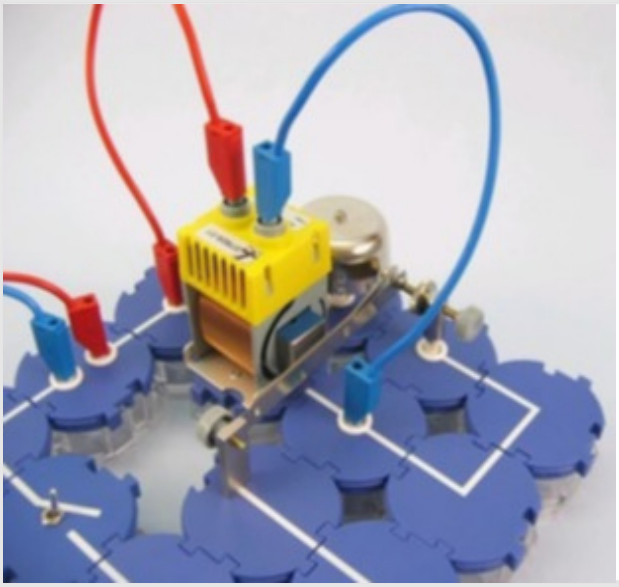

Fig. 3

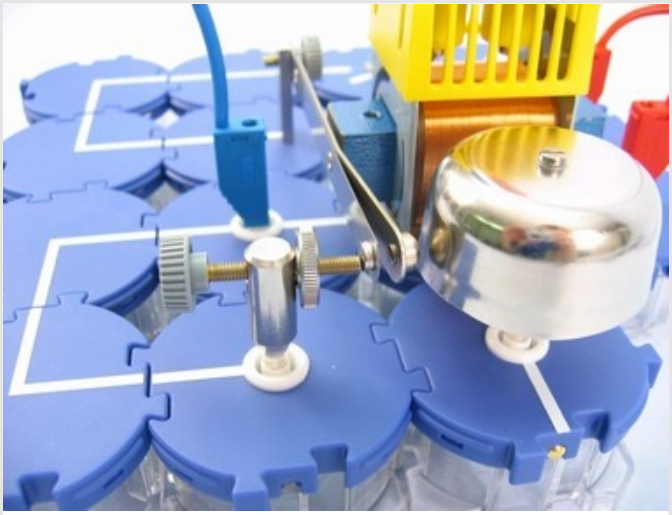

Fig. 4

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Report

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Observation

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Write down your observations!

Task (1/4)

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Drag the words into the correct boxes!

The armature is attracted by the _____ and starts to move until it hits the vibrating _____. The contact is broken by the attraction of the armature. The _____ is therefore broken and the coil no longer has current flowing through it, causing the _____ to vibrate back and the process starts again.

circuit
coil
sounding body
armature

Check

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Task (2/4)

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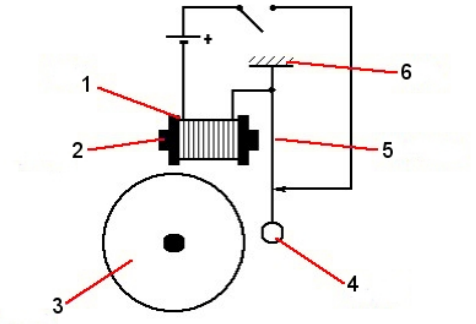
Match the terms with the corresponding numbers in the adjacent sketch.

The electric bell

1	2	Bell	Clapper
3	4	Iron core	Metal strip
5	6	Spring	Coil



Check

Task (3/4)

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What is the function of the coil in the experimental setup?

- The coil in the experimental setup takes over the function of the takes over no function.
- The coil in the experimental setup takes over the function of the permanent magnet.
- The coil in the experimental setup takes over the function of the sound body.
- The coil in the experimental setup takes over the function of the electromagnet.

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Task (4/4)

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In practice, electric bells are usually operated with alternating current. Why is this possible?

Slide	Score / Total
Slide 14: How it works	0/4
Slide 15: The electric bell	1/1
Slide 16: Coil function	0/1

Total score 1 / 6

Show solutions | Repeat | Export text

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