

EQUIPMENT BUILD PLAN ENERGY

Open-Works Wall Clock

Bruce took a spring-wound pendulum clock from a yard sale out of its case and mounted the exposed movement on an oak board, with an explanation posted beside it. Students can watch stored spring energy turn the gears and keep the pendulum swinging, and hear the chime bar vibrate.

Written from Bruce's original workshop handout. Bruce's final review of this plan is in progress.



DIFFICULTY	BUILD TIME
Intermediate	2-4 hours
COST	SAFETY
About \$10-30 for a used clock	Adult build / supervision
GOOD FOR	
Teachers, Makers	

What it shows

Take the case off a yard-sale clock and its spring, gears and pendulum become a working lesson on energy.

Key ideas: elastic potential energy, kinetic energy, periodic motion, harmonic motion, gears

Safety (Adult build / supervision). A wound mainspring stores a lot of energy and can release suddenly, cutting fingers or flinging parts. An adult should let the spring down fully before removing the movement from its case, or leave the movement as one

assembly and never take the spring apart.

CONSTRUCTION

Build it

Materials

- ☐ **Old spring-wound pendulum clock** · 1
Yard sales and thrift shops are good sources
- ☐ **Hardwood board for mounting** · 1
Bruce used oak with a curved top
- ☐ **Wood screws or small spacers (standoffs)** · as needed
- ☐ **Picture-hanging hardware** · 1 set
- ☐ **Printed explanation sign** · 1
- ☐ **Clear finish** · small can
Optional

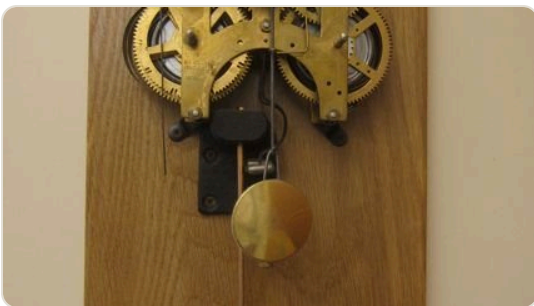
Tools

Screwdrivers
Drill and bits
Saw for the board
Sandpaper
Clock key

1

Choose the clock

Look for a working spring-driven pendulum clock with a chime. Wind it and make sure it runs before you begin.



2

Let down the spring

With the clock key on the arbor, hold the key firmly, release the click, and let the spring unwind slowly under control. An adult should do this step.

3

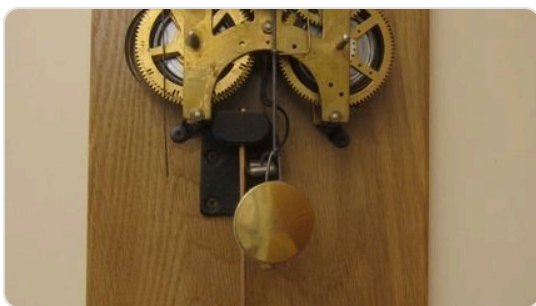
Remove the movement

Take out the screws holding the movement in the case and lift out the works with its hands, pendulum and chime.

4

Prepare the board

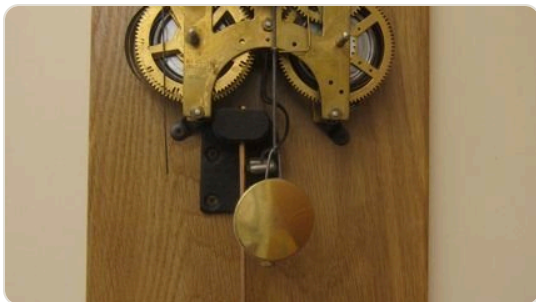
Cut and sand a board tall enough for the movement and the full swing of the pendulum, then finish it if you like.



5

Mount the movement

Fasten the movement to the board using its original mounting points, with spacers if needed so the gears and pendulum clear the wood. Hang the pendulum and check that it swings freely.



6

Level and set the beat

Hang the board on the wall, wind the clock, and adjust the board's tilt until the tick and tock sound evenly spaced.

7

Post the explanation

Mount a sign beside the clock explaining the energy changes, and ask visitors not to turn the hands.

THE PHYSICS

How it works

Winding the clock stores elastic potential energy in the coiled spring. As the spring slowly unwinds, that energy becomes the kinetic energy of the turning gears.

The escapement lets the gears advance one tooth at a time and gives the pendulum a small push on each swing. The pendulum's steady back-and-forth swing is periodic motion, and it sets the clock's rate.

When the hammer strikes the chime bar, the bar vibrates back and forth with decreasing amplitude until it comes to rest. That is harmonic motion, and the vibration makes the sound.

Using it

- Trace the path of energy: your hand winding the key, the spring, the gears, the pendulum, and finally heat and sound.
- Count the pendulum's swings for 30 seconds and calculate its period.
- Count teeth on two meshing gears and work out how many times faster the smaller one turns.
- Ask: Why does the clock eventually stop? Where did the energy go?

GO FURTHER

Variations

- Mount a clear cover over the movement if students will be close to it.
- Pair it with a simple homemade pendulum so students can see how length changes the period.

IF IT DOESN'T WORK

Troubleshooting

IF THIS HAPPENS

The clock stops after a few minutes.

TRY THIS

It is out of beat. Tilt the board slightly until the tick and tock are evenly spaced, or gently bend the crutch so they are.

IF THIS HAPPENS

The pendulum hits the board.

TRY THIS

Add spacers behind the movement so the pendulum has room to swing.

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