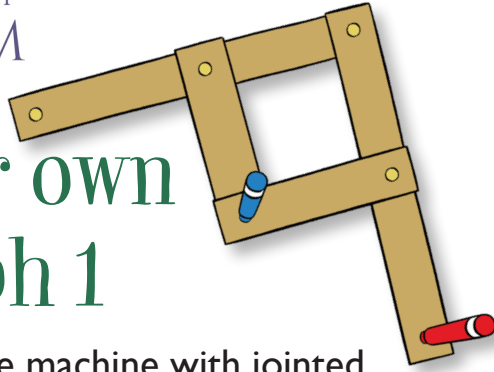




Make your own pantograph 1



A pantograph is a simple machine with jointed arms that can copy or draw pictures at different sizes. Before the invention of computers, The Royal Mint used special machines that work in the same way as a pantograph in its coin-making process. These were called reducing machines and they were used to trace large coin designs and scale them down to life-size coin copies. Try making your own cardboard pantograph and then experiment with enlarging and reducing pictures.

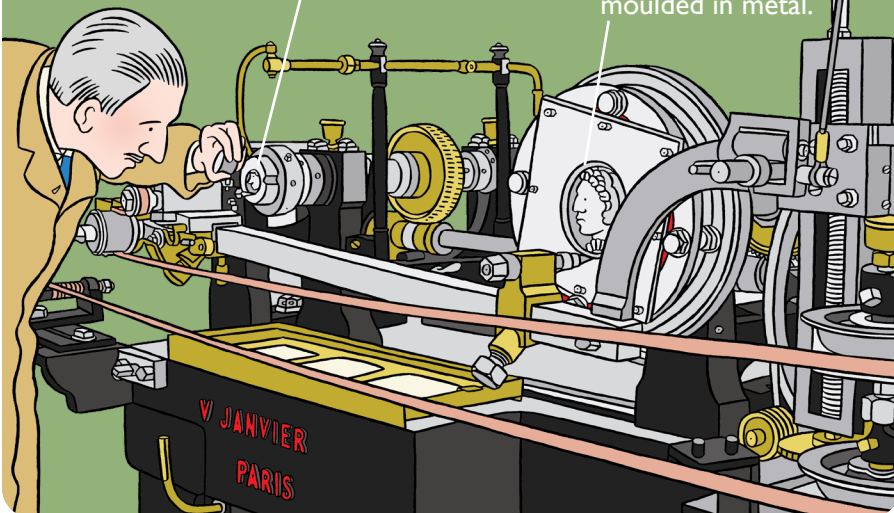
- You will need:**
- scissors
 - sharp pencil
 - corrugated cardboard
 - 4 paper fasteners
 - 2 felt-tip pens
 - sheets of paper
 - sticky tape

The Janvier reducing machine

Built in 1905, the Janvier was the Royal Mint's first reliable reducing machine powered by electricity. It took several days for the machine to trace a large moulded coin design at one end and use a cutting tool to carve out a coin-sized metal copy at the other. The machine had a solid cast-iron base to help prevent any vibrations that might make the tools jump and ruin days of work.

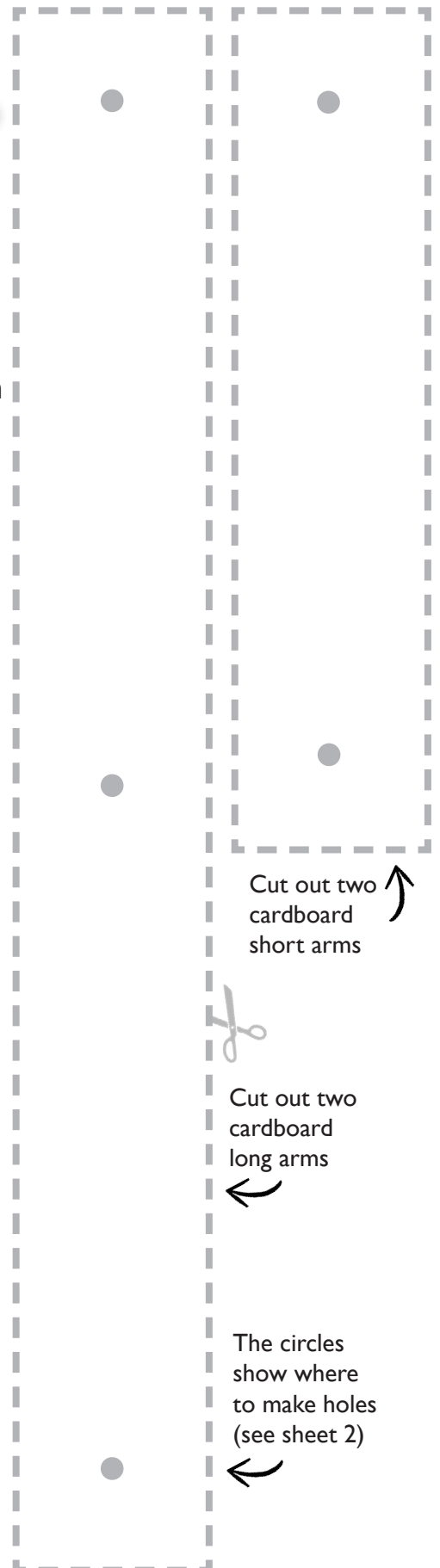
A cutter carves a small metal copy called a punch – a tool used for stamping coins.

A moving tool traces an electrotype – a large coin design moulded in metal.



Step 1

First, cut-out these pantograph templates. Then draw around the templates on a sheet of cardboard. Cut out two of each shape.



Cut out two cardboard short arms

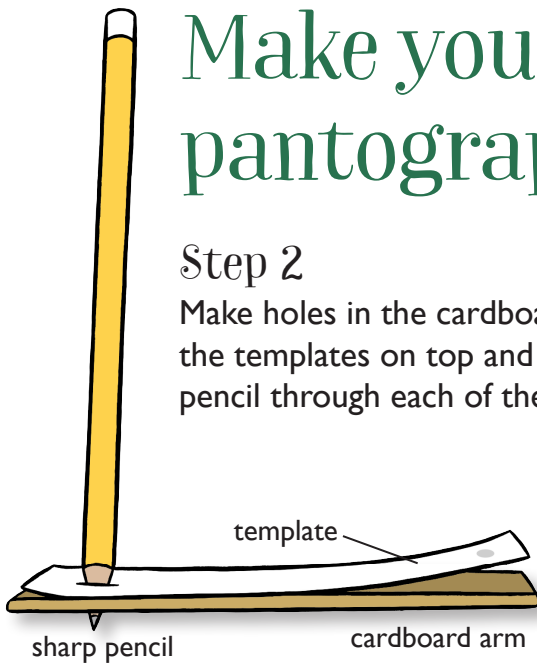
Cut out two cardboard long arms

The circles show where to make holes (see sheet 2)

Make your own pantograph 2

Step 2

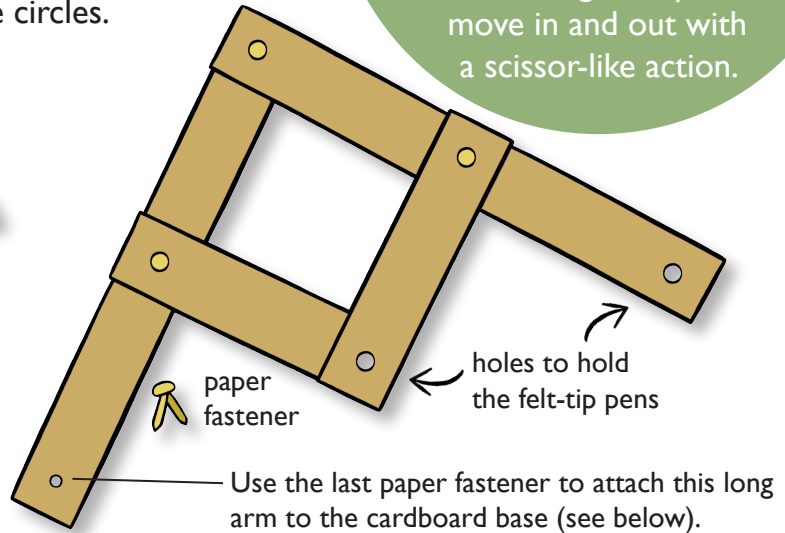
Make holes in the cardboard arms by lying the templates on top and pushing a sharp pencil through each of the circles.



Test your pantograph machine
Hold the two short unattached arms together and push and pull the longer arms to see how your pantograph moves. The arms are jointed levers and the hinges help them move in and out with a scissor-like action.

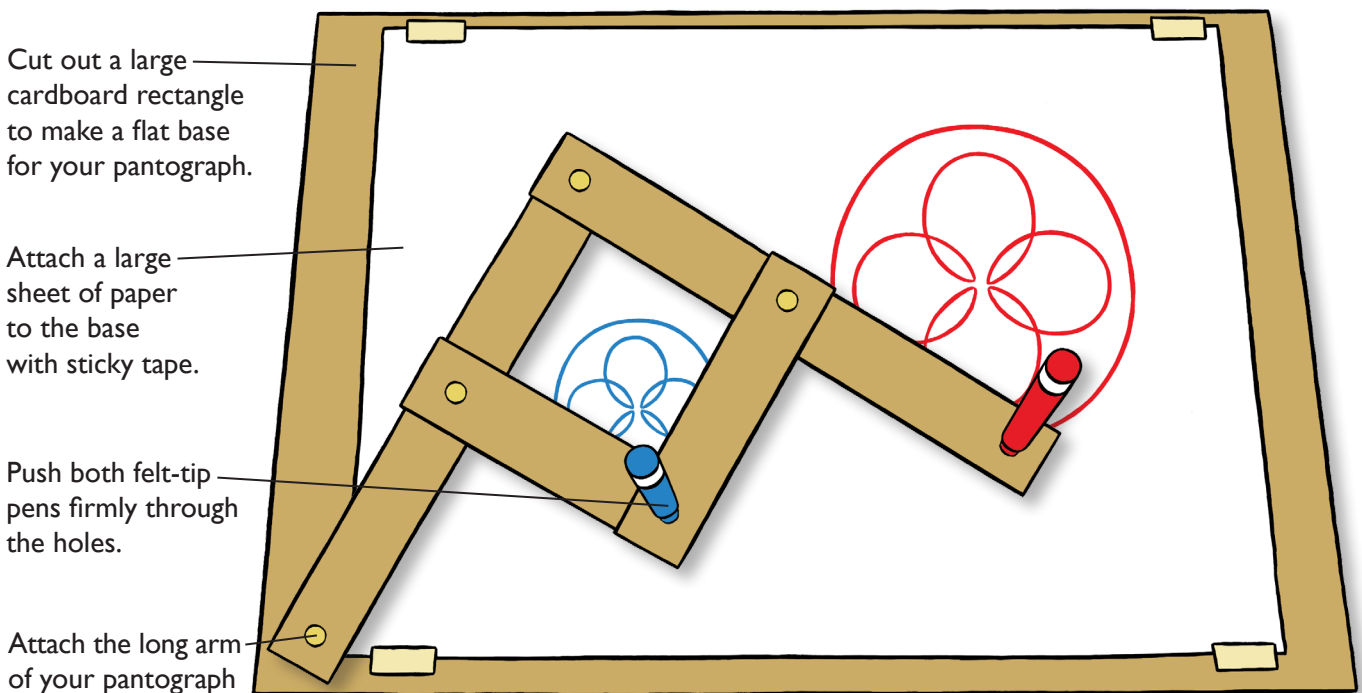
Step 3

Join the pantograph pieces together using three paper fasteners. Overlap the cardboard arms as shown.



Enlarge and reduce pictures

Set up your pantograph as shown below and start experimenting. First hold the pen in the middle of your pantograph and draw a picture. What size is the picture copied by the second pen – larger or smaller?



Next, draw a picture holding the pen in the long arm of your pantograph. What size is the copy you get now?