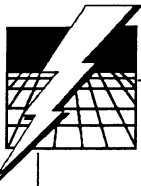


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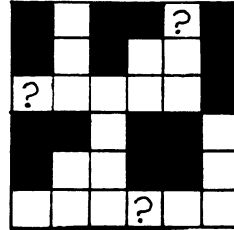


Introduction

This book is all about how and why things work. Sometimes it is difficult to learn from words and pictures, so it is also about making things. There are two types of making exercises in the book, **experiments** and **projects**. It is important to do the experiments when they appear, as this will help you to do the projects that follow.



There are also some word games which will help you to remember what has been learnt. When you come across an important word for the first time, it will be printed in **bold** letters. Try to remember these words and what they mean.



In the middle of the book is a game that you can play with your friends. At the back is a Mini-Dictionary which explains the meaning of words that you may not have come across before. If you are not sure about a word, *look it up*.



Introduction

Introducing Control

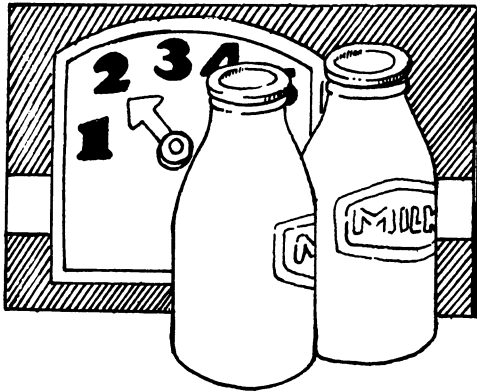
What do you think is meant by the word **control**?

What are you doing if you control something?

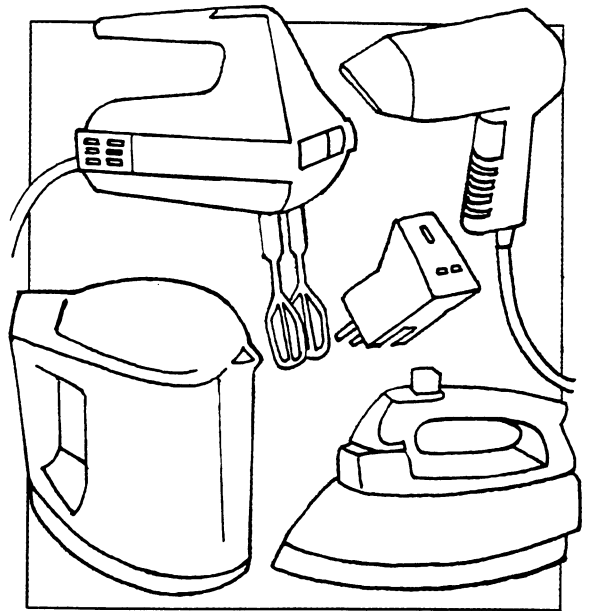
Why is it important to control things?

Control is a word that you probably hear every day. In order to ride a bike safely, you have to be in control of it. To cook a meal, you need to be able to control the machines in your kitchen.

Control means making something do what you want. In this book you will discover a number of ways of controlling things.



Exercising control over something can be very simple. For instance, how could you control the number of pints of milk left in the morning? Machines often contain many complicated controls but they are designed to be easily used. Can you think of some everyday items that you need to have control over?



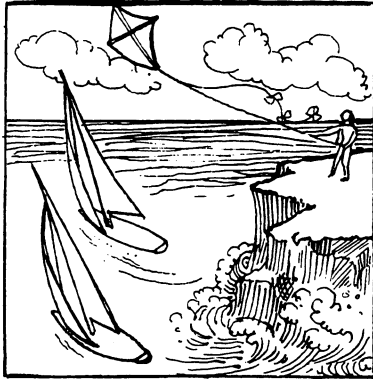
From prehistoric times to the present day, human beings have attempted to control their world. Thousands of years ago, people discovered how to make and control fire, how to make tools for hunting and fishing and how to provide shelter and clothing. As we have developed through the ages, we have learnt how to control both the things we have made and the natural world.

Controlling the natural world is becoming more and more difficult. Many of the world's resources are being used up and one day they may disappear completely. As these natural resources are used up, the environment in many parts of the world is changing. Can you think of any examples where people may be losing control over their environment?

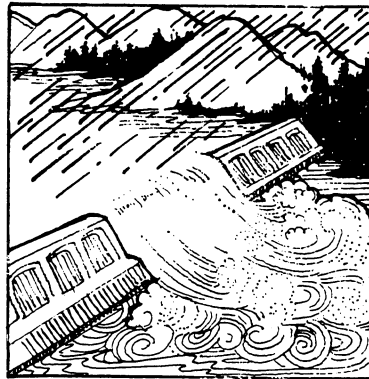
Technology and Control

Technology has become a familiar word. Technology is about studying how machines work and using machines to solve problems. We have been doing this for a long time and control is now an important part of technology.

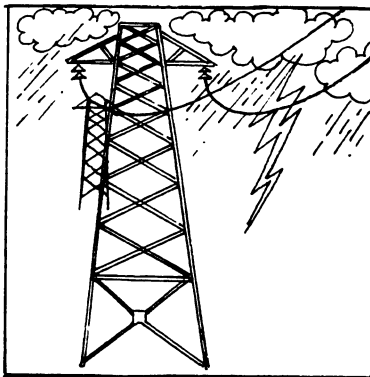
The pictures show some of the things that we all have a certain amount of control over. Can you think of any more?



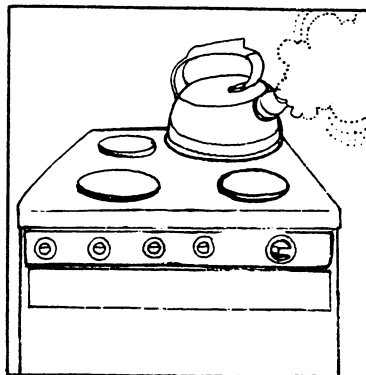
Air



Water



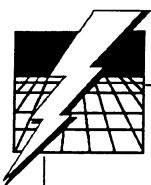
Electricity



Heat

Technology might also be thought of as the 'appliance of science'. By applying the principles of science found in this book to your designing and making activities, you should be able to develop better and more efficient products. In turn, this will help you to

understand how and why science plays such an important role in our lives. Remember that it is impossible to design anything without using technology and that successful technology relies on good design.



1 Experimenting in Control

Try the following experiments on your own or in a group.

Experiment 1

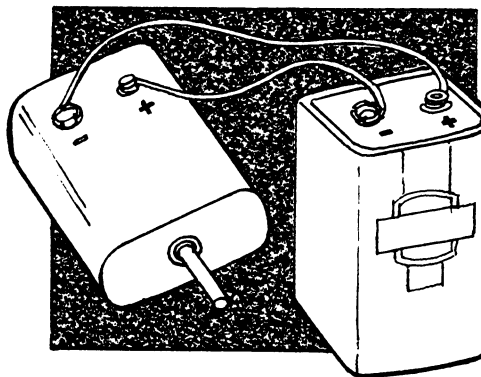
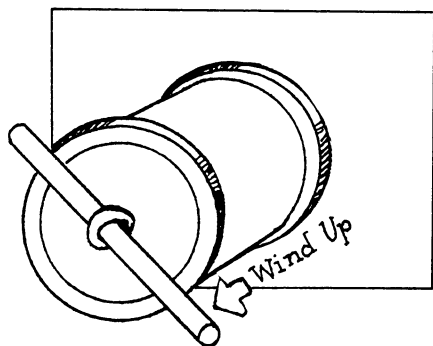
This is an old idea that uses energy from an elastic band. Make the cotton-reel 'tank' and answer the questions.

You will need:

- some elastic bands
- a cotton reel
- a 50 mm length of 3 or 5 mm dowel
- a matchstick

Questions

- 1 How is the tank's speed controlled?
- 2 Can you get it to speed up/slow down?
- 3 Can you make it turn in a circle?
- 4 What is the smallest/largest circle the tank will make?
- 5 Would it help to replace the dowel with a piece of stiff wire to help control direction? Why?
- 6 How else can an elastic band be used as a control mechanism?



Experiment 2

You will need:

- a motor (1.5–4.5 V)
- a battery
- a battery holder
- a length of wire
- card
- paper fasteners
- paper-clips

Connect the motor to the battery (as in the picture) and answer these questions.

Questions

- 1 Which way is the motor turning?
- 2 Can you make it reverse?
- 3 Can you make a switch that will turn it off and on?

Bicycle Skills List

Observing
Balancing
Steering

Speed
Starting
Stopping