

Heat transfer
Heat convection

Model experiment on the operation of a hot-water heating system

Object of the experiment

1. Demonstrating the operation of a hot-water heating system

Setup

- Set up the central heating model with the stand material.
- Remove the stopper and the pipe system from the boiler.
- Fill half the boiler with water, and add two spatula spoonfuls of wood shavings.
- Close the boiler with the stopper, and connect the pipe system.
- Using the adjusting screws of the stand base, align the central heating model vertically.
- Remove the stopper from the heater.
- Using a funnel, pour water into the compensating pipe until the heater is filled completely.
- Close the heater with the stopper.

Apparatus

1 Central heating model	389 20
1 Stand rod, 75 cm, 12 mm diam.	300 43
1 Leybold multiclamp	301 01
1 Stand base, V-shape, small	300 02
1 Butane gas burner	666 711
1 Butane cartridge, 190 g, set of 3	666 712ET3
1 Measuring beaker PP, 1000 ml	604 211
1 Spoon-ended spatula, PP, 180 mm	666 966

Carrying out the experiment

- Slowly warm the boiler with the cartridge burner and observe the motion of the wood shavings.

Observation

The wood shavings rise with the warmed water out of the boiler and reach the heater through the upper opening.

There they circulate, escape from the heater through the pipe at the bottom and return to the boiler.

Evaluation

The water warmed up in the boiler expands.

Therefore its density decreases, and it rises in the pipe until it reaches the heater.

As the surface area of the heater is big, the water cools down quickly through outward heat radiation.

The density of the water increases and it flows downwards back to the boiler.

The temperature difference between the water in the boiler and the cooled water in the heater gives rise to heat convection in the central heating model.

The heat convection is associated with a transport of matter (wood shavings).