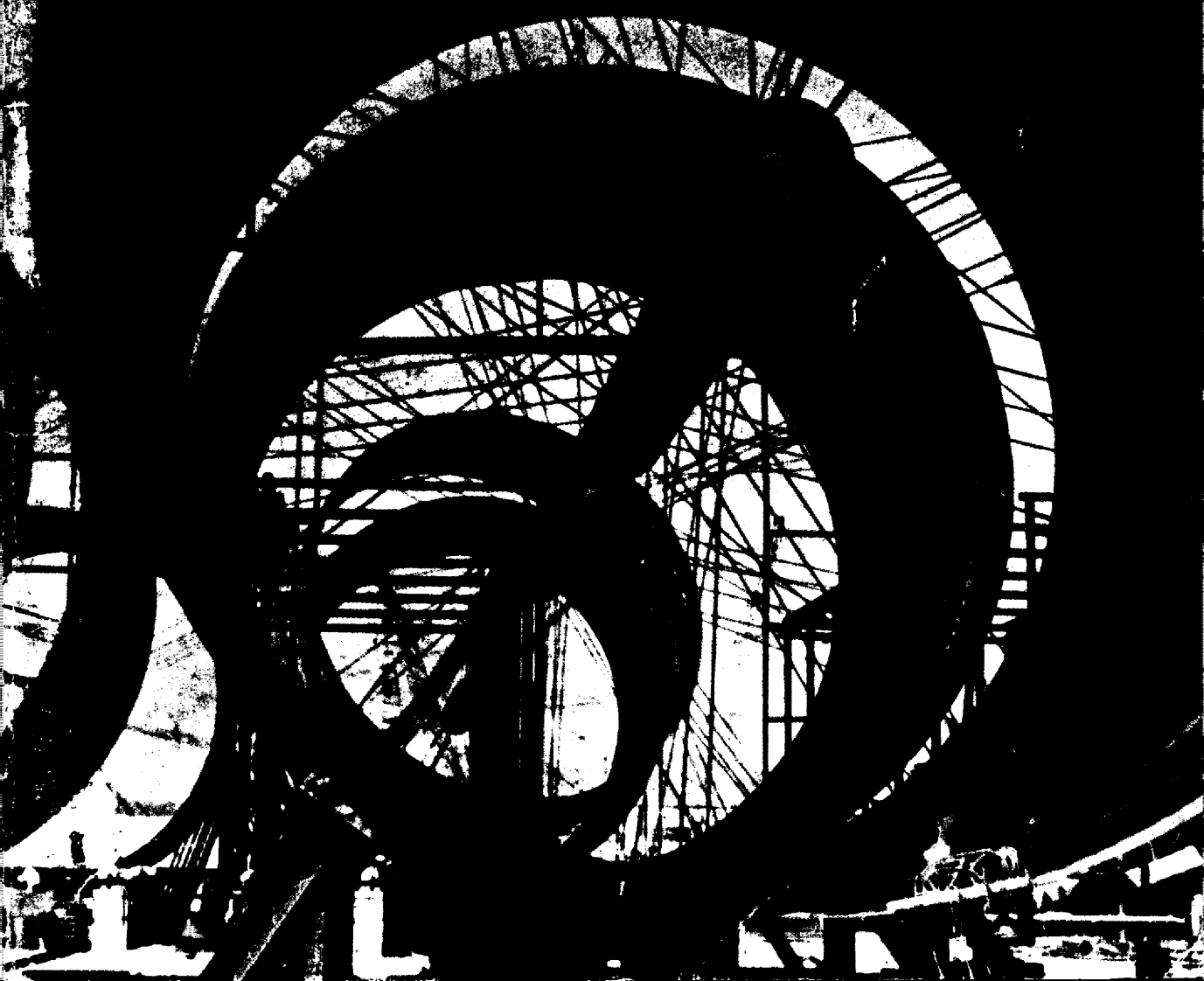
NDERSTANDING TECHNICAL ENGLISH

K. METHOLD & D. D. WATERS



UNDERSTANDING TECHNICAL ENGLISH 1

K. METHOLD

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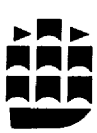

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The cover photograph shows sections of steel tube for The Cross Harbour Tunnel from Hong Kong to Kowloon, stacked prior to assembly.

Contents

To the Teacher

This four stage, graded reading course is intended for students of English as a foreign language who wish to relate their reading in English to topics relevant to their future careers as craftsmen or technicians. The course contains the following features:

1. The reading passages
   Each passage is complete in itself. The length of the passages varies from about 250 words in Book One to 750 words in Book Four. The topics are of general interest to all technical students and require little specialised technical knowledge on the part of either the student or the teacher. All technical terms can be understood from the context or from accompanying illustrations. The course can, therefore, be used with confidence by general English teachers who have little technical knowledge.

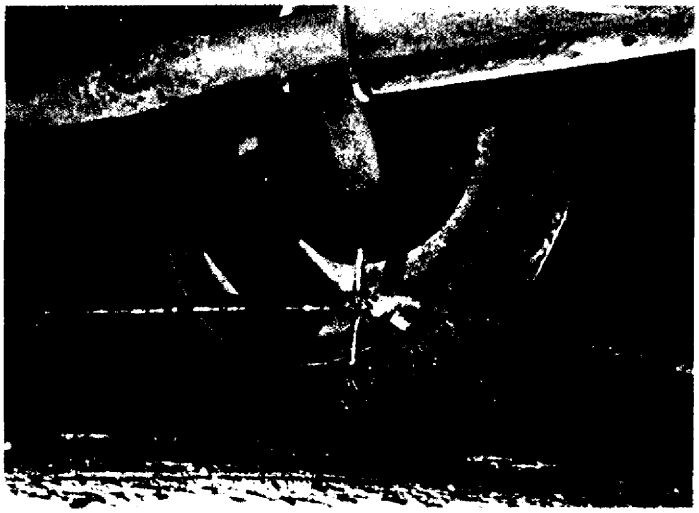
2. The vocabulary
   No attempt has been made to teach a highly specialised technical vocabulary. The emphasis throughout is on presenting a general technical vocabulary common to all crafts and technologies. The vocabulary has been selected from a careful analysis of the words most frequently used in basic texts on woodwork, metalwork, technical drawing, mechanics and fundamentals of electrical technology. Full details of this technical lexis and of the core general English lexis are given in the teacher's handbook to the series.

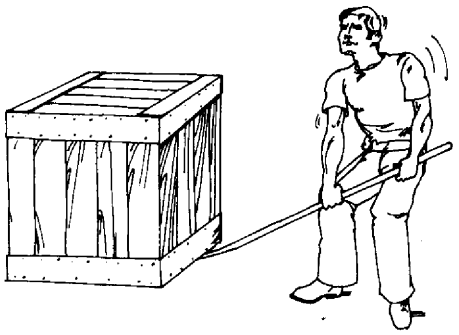
3. Structural control
   All the material is structurally graded. A basic assumption has been made concerning the students' knowledge at point of entry, and details of what the students are expected to know, if only passively, are given in the teacher's manual. All other structures are introduced gradually, in a pre-determined order, and are fully dealt with in the exercises. The complete structure list is provided in the teacher's manual. This list differs from other widely used lists in that it takes into account those sentence patterns most commonly used in technical writing.

4. The exercises
   These are designed to 'exercise' and to test the students' knowledge. All the exercises require the students to use those words and structures that they have encountered in the reading passages. An important feature of the exercises is that they continually revise the vocabulary introduced in earlier passages. There is, therefore, a carefully built-in revision factor throughout the book. For this reason there are no separate revision units.

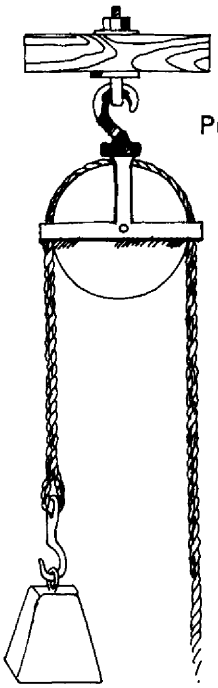
5. Objectives
   This course is not intended to be a basic English course, and should be used in conjunction with any good general English course. Its purpose is to provide supplementary material with a technical bias to the usual English programme.

1. SIMPLE MACHINES

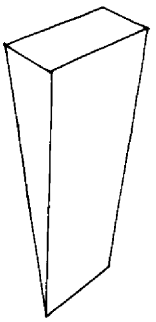




Lever



Pulley

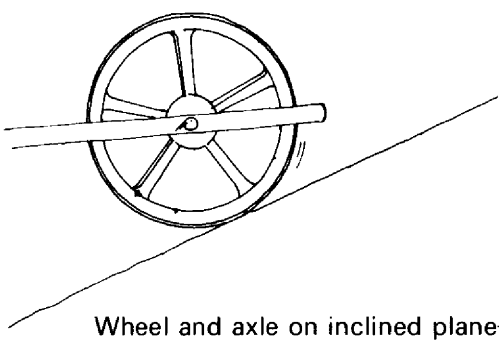


Wedge

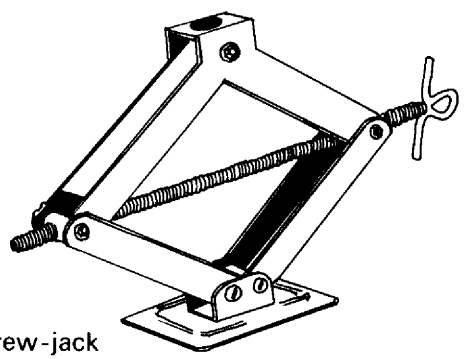
There are six simple machines. They are the lever, the pulley, the wheel and axle, the inclined plane, the wedge and the screw-jack.

Simple machines make our work easier. A large rock is very heavy but a man can move it with a lever. He can lift a heavy weight with a pulley. He can lift a car off the ground with a screw-jack. He can split a piece of wood with a wedge.

In the past workmen had only their own strength and the six simple machines. They built tall buildings with these machines, and they still use them today. Workmen lift bricks and cement to the tops of buildings with ropes and pulleys. They push their wheel-barrows up an inclined plane. And the wheel-barrows, of course, have a wheel and axle.



Wheel and axle on inclined plane



Screw-jack

Exercises

1 Vocabulary

a.

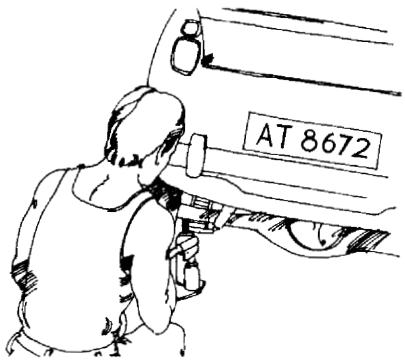
Complete the sentences about the pictures on the left:

a. The man is splitting the piece of wood with a _____

b. The man is lifting up the car with a _____

c. The man is moving the tree with a _____

d. The man is using a _____ and an _____



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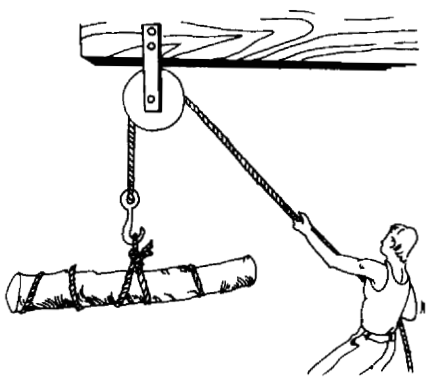

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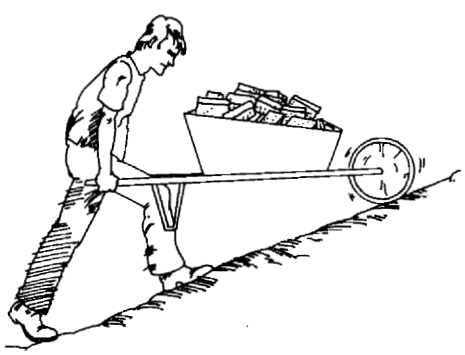


d.

2 Comprehension

A. Which of a, b, c or d is correct?

(i) You want to lift a bucket of sand. Which simple machine will you use?

a. a lever b. a wedge
c. a pulley d. a screw-jack

(ii) You want to take the tyre off your bicycle wheel. Which simple machine will you use?

a. a wedge b. a wheel and axle
c. an inclined plane d. a lever

(iii) You want to push a large box on to a lorry. Which simple machine will you use?

a. a pulley b. a screw-jack
c. a wheel and axle d. an inclined plane

(iv) You want to take a heavy cupboard from your workshop to your house. Which simple machine will you use?

a. a pulley b. a screw-jack
c. a wheel and axle d. an inclined plane

B. Answer these questions in sentences:

a. What are the six simple machines?
b. Why do we use simple machines?
c. What must we use with simple machines?

3 Language Practice

A. Read these sentences:

(i) Move the rock. Use a lever.
(ii) Move the rock with a lever.

Write these sentences like (ii):

a. Draw a picture. Use a pencil.
b. Lift the car. Use a screw-jack.
c. Cut the piece of paper. Use a pair of scissors.
d. Break the piece of wood. Use your hands.

B. Read this sentence:

The rock is heavy but the man can move it.

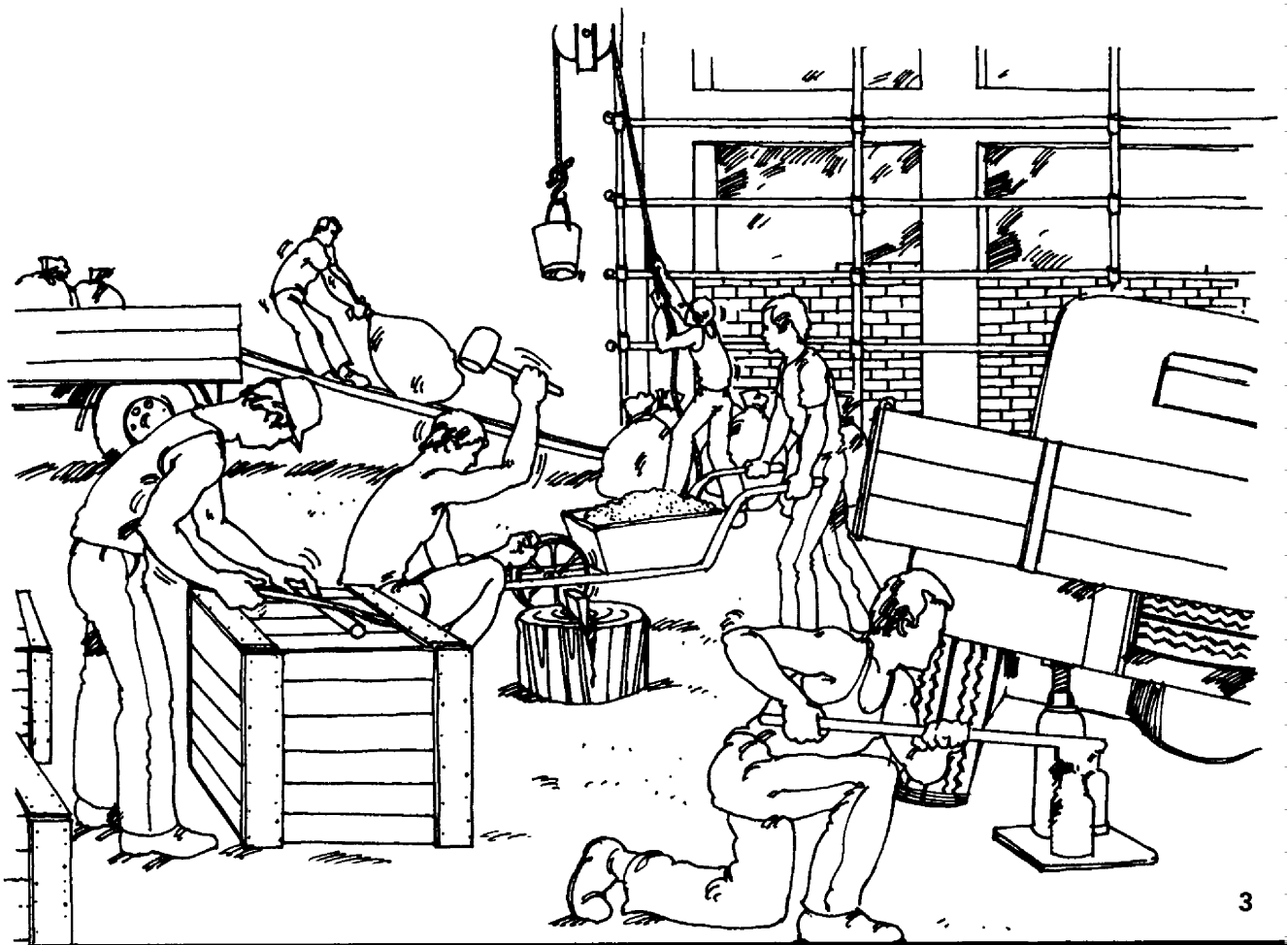
Complete these sentences:

a. The paper is thick _____ (cut)
b. The ceiling is high _____ (touch)
c. The knife is blunt _____ (use)
d. The door is closed _____ (open)

4 Composition

These men are building a house. They are using many machines. Write sentences about the picture like this:

One of the men is lifting a lorry. He is using a screw-jack.



2. USING A HACKSAW

1. The man cuts the iron rod into two *parts.* He cuts the rod with a *hacksaw.* He has put the rod into a *vice.* Now he uses his thumb as a *guide* and he makes the first cut. He moves the saw backwards and forwards a few times across the metal.

2. The man has made the first, small cut. Now he holds the *frame* of the saw with both hands. He saws with light, slow *strokes.* The saw cuts only on the forward strokes. When the man pulls the saw back, he does not *press* hard.

3. The man is near the end of the cut now. He must be careful. He must saw lightly or the rod will break. It may break the *blade* of the saw. When the man has made the last cut, he will make the edge of the rod *smooth.* He will use a *file* to make it smooth.

Exercises

1 Vocabulary

Complete each of the sentences with one of the words in the box.

a. The edge of this piece of metal is not smooth.
Use this _____ to make it smooth.

b. The iron _____ is one centimetre thick.

c. The boy is making a _____ for a picture.

d. The _____ of the knife is not sharp.

e. How many _____ shall I cut this piece of wood into?

blade	**frame**	**file**	**parts**	**smooth**
strokes	**vice**	**guide**	**press**	**rod**

2 Comprehension

A. Answer the questions about the pictures:

a. How is the man holding the hack-saw?

b. What is the man doing wrong?

c. What has the man *not* done?

d. What must the man do to the end of the rod?

B. Which of the answers a, b, c or d is correct?

(i) What can we use to cut an iron rod?
a. a vice b. a guide
c. a saw d. a file

(ii) How many tools did the man use?
a. one b. two
c. three d. four

(iii) When may the rod break?
a. on the first cut
b. on the last cut
c. on the forward strokes
d. on the backward strokes

(iv) When did the man use his thumb as a guide?
a. he did not use it
b. when he made the first cut
c. when he made the last cut
d. when he used the file

3 Language Practice

A. Read this sentence:

The man cut the rod with a hacksaw.

Make sentences like this. Use these words:

a. turn/lock/key
b. break/window/stone
c. write/answer/pen
d. lift/car/screw-jack

B. Read the sentences in (i) and (ii):

(i) The man wants to make the rod smooth. He will use a file.
(ii) The man will use a file to make the rod smooth.

Make sentences like (ii) with these words:

a. The man wants to cut the piece of metal. He will use a saw.
b. The man wants to stick some paper on the wood. He will use glue.
c. The man wants to hold the rod tightly. He will use a vice.
d. The man wants to make a wooden toy. He will use a sharp chisel.

4 Composition

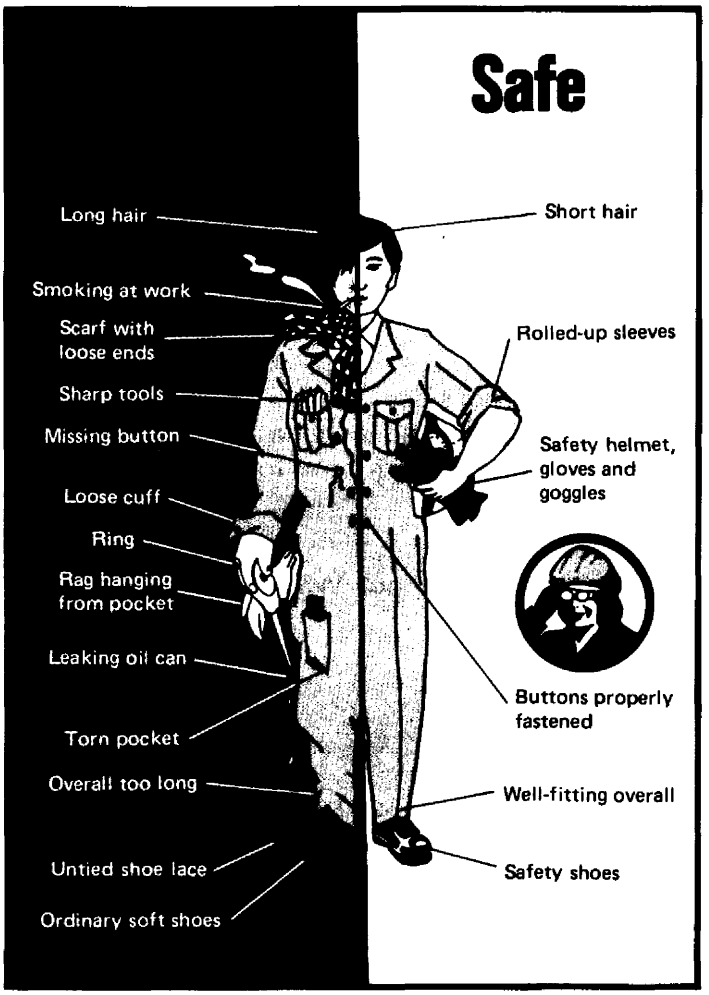
Read the passage again. Write two or more Safety Rules for 'Using a Hacksaw'.

Example: Always put the iron rod into a vice.

3. SAFETY RULES

There are many sharp *tools* in a *workshop.* Some can cut wood and some can cut *metal.* Remember these safety rules or you will cut or injure yourself.

1. Always wear an *apron* or an overall.
2. Wear a shirt with short sleeves or roll up the long sleeves.
3. Take off your tie.
4. Do not run in the workshop: always walk.
5. When you are carrying tools, point them downwards. Keep them near your sides.
6. Always keep both hands behind the *cutting edge* of tools.
7. Keep tools in their places. Do not leave them on the top of the *bench.* They may fall off the bench and hurt your feet.
8. Ask your teacher how to use every tool. Do not *experiment* with tools and *machines.*
9. Wait for *instructions* before you touch any *lever* or *switch on* any machine.



Exercises

1 Vocabulary

Complete each of the sentences with one of the words in the box.

a. The boy pulled the _____ and the machine started.

b. A good workman has sharp _____

c. The students waited for the teacher's _____

d. The students took off their ties and put on their _____

e. The boy cut himself when he _____ with a tool.

overalls/aprons bench edge switch on experimented metal instructions lever remember rules tools workshop

2 Comprehension

A. Look at the pictures on the right. Which safety rules have the men forgotten?

B. Which of the answers a, b, c or d is correct?

(i) You want to switch on a machine. What must you do first?
- a. keep your hands near your sides
- b. experiment with the levers and switches
- c. run to the teacher and ask him how to use it
- d. wait for instructions

(ii) You are going to use a cutting tool. Where must you keep your hands?
- a. pointed downwards
- b. behind the cutting edge
- c. on the bench
- d. under your apron or overalls

(iii) You are going for a lesson in the workshop. What clothes will you put on in the workshop?
- a. a tie
- b. a shirt with long sleeves
- c. an apron or overalls
- d. an old coat

a.

b.

c.

d.

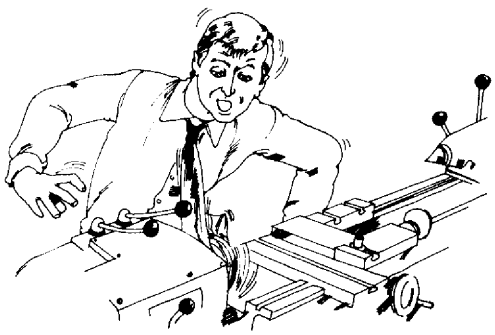
(iv) You do not know how to use a tool. What must you do?
   a. experiment with it
   b. leave it on the top of the bench
   c. point it downwards
   d. ask the teacher how to use it

3 Language Practice

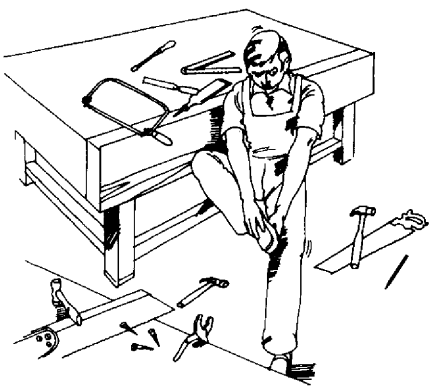
A. Read this sentence:

Remember to point sharp tools downwards or they will hurt you.

Make sentences like this about each of the pictures on the left:

a. 

a. take off/pull in
b. do not leave/fall off
c. keep/cut yourself

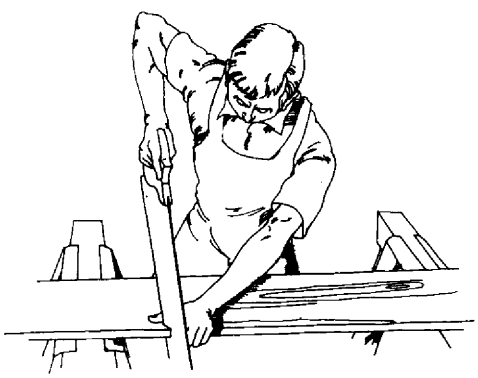
b. 

B. Read this sentence:

Ask your teacher how to use every tool.

Write sentences like this. Use these words:

a. friend/sharpen the tool
b. teacher/switch on the machine
c. father/make the box
d. friend/do the exercise



4 Composition

Read the safety rules again and answer these questions in sentences:

Why must you wear an apron or overalls in the workshop?
Why must you keep the tools in their places?
Why must you walk and not run in the workshop?
Why mustn't you experiment with tools?

4. PAINTING

Rub the surface of the wood with glasspaper. This will make it smooth. Give the surface one coat of priming paint. Use a flat brush. Paint across the grain first. Then paint with light strokes along the grain. Let the first coat of paint dry.

Fill up any holes and cracks in the wood with putty. Rub the surface of the wood with glasspaper. Brush away the dust. Put on the undercoat. Brush the paint well into the wood. Paint across the grain first. Then paint with light strokes along the grain. Let the undercoat dry.

Make the surface smooth again with glasspaper. Brush away the dust. Put on the top coat. Brush the paint well into the wood. Paint across the grain. Then paint with light strokes along the grain.

Do not put too much paint on your brush. Dip only the tip of the brush into the paint. When you are not using your paint brushes, keep them clean. Clean them first with turpentine. Then wash them in warm, soapy water.

Painting by machine

Exercises

1 Vocabulary

Complete each of the sentences with one of the words in the box.

a. Put some _____ along the bottom of the windows.
b. You have not painted the door very well. Put on another _____
c. The _____ of this piece of wood is not smooth.
d. You must paint across and along the _____

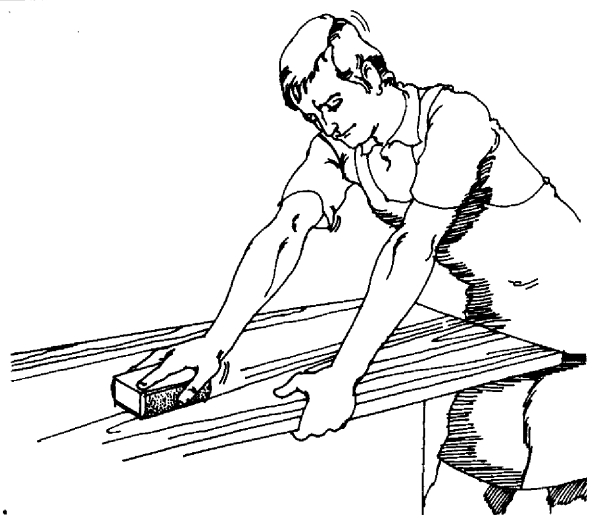
rub	**surface**	**grain**	**putty**
crack	**coat**	**dip**	**brush**

2 Comprehension

A. Answer these questions about the pictures below:

a. What is the man doing?
b. What must the man do to this piece of wood?
c. What is the man doing in this picture?
d. What is wrong with this man's brushes?

a.



b.

c.

d.

B. Which of the answers a, b, c or d is correct?

(i) What can we clean paint brushes with?
   a. glasspaper
   b. putty
   c. turpentine
   d. priming paint

(ii) How can we make a piece of wood smooth?
   a. We can rub it with turpentine.
   b. We can paint across the grain.
   c. We can fill up the cracks with putty.
   d. We can use glasspaper.

(iii) What must we do with our paint brushes?
   a. brush away the dust
   b. rub them smooth
   c. keep them clean
   d. dip only the tips into turpentine

(iv) When do we use light strokes?
   a. when we put on the undercoat
   b. when we use priming paint
   c. when we paint along the grain
   d. when we brush away the dust

3 Language Practice

A. Most of the sentences in the passage are imperative statements.

Examples:
Let the first coat of paint dry.
Dip only the tip of the brush into the paint.

Make imperative statements from these words. Put the words into the correct order:

a. the iron rod cut with a hacksaw
b. into a vice the piece of metal put
c. with both hands hold the frame of the saw
d. a file use to make the end smooth

B. Read these sentences:

(i) Rub the surface of the wood with glasspaper. (make____ smooth)
(ii) This will make the surface of the wood smooth.

Now write sentences like (ii) for each of these statements:

a. Hold the piece of metal over a fire. (make____soft)
b. Use your tools carefully. (keep____ sharp)
c. Put a piece of wood under the door. (hold____open)
d. Wipe the window with a wet cloth. (make____clean)

4 Composition

Write Part I of 'Using a Hacksaw' again. Use only Imperative statements. Here is Part 2, as an example:

Make the first small cut. Hold the frame of the saw with both hands. Saw with light, slow strokes. When you pull the saw back, do not press hard.

5. WORKING WITH METAL

1. The craftsman is going to make a small aluminium dish. He has rubbed the metal with soap and he has also made it soft. Now he is putting the piece of aluminium on to a forming block. There is a hollow in the centre of the forming block.

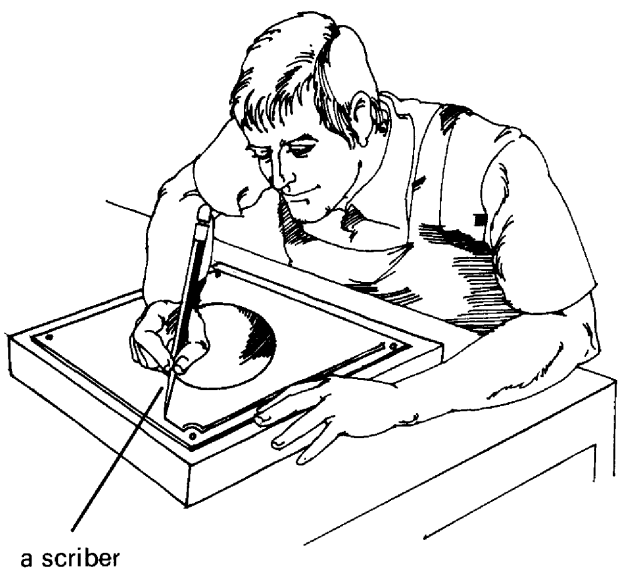
2. The craftsman wants to make a hollow in the centre of the piece of aluminium. He is hitting the metal into the hollow of the forming block. He is using a rubber mallet to hit the piece of metal. He is turning the forming block round and round.

3. The craftsman has made the hollow in the piece of aluminium. He has drawn a design on the metal. He has cut the design into the metal. Now he is going to cut out the design. He will finish the dish by filing smooth any sharp or rough edges.

1.

2.

3.



a scriber

Exercises

1 Vocabulary

Complete each of the sentences with one of the words in the box.

a. Do you like the _____ of this table?

b. Draw a line through the _____ of a circle.

c. A _____ works with tools.

d. Use a file to make the _____ edges smooth.

e. Put the food on the _____

centre	**hollow**	**dish**	**soft**	
craftsman	**rough**	**design**		

2 Comprehension

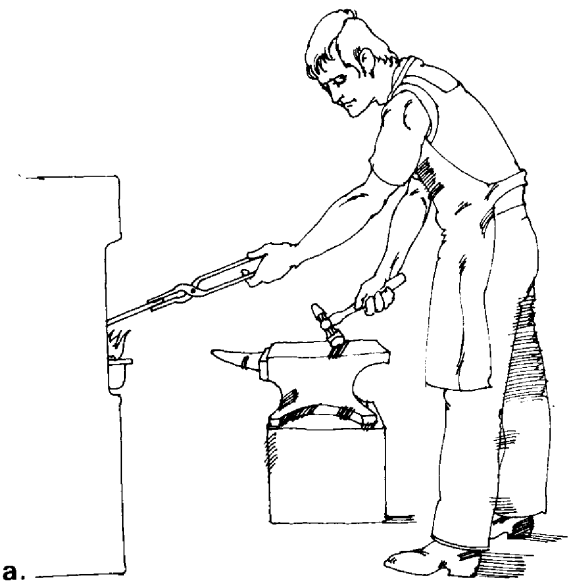
A. Answer these questions about the pictures below.

a. Why is the craftsman holding the metal over a fire?

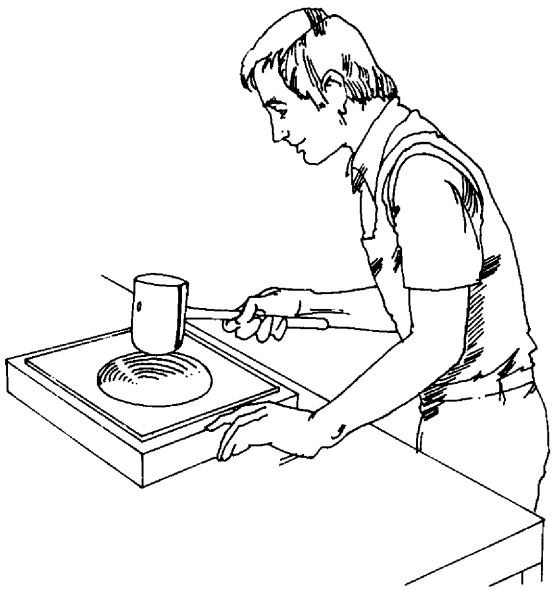
b. How will the craftsman make the centre of this piece of metal hollow?

c. What is the craftsman doing in this picture?

d. What is the craftsman doing to the edge of the piece of metal?



a.



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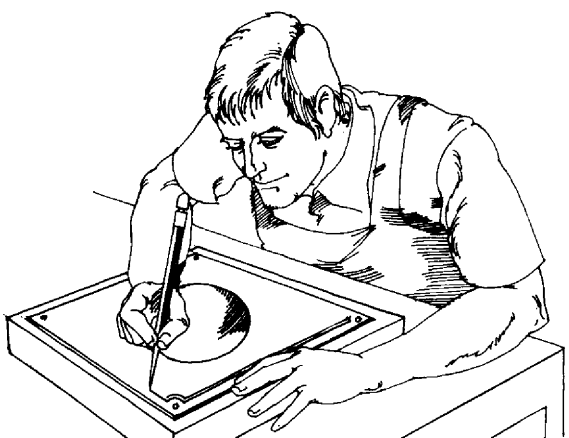


c.

d.

B. Which of the answers a, b, c or d is correct?

(i) Where does the craftsman want the hollow?
   a. in the centre of the forming block
   b. in the centre of the piece of metal
   c. at the edge of the dish
   d. at the edge of the design

(ii) What did the craftsman do with the design?
   a. He put it on to the forming block.
   b. He rubbed it with soap.
   c. He filed it smooth.
   d. He cut it into the metal.

(iii) What tool did the craftsman use to make the hollow in the metal?
   a. a file
   b. a mallet
   c. a dish
   d. a knife

(iv) What did the craftsman do to the rough edges of the dish?
   a. He rubbed them with soap.
   b. He hit them with a rubber mallet.
   c. He made them soft.
   d. He filed them smooth.

3 Language Practice

A. Read these sentences:

(i) How did the man make the edges smooth? He filed them.
(ii) The man made the edges smooth by filing them.

Make sentences like (ii) for the following:

a. How did the man make the metal soft? He heated it.
b. How did you make a hollow in the piece of metal? I hit it with a rubber mallet.
c. How did the students put a design on the dish? They cut it into the dish with a scriber.
d. How can we make the first cut in an iron rod? We can use our thumb as a guide.

B. Read these sentences:

(i) The craftsman hit the metal with a rubber mallet.
(ii) The craftsman used a rubber mallet to hit the metal.

Make sentences like (ii) for the following:

a. The man made a hollow in the metal with a forming block.
b. The boy drew a design with a scriber.
c. The craftsman made the edges smooth with a file.
d. The student cut the rod with a hacksaw.

4 Composition

Read the passage again. Write a sentence for each of the craftsman's actions. Here are the first three actions:

(i) He rubbed the aluminium with soap.
(ii) He made the metal soft.
(iii) He put the metal on to the forming block.

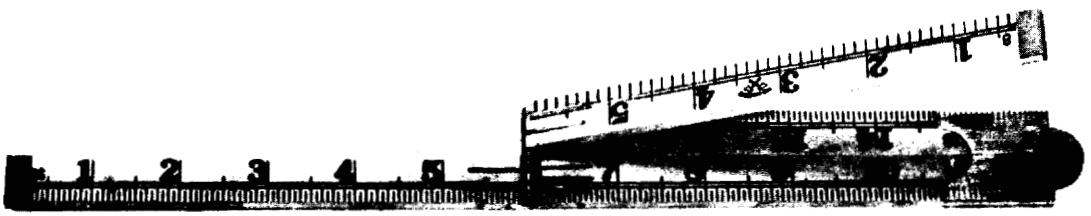
6. MEASURING

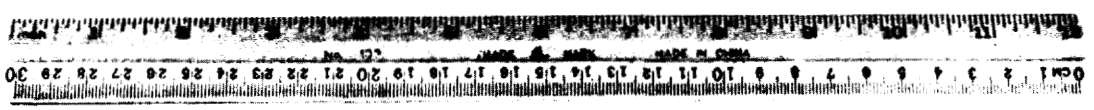
Every craftsman must be able to measure accurately. He must be able to use measuring tools. The simplest measuring tool is the ruler. It has a number of units. These units are in centimetres or inches. The folding rule is a kind of ruler. It also has a number of units.

A craftsman can get an accurate measurement from a rule by tipping it on its edge. This brings the markings on the rule nearer to the piece of wood or metal.

The steel tape is a thin metal tool. A craftsman can hold it flat on an object. He can also measure round objects with a steel tape. He holds the end of the tape under his thumb. Then he begins measuring.

Measuring tools are very important tools. We must keep them clean and smooth. Old or damaged measuring tools are not accurate. We must keep our measuring tools in a separate place or other tools will damage them.





Exercises

1 Vocabulary

Complete each of the sentences with one of the words in the box. Use each word in its correct form.

a. Some tools are _____ to use. A ruler is one of the _____ tools.

b. Don't _____ your tools. You cannot do good work with _____ tools.

c. Do you know how to _____ your desk? What are the _____ of the desk?

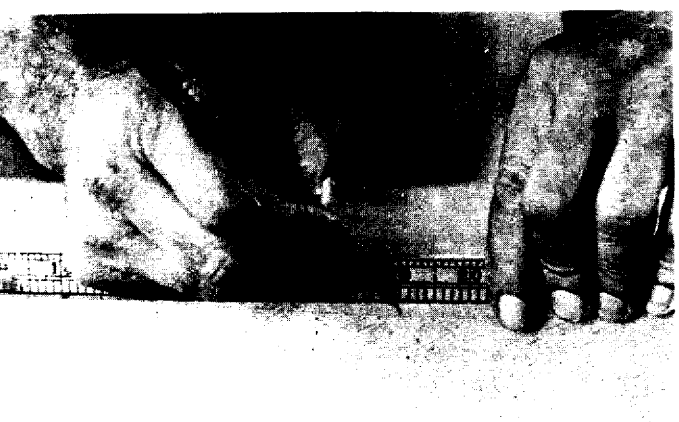
d. Your work is not _____. Measure this piece of wood _____.

accurate, accurately;
damage, damaged;
measure, measurements;
simple, simplest

2 Comprehension

A. Answer the questions about the pictures:

a. What is the craftsman doing? Why is he doing it?



b. What is wrong with these tools? Why is it wrong?

B. Which of the answers is correct, a, b, c or d.

(i) What do all measuring tools have?
a. markings b. steel tapes
c. folds d. damaged edges

(ii) What do we use to measure a round object?
a. a round ruler b. a folding rule
c. a steel tape d. a wooden ruler

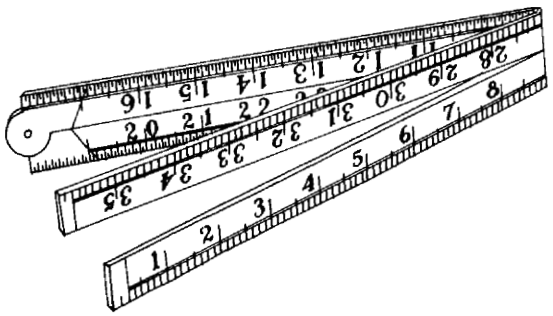
(iii) What must we do with measuring tools?
a. keep them with other tools
b. file the edges smooth
c. make markings on them
d. keep them clean

(iv) What must every craftsman be able to do?
a. use damaged tools
b. make markings on his tools
c. use measuring tools accurately
d. measure with his thumb

3 Language Practice

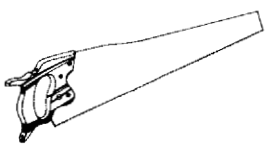
A. Look at the picture and read the sentence about it:

A craftsman must be able to use a folding rule.

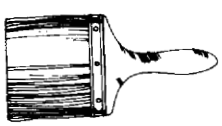


Now write sentences like this about these pictures:

a.



b.



c.

d.

B. Read this sentence:

The man began measuring at the eleven-millimetre mark.

Make sentences like this for these words:

a. start/paint/at the top of the door
b. begin/saw/eleven millimetres from the end
c. stop/work/at twelve o'clock
d. start/make/the tray yesterday

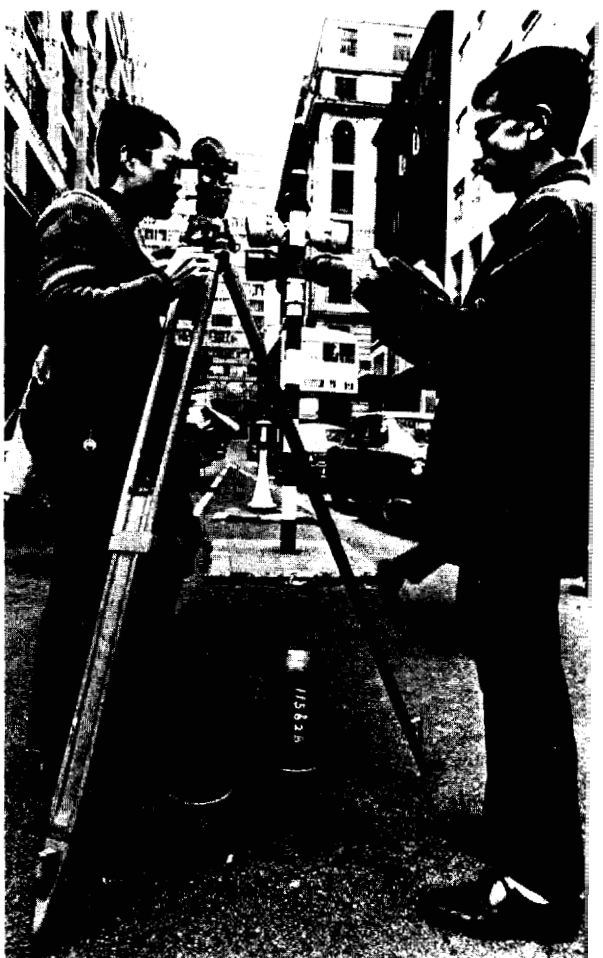
4 Composition

Think about the answers to these questions:

What must every craftsman be able to do?
What are three kinds of measuring tools?
Why must we keep our measuring tools clean and separate from other tools?

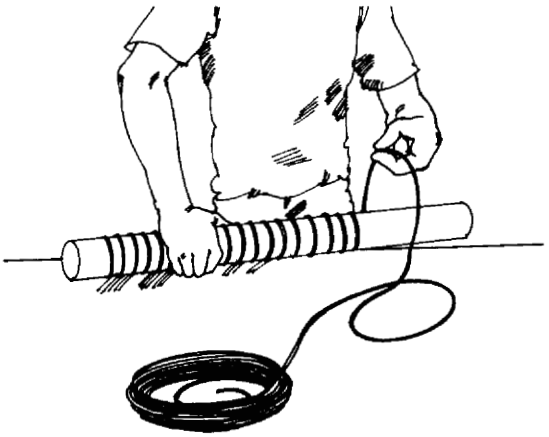
Now write a summary of the passage.

Measuring distance

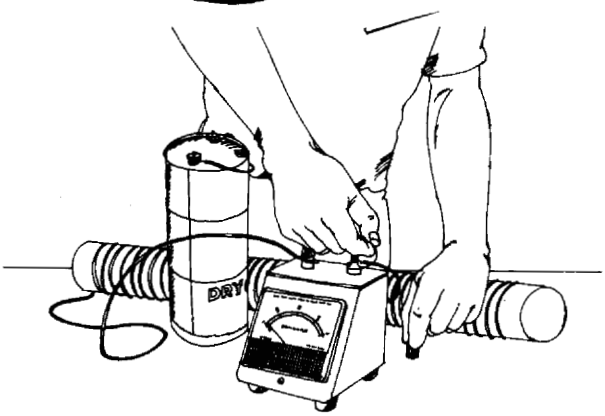


7. MAKING AN ELECTRIC CURRENT

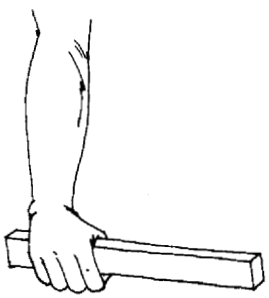
1. The boy is going to make an electric current. First he is making a coil of copper wire. He has nearly made the coil. He has wound a piece of copper wire many times round a thick paper tube.



2. The boy has connected one end of the copper wire to a galvanometer. Now he is connecting the other end of the wire to the galvanometer. When an electric current flows into the galvanometer, the needle will move. The galvanometer will measure the electric current.



3. The boy has a magnet in his hand. He is going to move the magnet in and out of the coil. The movement of the magnet will make an electric current flow through the wire.



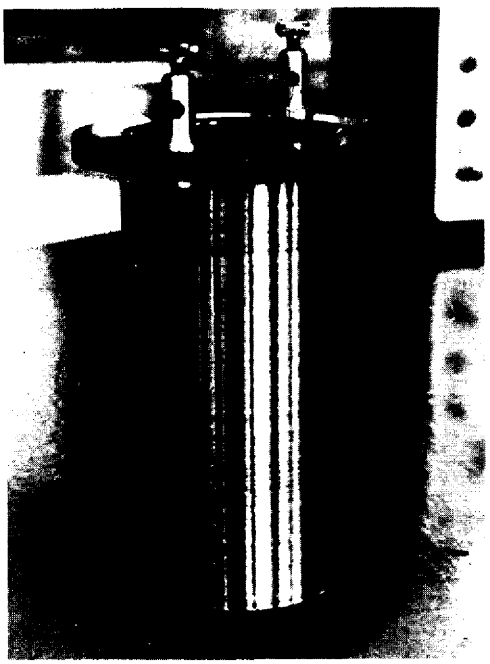
4. Here is a large generator. It is making a lot of electricity. There are many coils of wire inside the generator. There are many magnets inside the coils. The magnets are turning quickly inside the coils. They are making an electric current flow through the coils.

Exercises

1 Vocabulary

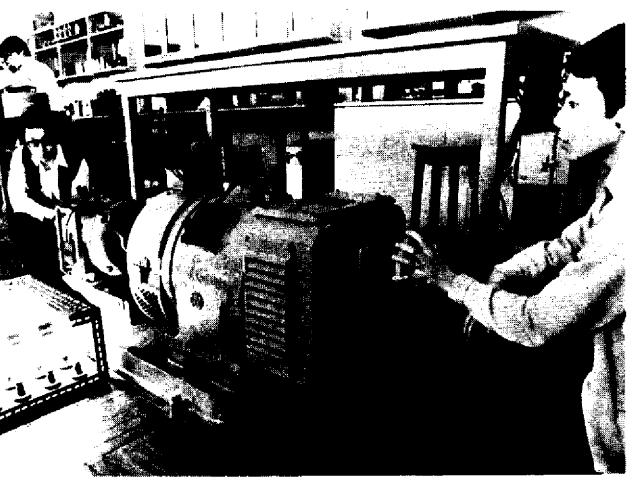
Complete these sentences about the pictures:

a. This is a _____ of copper _____
There is a _____ inside it.



b. The _____ of the _____ is moving.
There is an _____ _____ flowing
through the _____

c. This _____ is making _____



d. The man is _____ the wire to the
_____

2 Comprehension

A. Which of these sentences are true about the passage?

a. The man wound a piece of copper wire round a magnet.
b. The boy connected both ends of the coil to a galvanometer.
c. An electric current flowed through the magnet.
d. A galvanometer measures an electric current.
e. A generator is a kind of galvanometer.

B. Which of the answers a, b, c or d is correct?

(i) What did the boy use to make the coil?
a. an electric current
b. a magnet
c. some copper wire and a paper tube
d. a galvanometer

(ii) What made an electric current flow through the coil?
a. the movement of the magnet in the coil
b. the galvanometer
c. the paper tube
d. the needle in the galvanometer

(iii) What made the needle move in the galvanometer?
a. a magnet
b. a coil of copper wire
c. an electric current
d. a generator

(iv) Why did the boy connect the coil to the galvanometer?
a. He wanted to make an electric current.
b. He wanted to measure the electric current.
c. He wanted to take electricity out of the galvanometer.
d. He wanted an electric current to flow through the paper tube.

3 Language Practice

A. Read this sentence:

When an electric current flows into a galvanometer, the needle will move.

Join the statements in A to those in B. Write sentences like the above:

A. a. When the saw gets to the end of the cut _____
b. When the teacher gives instructions _____
c. When the priming paint is dry _____
d. When the piece of aluminium is soft _____

B. a. The craftsman will put it on to a forming block.
b. The man will put on the undercoat.
c. The students will switch on the machines.
d. The rod will break.

B. Read these sentences:

(i) An electric current is flowing through the coil. (A magnet)
(ii) A magnet is making an electric current flow through the coil.

Write sentences like (ii):

a. The needle is moving. (an electric current)
b. The metal is getting soft. (the flame)
c. The students are working hard. (the teacher)
d. The paper is sticking to the piece of wood. (the glue)

4 Composition

Write instructions in the Imperative on 'How To Make An Electric Current'.

8. HAMMERS

There are many different kinds of hammers. Not all hammers have the same kind of head. The heads have different weights, and the shapes are different, too. The length of the handle may be different. Some carpenter's hammers, for example, have a narrow straight edge. The carpenter uses this kind of hammer to hit small nails. He also uses a hammer with a curved, forked shape to take nails out of pieces of wood.

Some hammers have soft heads. These heads are not iron or steel, but copper. Sometimes we wrap the head in a leather bag. This gives a softer blow. When we do not want to damage the material, we use a hammer with a soft head.

When we want to spread the blow over a large area, we use a hammer with a wooden head. We call this kind of hammer a mallet.

When we want to hit a very large object, we can use a 'drop hammer'. This is a very heavy weight. Workmen or an engine lift the weight high into the air, then let the weight fall on to the object.

Pile driving with a 'drop hammer'

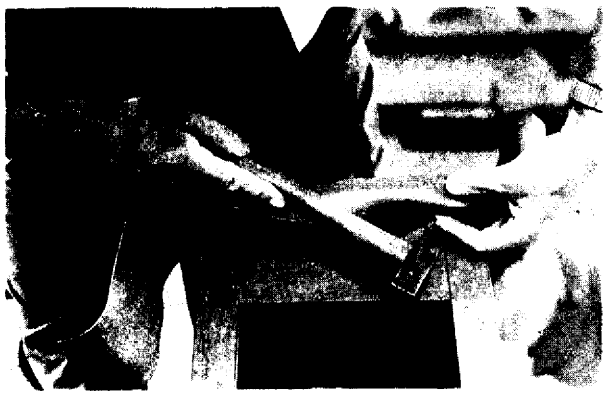
Exercises

1 Vocabulary

Write sentences about these pictures of hammers. Begin: 'This hammer has_____' Complete your sentences with words from the box.

a curved shape a forked shape
a soft head a narrow straight edge
a wooden head

a.



b.

c.

d.

2 Comprehension

A. Answer these questions in sentences:

Example:
What kind of hammer do we use to hit small nails?
We may use a hammer with a narrow straight edge.

a. What kind of hammer do we use to give a softer blow?
b. What kind of hammer do we use to take nails out of pieces of wood?
c. What kind of hammer do we use to spread the blow over a large area?
d. What kind of hammer do we use to make a hollow in a piece of aluminium? (See Unit 5)

B. Complete each of these sentences with one word:

a. Not all hammers are the same_____.
b. The two parts of a hammer are the head and the_____.
c. A mallet has a _____ or a rubber head.
d. Soft heads do not damage the_____.

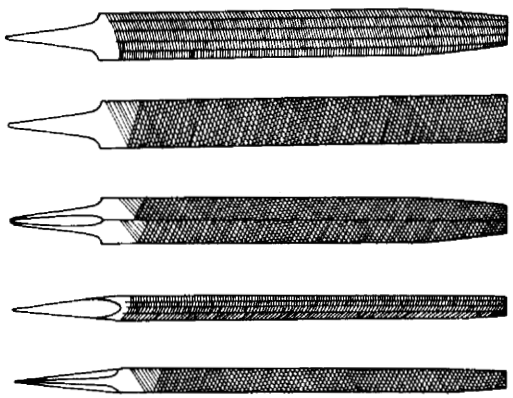
3 Language Practice

A. Look at the pictures on the previous page and read the sentences:

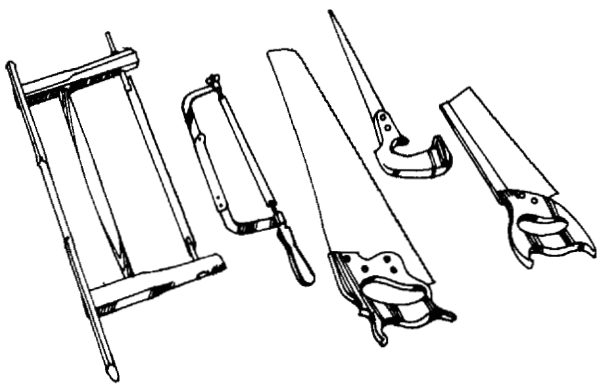
These are hammers. The hammers are not all the same.
These are different kinds of hammers.

Now make three sentences like these for each of the four pictures.

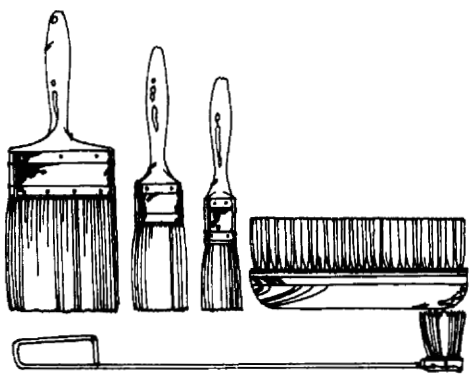
a.



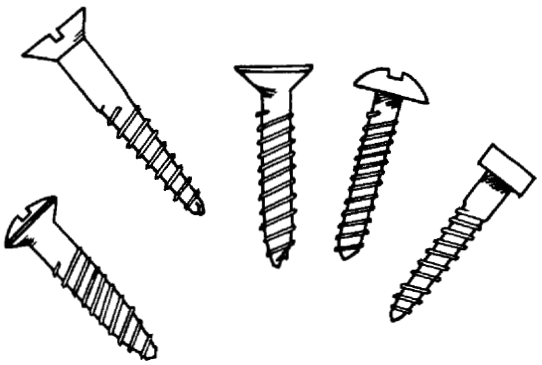
b.



c.



d.



B. Read these sentences:

(i) The carpenter used a hammer to take nails out of the piece of wood. The hammer had a curved, forked head.
(ii) The carpenter used a hammer with a curved, forked head to take nails out of the piece of wood.

Make two sentences like (i) for each of the following:

a. The boy used a pencil with a sharp point to draw the design.
b. The carpenter used a saw with a sharp blade to cut the piece of wood.
c. The craftsman used a mallet with a rubber head to hit the piece of aluminium.
d. The students used an old tool with a blunt edge to do the work.

4 Composition

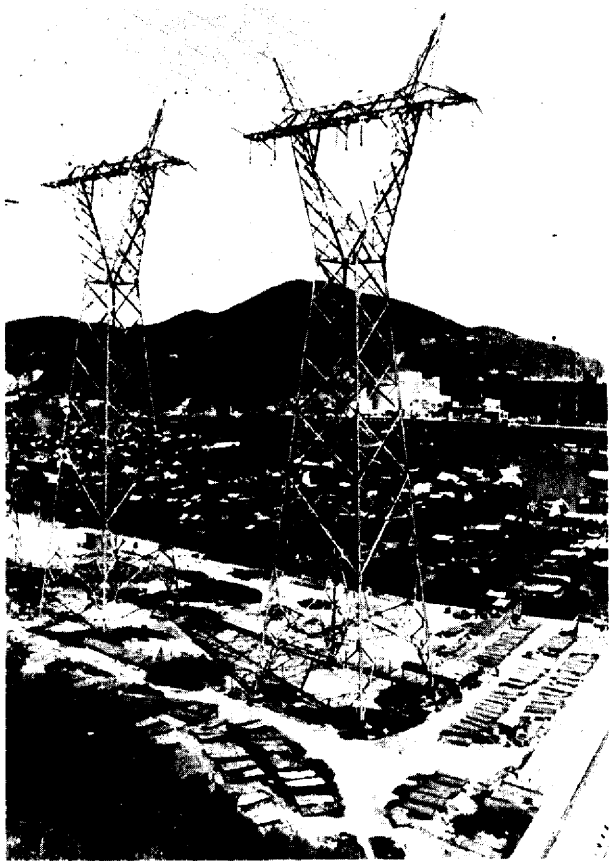
Read the first four sentences of the passage again. Now write four sentences like them about the different kinds of saws.

9. ELECTRICITY

Electricity is all around us. When thunder clouds get too full of electricity they send a spark to the earth. A spark from a cloud is called lightning. Lightning is a huge spark of electricity.

Men have learned how to make electricity. They also know how to make it work for them. They get light and heat from electricity and use it to drive trains and work radios and television sets.

Men also know how to store electricity. A torch battery is a container for electricity. It stores electricity. When we have used all the electricity in a torch battery, the battery is no use. Motor cars have large batteries. These batteries are also containers. They are different from torch batteries. When electricity flows out of a car battery we can put more electricity into it. We can charge the battery with a generator. We can also charge a car battery by connecting it to the main electricity supply via a battery charger.



Exercises

1 Vocabulary

Answer these questions in sentences:

a. What is lightning?
b. Where does lightning come from?
c. What is a battery?
d. What can a generator do?

2 Comprehension

A. Which of these sentences are true?

a. We can store lightning in a battery.
b. We cannot re-charge a torch battery.
c. All batteries are containers for electricity.
d. We cannot use all the electricity in a torch battery.
e. All electricity comes from batteries.

B. Complete the sentences in (i) with a statement from (ii):

(i) a. Thunder clouds send a spark to earth when _____
b. A torch battery is no use when _____
c. We can put more electricity into a car battery when _____
d. We put electricity into batteries when _____

(ii) a. There is no more electricity in it.
b. We re-charge it.
c. They are too full of electricity.
d. We want to store it.

3 Language Practice

A. Read these sentences:

(i) What is a spark from a cloud? It is lightning.
(ii) A spark from a cloud <u>is called</u> lightning.

Write these sentences like (ii):

a. What is a container for electricity? It is a battery.
b. What is a hammer with a wooden head? It is a mallet.
c. What is a block of wood with a hollow in it? It is a forming block.
d. What is a folding rule? It is a measuring tool.

B. Read these sentences:

(i) We can re-charge the battery by connecting it to the main electricity supply.
(ii) We can connect the battery to the main electricity supply. This will re-charge it.

Write these sentences like (ii):

a. We can make the blow softer by wrapping the head in a leather bag.
b. We can keep our brushes clean by washing them in turpentine.
c. We can hold the rod tightly by putting it into a vice.
d. We can make the measurements accurate by tipping the rule on its edge.

4 Composition

What tools do you know how to use? Write sentences about them, like this:

I know how to use a hammer. I use it to hit nails into pieces of wood.

Lightning

10. WHAT IS A CAMERA?

A camera is like a room with only one small round window. There is a dark blind over the window. Light can come into the room only when you pull the blind up. The light will spread all over the room.

Take out the flat glass from the window, and put in its place a curved lens. The lens brings the rays of light together. It focuses the light onto the wall of the room. The light does not spread all over the room.

The rays of light come from an object outside the room. These rays are reflected light. They are reflected from the object. When the lens focuses this reflected light onto the wall, we get a picture of the object. This kind of picture is called an image.

The four most important parts of a camera are the lens, the shutter, the lens opening and the film.

The lens does the work of the window in the room.

The shutter does the work of the blind.

The lens opening changes the size of the window. We can make it larger or smaller. We can let in more or less light. (See fig. 2)

The film is like the wall. The reflected light from an object passes through the lens and makes an image on the film.

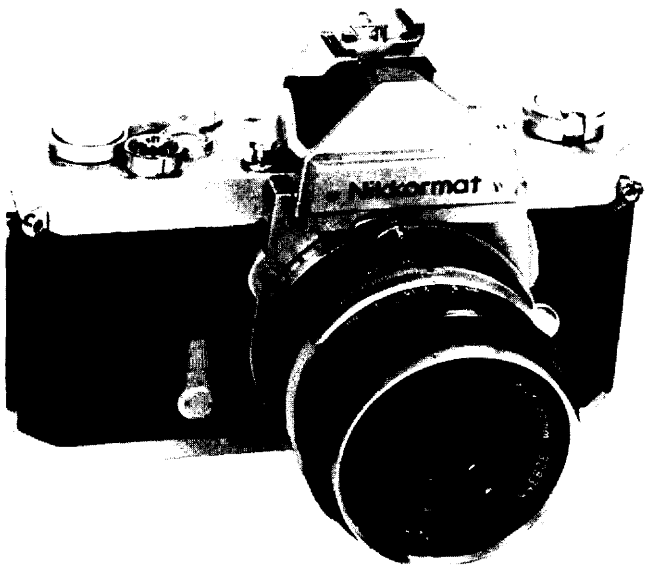


fig. 1. A SLR Camera

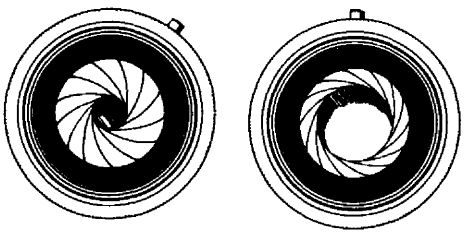


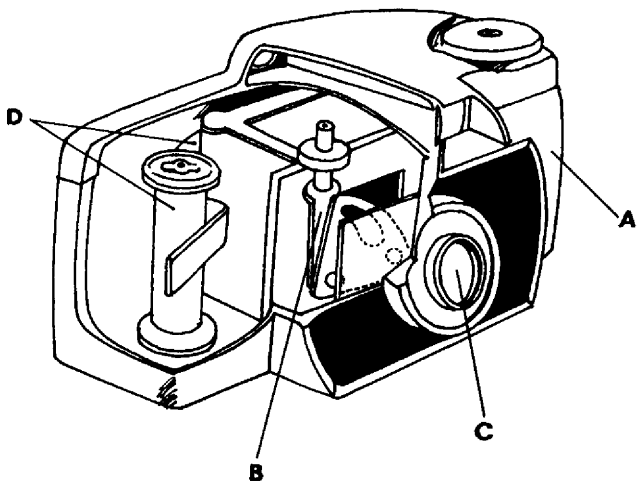
fig. 2. lens opening.

Exercises

1 Vocabulary

Look at the picture. Give names to a, b, c and d. Use words from the box.

camera	shutter	lens
image	rays of light	film



2 Comprehension

A. Which of the answers a, b, c or d is correct?

(i) What is a camera like?
- a. a picture
- b. a film
- c. a window
- d. a room

(ii) What is the shutter of a camera like?
- a. an image
- b. a window blind
- c. rays of light
- d. a lens

(iii) What is the lens of a camera like?
- a. a blind
- b. an image
- c. a window
- d. reflected light

(iv) What is the film in a camera like?
- a. a lens opening
- b. an image
- c. a wall
- d. a picture

B. Answer these questions in sentences:

a. What kind of light goes into a camera?
b. How do we let light into a camera?
c. What does a lens do to rays of light?
d. What do we get on a film in a camera?

3 Language Practice

A. Read these sentences:

(i) When you pull up the blind, light will come into the room.
(ii) Light will come into the room when you pull up the blind.

Write these sentences like (ii):

a. When you press the switch, the electric light will come on.
b. When you pull the lever, the machine will start.
c. When you move the magnet in and out of the coil, the needle of the galvanometer will move.
d. When you put the metal into the fire, it will melt.

B. Read this sentence:

The reflected light from an object passes through the lens and makes an image on the film.

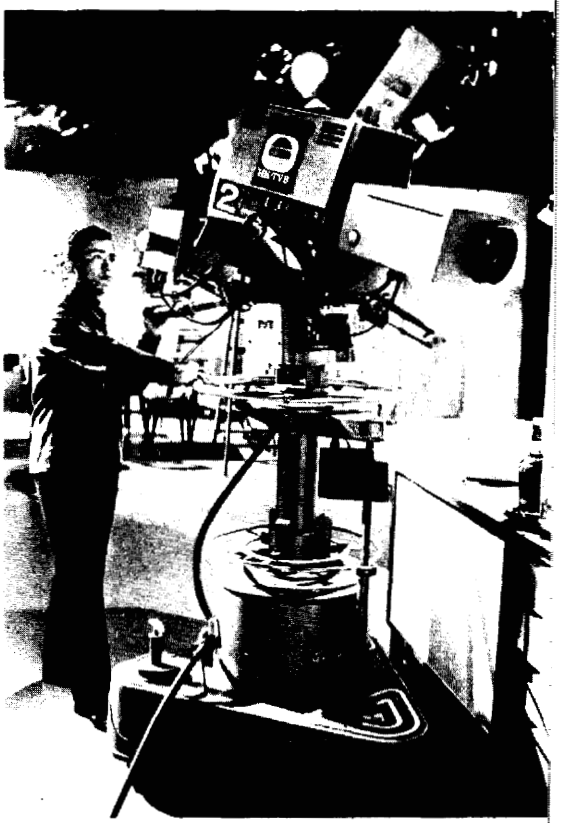
Now read these sentences:

The reflected light comes from an object.
The light passes through the lens.
The light makes an image on the film.

Make three sentences from each of these long sentences:

a. The electric current from the battery flows through the wire and moves the needle of the galvanometer.
b. The heat from the fire warms the metal and makes it soft.

A television camera



4 Composition

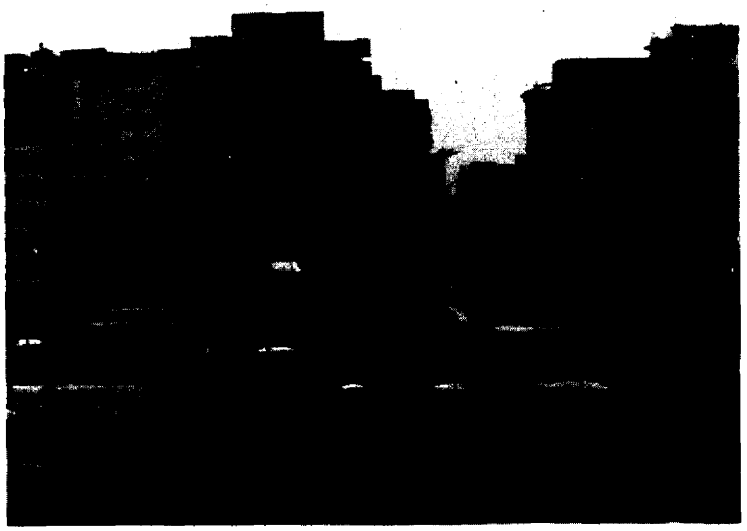
A camera is like a room but it is not a room. How is a camera different from a room?

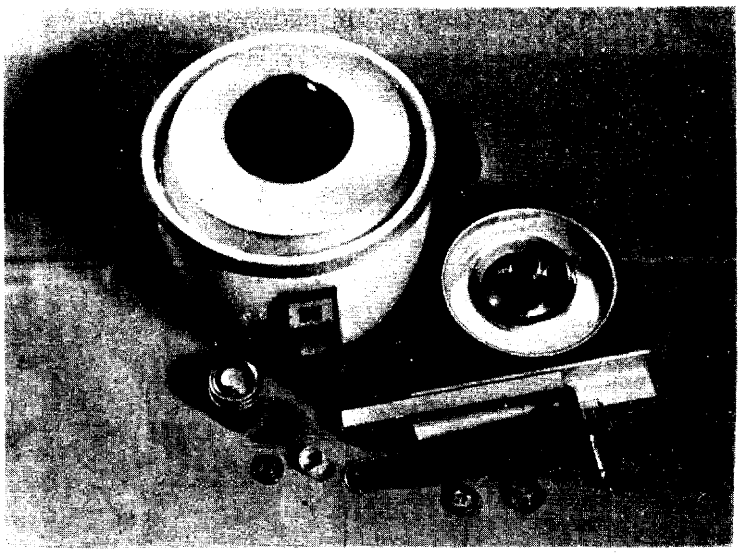
11. ALUMINIUM

Aluminium is a soft, light metal. It has a bluish-white colour. Electricity can flow easily through it. Aluminium is not a strong metal. We usually mix a little copper with aluminium to make it stronger.

Aluminium is not a poisonous metal and it does not rust. It is easy to work with. We can make it thinner and spread it out by hammering it. We can bend it, fold it, hammer it, roll it, and cut it into simple shapes.

We use aluminium to make many things. We use it to make household equipment, parts for cars, aircraft bodies, ships and railway carriages. It is one of the most important metals.





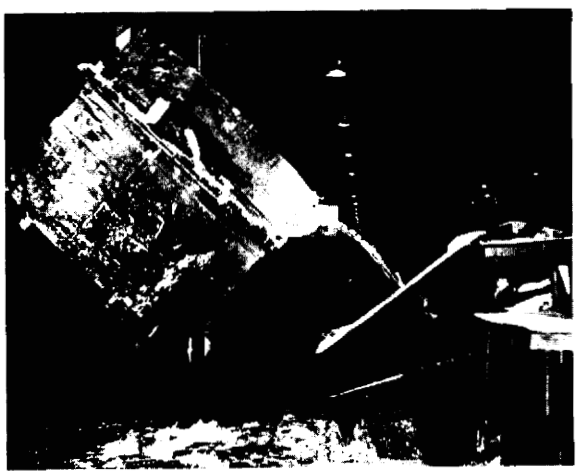
Exercises

1 Vocabulary

Use the correct verb from the box to make sentences about the pictures. Say what is happening in each picture.

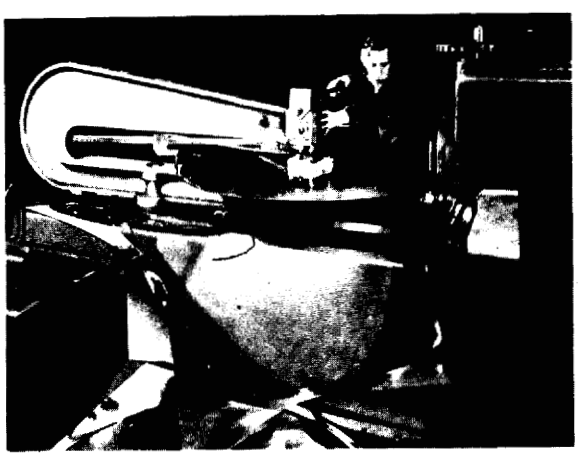
flow	bend	fold	cut	rust	roll

a.

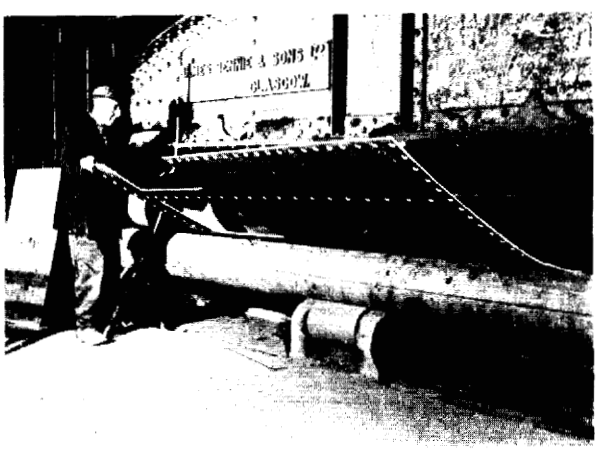


b.

c.



d.



2 Comprehension

A. Which of the answers a, b, c or d is correct?

(i) Why do we mix copper with aluminium?
   a. to make electricity flow through it more easily
   b. to make it easy to work with
   c. to make it rust
   d. to make it stronger

(ii) Why do we use aluminium to make household equipment?
   a. It has a bluish-white colour.
   b. It has copper in it.
   c. It is not a poisonous metal.
   d. It is not a strong metal.

(iii) How can we make aluminium thinner?
   a. We can mix it with copper.
   b. We can hammer it.
   c. We can bend it.
   d. We can fold it.

(iv) Why is aluminium one of the most important metals?
   a. It is light and does not rust.
   b. It has a good colour.
   c. We can mix it with copper.
   d. Electricity can flow through it.

B. A craftsman made a saucepan. He did not make it with iron. He made it with aluminium. Why did he use aluminium? Choose his reasons from this list:

Aluminium is a light metal.
It is an important metal.
It has a bluish-white colour.
It is easy to work with.
Electricity can flow through it.
It does not rust.
It is not a poisonous metal.
It is not a strong metal.

3 Language Practice

A. Read these sentences:

(i) Aluminium is easy to work with.
(ii) We can work with aluminium easily.

Write these sentences like (ii):

a. Copper wire is easy to bend.
b. A hacksaw is easy to use.
c. A flat surface is easy to paint.
d. Safety rules are easy to learn.

B. Read these sentences:

(i) We can mix a little copper with aluminium to make it stronger.
(ii) We can make aluminium stronger by mixing a little copper with it.

Write these sentences like (ii):

a. We can mix a little turpentine with paint to make it thinner.
b. We can heat the metal to make it softer.
c. We can file the rod to make the edge smoother.
d. We can rub the surface with glass-paper to make it smoother.

4 Composition

Read the first paragraph of the passage again. Write a paragraph like it about silver. Here are some notes to use:

Silver: soft, white, electricity flows, not strong, mix with copper, easy to work with but expensive

12. DRAWINGS OF BUILDINGS

When we build a house we use drawings. These drawings tell us everything about the house. They show us the details of the building, inside and outside. We use three kinds of drawings: elevations, plans and sections.

An elevation is the view of one side of a building. A building with four sides has four elevations. Look at the elevation in the picture. It shows the front side of the house. It shows the shapes and sizes of the door and window. It shows their positions in the wall.

A plan is the view of a building from above. Look at the plan in the picture. It shows the thickness of the outside wall. It shows the thickness of the inside wall, and the positions of the door and windows. We need several plans for each house. For a small, one-storey house, for example, we need a foundation plan, a first floor plan and a roof plan.

A section cuts the house from top to bottom. It shows the height of the rooms inside the building and the thickness of the floors, ceiling and roof. It also shows the height of the bottom of the windows from the floor, and the height between the tops of the doors and windows and the ceiling.

Fig. 1 Scale: 1:100 (10 mm =1 m)

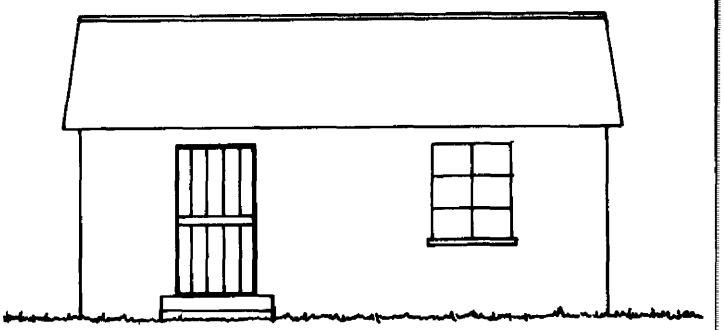


Fig. 2

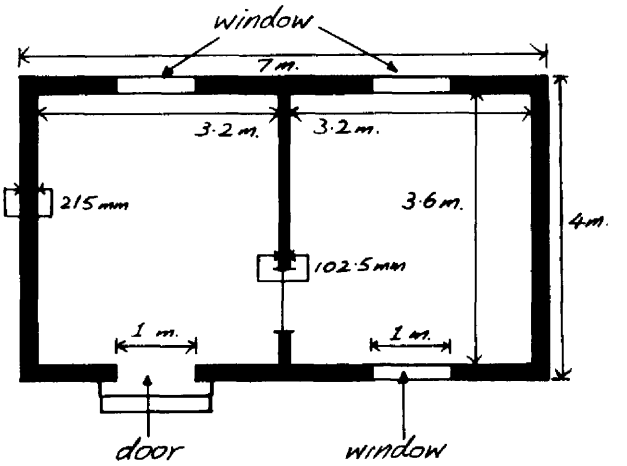
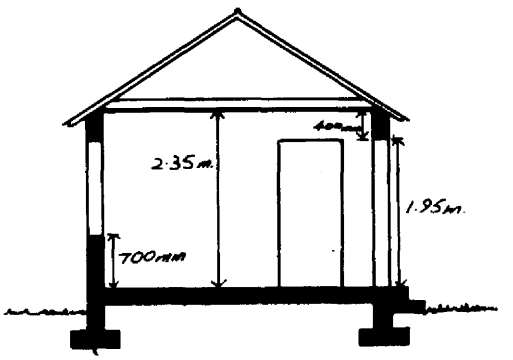


Fig. 3



Exercises

1 Vocabulary

Look at Figures 1, 2 and 3:

What kind of drawing is each picture?
Which parts of the building does each picture show?

2 Comprehension

A. Look at the Figures 1, 2 and 3 again. Answer these questions in sentences:

a. What kind of building is it?
b. How many storeys has this building?
c. How many windows are there in this building?
d. How many doors are there in this building?
e. What is the thickness of the outside walls?
f. What is the thickness of the inside wall?
g. How high is the ceiling?
h. How high are the windows from the floor?
i. What is the width of the front door?
j. What is the area of each room?

B. Which of the measurements a, b, c or d is correct for the building?

(i) What is the height of the front door?
a. 2.35 m b. 1 m
c. 1.95 m d. 400 mm

(ii) What is the width of the windows?
a. 700 mm b. 1 m
c. 3.2 m d. 7 m

(iii) What is the height from the top of the door to the ceiling?
a. 1.95 m b. 1 m
c. 2.35 m d. 400 mm

(iv) What is the area of the building?
a. 28 sq m b. 12.8 sq m
c. 28 m d. 23 sq m

3 Language Practice

A. Read these sentences:

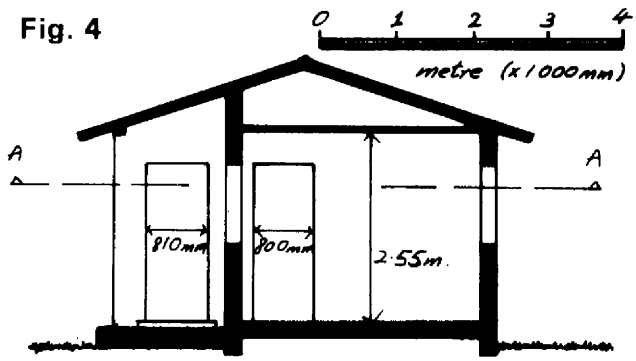
(i) The room is 4 metres wide.
(ii) The width of the room is 4 metres.

Write these sentences like (ii):

a. The wall is 8 metres long.
b. The room is 6 metres wide.
c. The walls are 150 mm thick.
d. The foundations are 1 metre deep.

B. Here is a drawing. What does it show us?

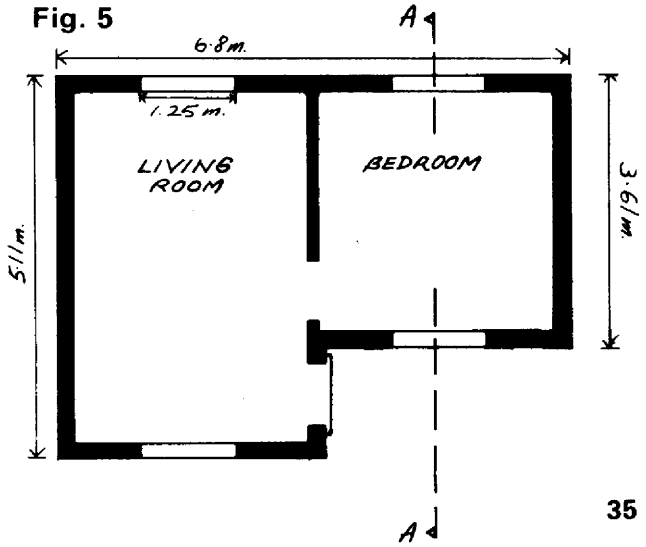
Fig. 4



This drawing shows us a section of the building. It also shows us the height of the room and the width of each door.

What does this drawing show us?

Fig. 5



4 Composition

Study all the Figures on page 34. They are different drawings of the same building. What do you know about this building? Write all the details in sentences. Here are your first three sentences:

These are drawings of a house. The house has one storey. The height of the house from the floor to the top of the roof is _____

(Note: When you have written all your sentences, write them again in a better order.)

13. MACHINES

Machines help us to do work. Try to crack a nut with your finger. You cannot do it. Now put the nut in a nut-cracker. Press the arms of the nut-cracker together. The nut cracks easily. A nut-cracker is a simple machine.

A nut-cracker does not work without help. The nut-cracker helped you but you helped the nut-cracker. You pressed the arms of the nut-cracker. You used some of your strength. You used the power of your hand to move the arms of the nut-cracker. You put power into the nut-cracker. The nut-cracker did not have any power inside it. The power came from outside the machine. It came from you. The power made the parts of the machine move, and then the machine did the work.

Look at the two drills below. The drills are boring holes in a piece of wood. One drill is getting its power from a man. He is turning the handle of the drill. The other drill is getting its power from electricity. An electric current is driving a motor inside the drill. The motor is turning the drill.

Nut-cracker

Hand-drill

Electric drill

Exercises

1 Vocabulary

A. Write two sentences for each word. In the first sentence use the word as a noun. In the second sentence use the word as a verb.

Example: hammer
(i) The man is using a hammer.
(ii) The man is hammering a nail.

a. drill **b.** file **c.** saw **d.** brush

B. Complete each of these sentences with a verb from the box. Use each verb in its correct form.

a. The drill _____ a hole in the piece of wood.
b. The electric current _____ the motor of the machine.
c. The man _____ the arms of the nut-cracker.
d. The motor _____ the drill.

use put bore crack help drive press make turn

2 Comprehension

A. Which of the answers a, b, c or d is correct?

(i) What makes a nut-cracker work?
a. power from our hands
b. electricity
c. power inside the nut-cracker
d. a machine

(ii) What do all machines use?
a. power from our hands
b. electric motors
c. power from outside
d. their own strength

(iii) Why do we use machines?
a. They use electricity.
b. They help us to do work.
c. We can help them.
d. They use power from outside.

(iv) Which of these things is a machine?
a. electricity b. power
c. wood d. a drill

B. Answer each question with a sentence:

a. What are nut-crackers and drills?
b. What is the power from our hands?
c. What do all machines do?

3 Language Practice

A. Read these sentences:

(i) A nut-cracker must have help.
(ii) A nut-cracker won't work without help.

Write sentences like (ii) for these words:

a. engine/work/fuel
b. craftsman/work/tools
c. pen/write/ink
d. radio/work/electricity

B. Read these sentences:

(i) A nut-cracker has arms. (press)
(ii) Press the arms of the nut-cracker.

Write sentences like (ii) for the following:

a. A drill has a handle. (turn)
b. A knife has a blade. (sharpen)
c. A hammer has a handle. (hold)
d. The rod has a rough edge. (smooth)

4 Composition

Read the first paragraph of the passage again. Now write paragraphs like it about the following:

Moving a heavy rock with a lever.
Lifting a car with a screw-jack.

Spinning frame: an example of a more complicated machine

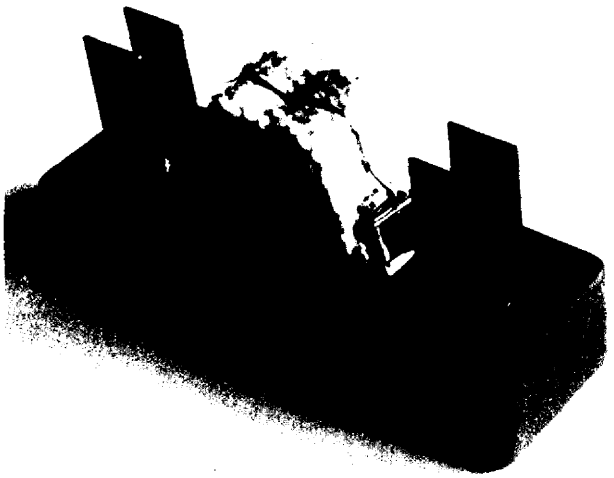
14. FUSES

We put fuses into electric appliances to make electric appliances safe. Radios, television sets, heaters, and refrigerators are all electric appliances. These appliances have fuses.

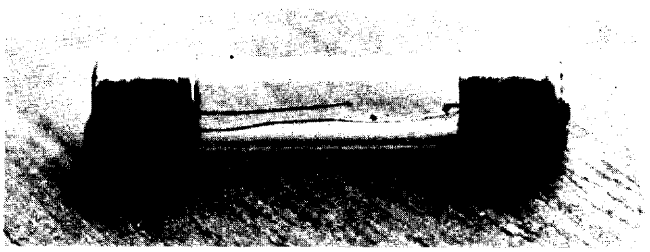
A fuse is a small piece of wire. When too much electricity tries to pass through the fuse, it melts. When it has melted no electricity can pass through it.

When there is something wrong with an electrical appliance, too much electricity may flow into it. When there is a fuse in the appliance or in the plug, the fuse will melt. The electricity will not be able to cross the broken fuse wire, and the appliance will be safe.

Not all fuses are the same size. Some appliances need more electricity than others. An electric heater, for example, will usually need a current of 15 amps. A radio will need only 5 amps. Fuses must be the correct size for the appliance. When a fuse is too small, it melts too quickly. When a fuse is too large, it does not melt quickly enough. Then the appliance may get too much electricity and it is not safe.



Wire fuse



Cartridge fuse

Exercises

1 Vocabulary

Complete each of the sentences with a word from the box:

a. There isn't a fuse in the radio but there is one in the _____

b. Most homes have one or more electrical _____ in them.

c. The fuse melted because there was too much _____

d. The heater is not _____ because it does not have a fuse.

current size plug safe appliances flow wire

2 Comprehension

A. Which of the answers a, b, c or d is correct?

(i) Why are fuses important?
- a. They are pieces of wire.
- b. Electricity cannot flow through them.
- c. They need a lot of electricity.
- d. They keep electrical appliances safe.

(ii) When is an electrical appliance not safe?
- a. when the fuse is too big
- b. when the fuse is too small
- c. when the fuse is in the plug
- d. when the fuse has melted

(iii) When does a fuse melt?
- a. when the electric current is too large
- b. when the electric current is too small
- c. when there is no electric current
- d. when the appliance is hot

(iv) What must we do when a fuse melts?
- a. put in a bigger fuse
- b. put in a smaller fuse
- c. put in another fuse of the same size
- d. find out what is wrong with the appliance

B. Complete these sentences:

a. Fuses are different sizes because _____

b. Electricity cannot flow into an appliance when _____

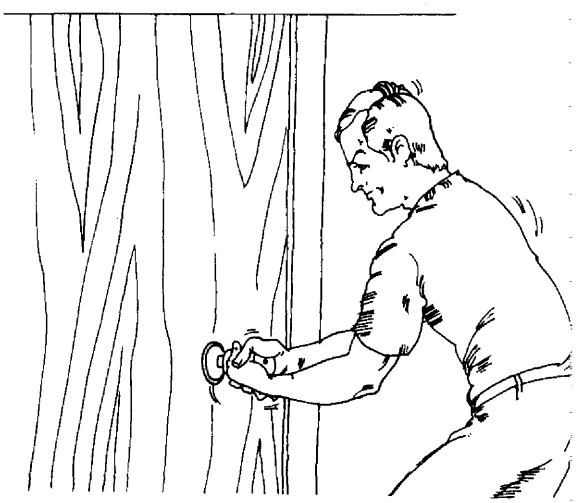
c. Too much electricity may flow into an appliance when _____

d. Not enough electricity can flow into an appliance when _____

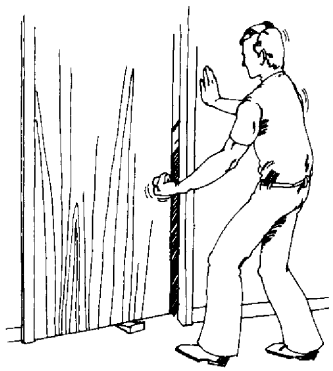
3 Language Practice

A. Look at the picture and read the sentences:

What is the man doing? Is he opening the door? No, he isn't. He wants to open the door, but the door will not open. The man is trying to open the door.

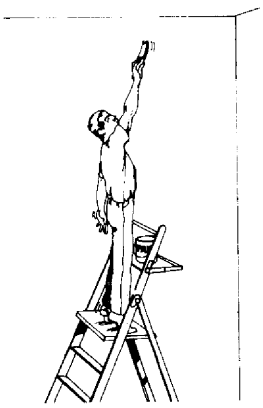


Look at the pictures below. What is the man trying to do in each picture?

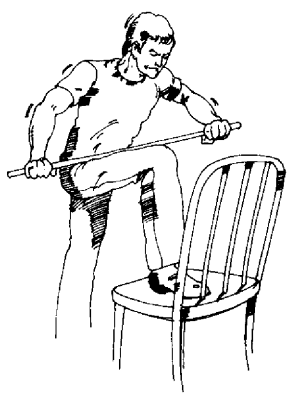


a.

b.



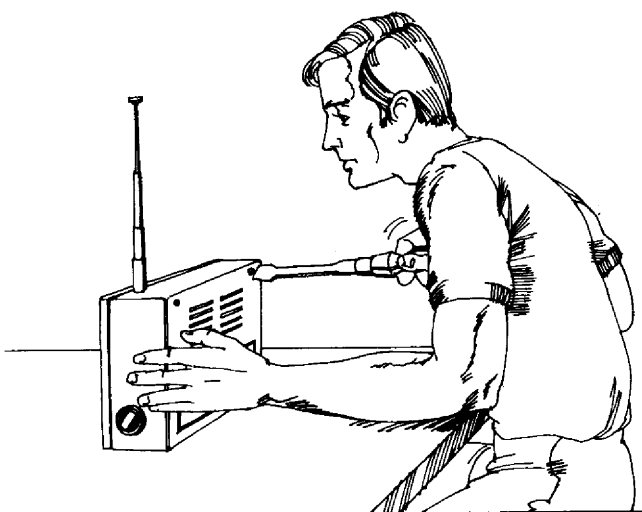
c.



d.

B. Look at these pictures and read the sentences:

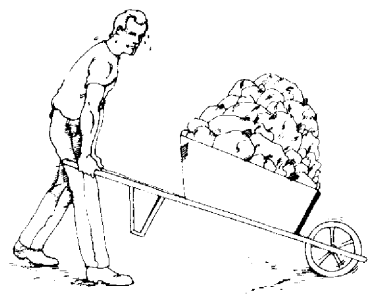
The screwdriver is too big.
The screwdriver is not small enough.



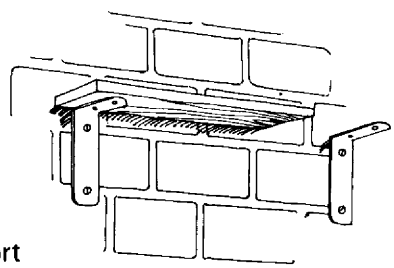
Write two sentences about the pictures below:

a. small

b. wide



c. heavy



d. short

4 Composition

Write out the two most important sentences in the passage.

15. FIBRES

A fibre is long and thin. Textiles are made from fibres. Different textiles are made from different fibres. We use textiles all day and every day.

Mattresses on some beds have cotton covers. Sheets and pillow-cases are made of cotton, too. Cotton is a fibre.

The seat of your chair may have a cover. This cover is probably nylon, rayon, wool or cotton. Nylon, rayon and wool are fibres.

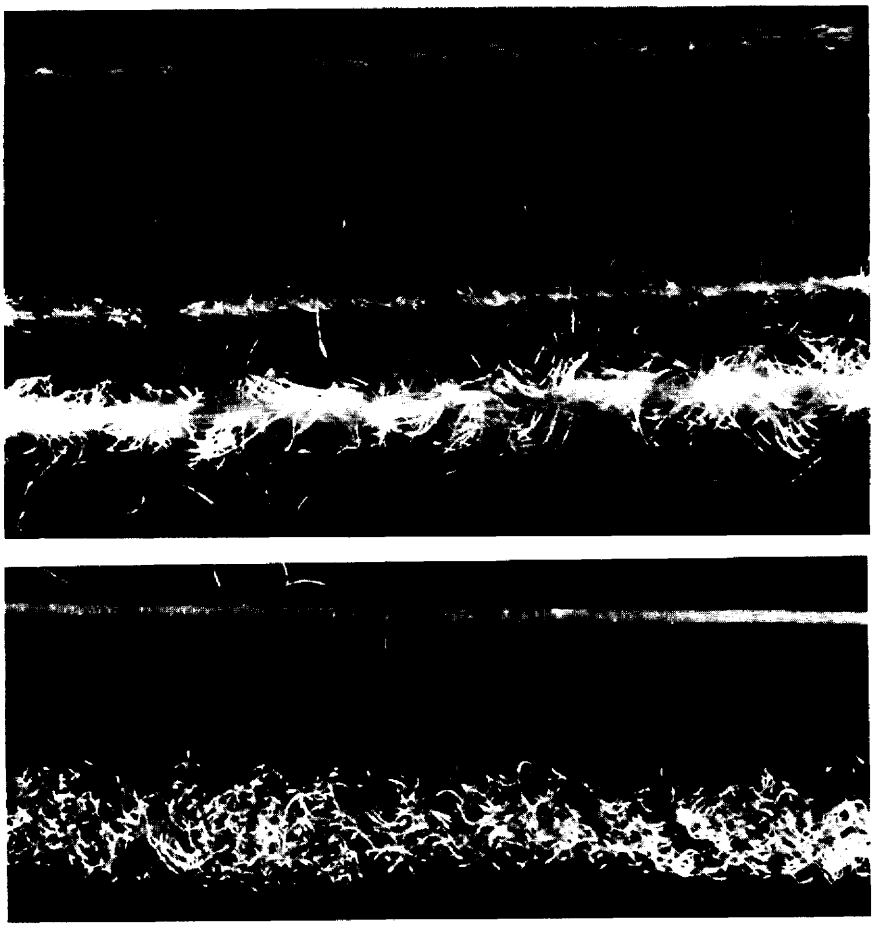
There are sacks of rice or potatoes in the shops. These sacks are made of jute. Jute is a fibre.

Some people wear drip-dry shirts. These shirts are made of polyester. Polyester is a fibre.

Your underwear has elastic in it. Elastic is made of rubber. Rubber is a fibre.

Some fibres are natural fibres. They come from plants, animals or minerals. Jute and cotton, for example, come from plants. Wool comes from an animal–the sheep. Natural rubber comes from a tree.

Other fibres are man-made. They are made in factories. Rayon, nylon and polyester are man-made fibres.



Nylon yarn

Cotton yarn

Wool yarn

Rayon yarn

Stretch nylon yarn

Exercises

1 Vocabulary

Look at the picture.
What fibres are the textiles made from?

2 Comprehension

A. **a.** Make a list of the natural fibres.
b. Make a list of the man-made fibres.
c. Make a list of all the different textiles in the class-room or workshop.
d. Make a list of all the different textiles in your home.

B. Choose the true sentences:

a. Fibres are important to us.
b. Textiles are long and thin.
c. All shirts are made of polyester.
d. Most fibres come from sheep.
e. We use different fibres to make different textiles.
f. Some textiles are made from natural fibres.
g. Some fibres are man-made fibres.
h. All textiles are made from natural fibres.
i. Polyester is a kind of cotton.
j. We make textiles from fibres.

3 Language Practice

A. Read these sentences:

(i) All textiles are made from fibres.
(ii) We make textiles from fibres.

Write these sentences like (ii):

a. Sheets and pillow cases are made from cotton.
b. Sacks are made from jute.
c. Drip-dry shirts are made from polyester.
d. Elastic is made from rubber.

B. Read this sentence:

Different textiles are made from different fibres.

Write sentences like this for each of the following:

a. tools/metals
b. buildings/materials
c. plastics/chemicals
d. clothes/textiles

C. Read these sentences:

(i) All textiles are made from fibres.
(ii) We make textiles from fibres.
(iii) We use fibres to make textiles.

Write sentences like (i) from the following. Use 'is made' or 'are made':

a. We use wood to make most furniture.
b. We make a lot of household goods from aluminium.
c. We use copper to make electric wire.
d. We make sharp tools from steel.

4 Composition

Make a list of ten things in the room that you are in now. Write two sentences about each. Say what it is made of. Say what we use it for.

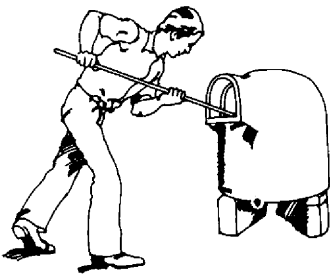
In a textile factory

16. MAKING THINGS WITH GLASS: GLASSBLOWING

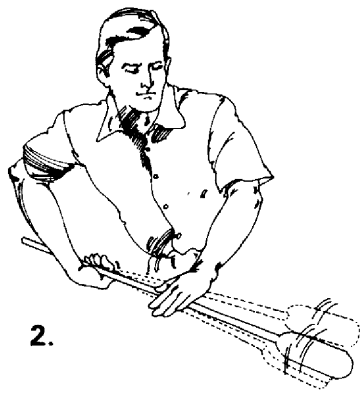
Glass is made from silica. Silica is a fine, white sand. Sometimes a glass-maker adds soda to the silica. The soda makes the silica melt faster. Sometimes he adds a little gold to give the glass a red colour. He can also add lead to make the glass clear and transparent.

The glass-maker puts the silica mixture into a crucible. This is a kind of large clay pot. Then he puts the crucible into a furnace. The furnace heats the silica mixture. At 1 600 ° Centigrade the mixture melts, and the glass-maker can make things with it.

These pictures show a glass-maker making a jug.



1.



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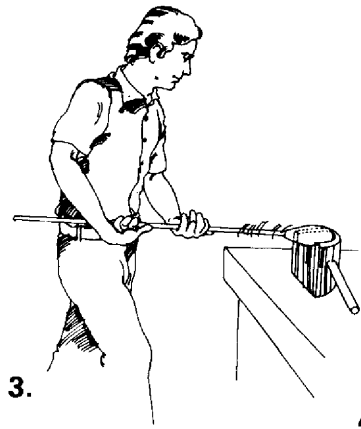

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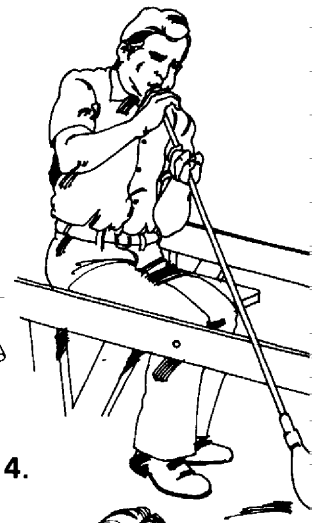
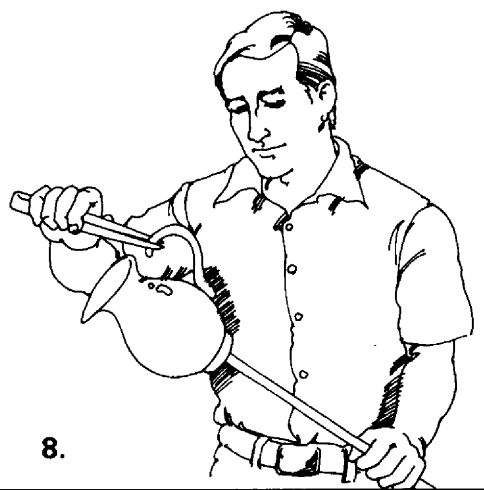


4.

1. He is dipping a blowpipe into the molten glass and lifting up a gob of glass from the crucible.
2. He is rolling the gob backwards and forwards on a flat piece of metal.
3. He has placed the white-hot gob of glass onto a block of wood with a hollow in it. He is turning the gob round and round and making it into a rough cylinder.
4. He is blowing into the blowpipe and a bubble is forming inside the gob of glass.
5. He is making the neck of the jug by squeezing the glass.
6. He has added a piece of glass to the bottom of the jug. Now he is cutting his blowpipe away from the top of the jug.
7. He is making the opening of the jug and the lip.
8. He has added one end of a thick ribbon of glass to the side of the jug. He is fixing the other end of the ribbon to the neck of the jug. This is the handle of the jug.

5.

6.



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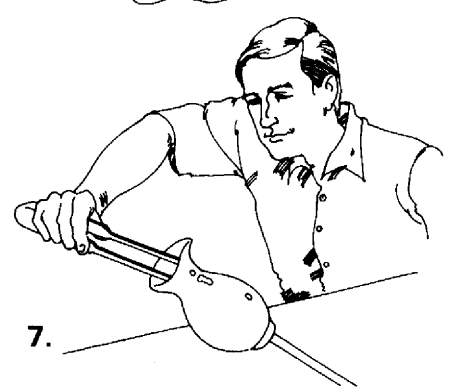


7.

Exercises

1 Vocabulary

A. Begin each sentence with a verb from the box.

a. _____ the glass mixture in a crucible.

b. _____ the handle to the side of the jug.

c. _____ soda to the silica.

d. _____ the blowpipe into the molten glass.

add	**melt**	**dip**	**roll**
blow	**squeeze**	**fix**	

B. Complete these sentences with a word from the passage:

a. Some glass is _____. We can see through it.

b. Glass is a _____ of silica and soda.

c. A glassmaker works with _____ glass.

d. A _____ is a large clay pot.

2 Comprehension

A. Answer these questions about glass-makers.

a. Why do they add soda to silica?

b. Why do they add gold to silica?

c. Why do they add lead to silica?

d. Why do they heat the silica mixture?

B. Which of the answers a, b, c or d is correct?

(i) What tool does a glass-maker use to make a jug?

a. a crucible b. a blowpipe
c. a handle d. a furnace

(ii) How does the glass-blower make the neck of the jug?

a. He adds a piece of glass to the jug.
b. He squeezes the glass.
c. He ties the handle on with ribbon.
d. He blows into the jug.

(iii) Why does the craftsman blow into the gob of glass?

a. to make it cool
b. to make it hollow
c. to make it transparent
d. to make it melt

(iv) How many different pieces of glass does the glass-maker use to make a jug?

a. one b. two
c. three d. four

3 Language Practice

Read these sentences:

(i) Sometimes we add a little gold to the silica. The gold gives the glass a red colour.

(ii) Sometimes we add a little gold to the silica to give the glass a red colour.

Make two sentences from the following:

a. Sometimes we add lead to the silica to make the glass transparent.

b. Sometimes we add soda to the silica to make the silica melt faster.

c. Sometimes we add turpentine to paint to make the paint thinner.

4 Composition

Rewrite the sentences about the pictures 1–8 on the previous page in the Imperative.

17. PLUGGING A WALL

We often need to fix things to a wall. If the wall is made of wood, the job is easy. If the wall is made of brick, we must use a plug.

Choose a place between two bricks, and take out the mortar. Make a hole about 100 mm deep and 50 mm wide.

Split a piece of wood 180 mm long and 50 mm wide. The piece of wood must be just too thick to go into the hole between the bricks. Cut two opposite corners off one end of the piece of wood. This end will now go into the hole a little way. Drive the piece of wood in deeper with a hammer. About 10 mm of the plug will not go into the hole. Cut this piece off with a saw. Take another piece of wood. Use it as a punch and drive the plug in a little deeper than the surface of the wall.

Now you can put a screw into the wall by screwing it into the wooden plug. If your plug is made of dry wood, it will stay in the hole for many years. If it is made of wet wood it will fall out in a few days.

Exercises

1 Vocabulary

Complete each of these sentences with a word from the box:

a. Take out the _____ between two bricks.

b. Drive the nail beneath the surface of the wall with a _____

c. Put one end of the piece of wood into a vice and cut 30 mm off the _____ end.

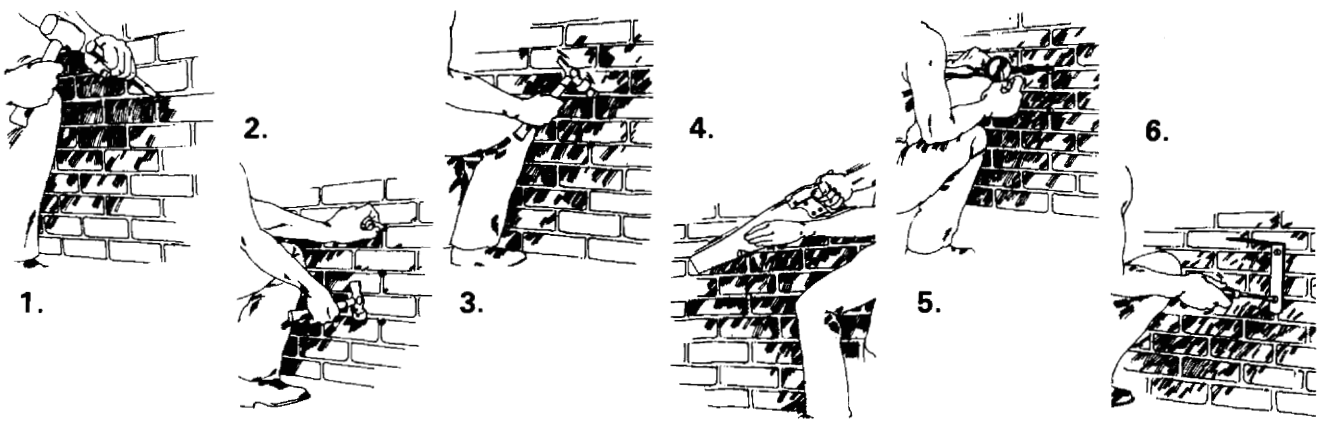
d. _____ off the pieces of dry cement on the floor.

e. A well-made plug will _____ in place for many years.

split	**mortar**	**stay**
scrape	**punch**	**opposite**

2 Comprehension

A. The pictures show a man fixing a shelf to a brick wall. Write sentences about the pictures.



B. Which of the answers a, b, c or d is correct?

(i) When do we need to plug a wall?

a. when we want to fix a shelf on to a wooden wall
b. when we are using wet wood to fill a hole
c. when we want to fix something to a brick wall
d. when we want a plug to stay in place

(ii) What size should the piece of wood be?

a. smaller than the hole
b. a little larger than the hole
c. the same size as the hole
d. any size

(iii) What kind of wood should we use to make a plug?
a. wet wood b. any kind of wood
c. dry wood d. old wood

(iv) What do we use a punch for?
a. to drive something in deeply
b. to cut off the end of a piece of wood
c. to scrape mortar out of a brick wall
d. to split pieces of wood

3 Language Practice

A. Read these sentences:

(i) The piece of wood will not go into the hole. It is too thick.
(ii) The piece of wood is too thick to go into the hole.

Write these sentences like (ii):

a. The plug will not stay in the hole. It is too wet.
b. The saw will not cut the piece of wood. It is too blunt.
c. The paint will not go onto the wall smoothly. It is too thick.
d. The fuse will not make the appliance safe. It is too big.

B. Read these sentences:

(i) If the wall is made of wood, the job is easy.
(ii) The job is easy if the wall is made of wood.

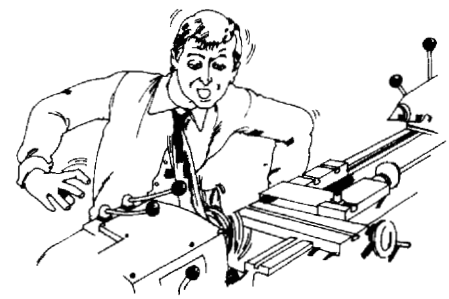
Write these sentences like (ii):

a. If you use dry wood, the plug will stay in the hole.
b. If you measure accurately, your work will be better.
c. If you press too hard, the end of the rod will break.
d. If you move a magnet in and out of a coil of wire, an electric current will flow through the coil.

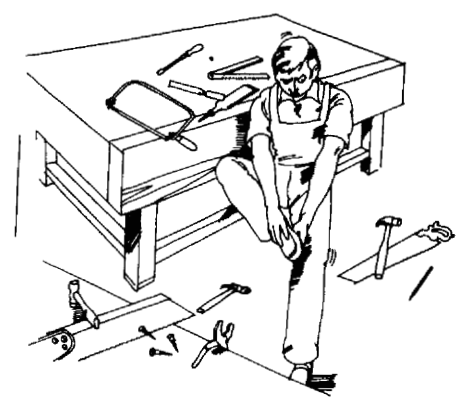
4 Composition

Write 'If' sentences for these three pictures:

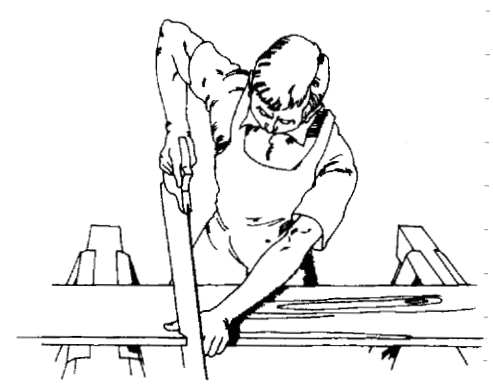
a.



b.



c.



18. HOW TO USE NAILS

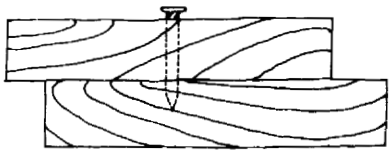


Fig. 1

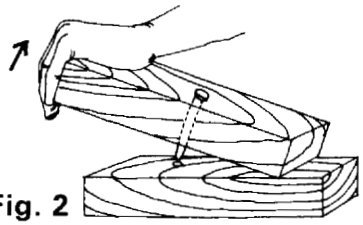


Fig. 2

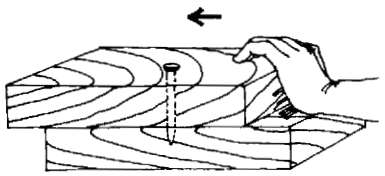


Fig. 3

Figure 1 shows two pieces of wood. There is a single nail joining the two pieces of wood together. We can pull the pieces of wood apart by pulling in the direction of the arrow (Figure 2). We cannot pull them apart by sliding one piece of wood over the other (Figure 3).

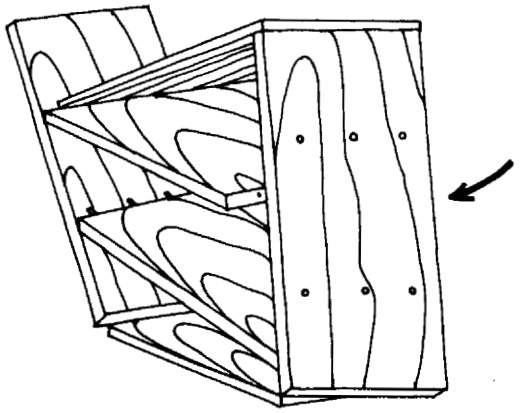


Fig. 4

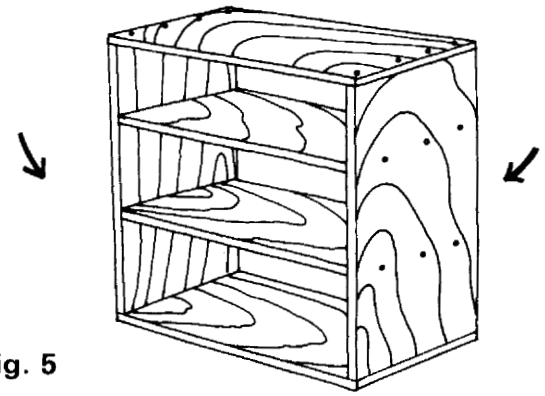


Fig. 5

Figure 4 shows a small cupboard. The nails are in the sides of the cupboard. A blow from either side will knock the cupboard into pieces. In Figure 5 most of the nails are in the top and the bottom of the cupboard. This cupboard is much stronger. A blow from any direction will push the nails more firmly into place. The upper and lower nails will stop the sides from separating. The middle nails will stop the shelves from dropping.

But the cupboard is still not completely strong. If we twist it or push it, we can make it lean over (Figure 6). We can stop it from leaning over by nailing a back on to the cupboard (Figure 7).

The good workman does not knock in his nails anywhere. He asks himself an important question. What stresses may pull the nails out? Then he drives the nails into the best places.

Fig. 6

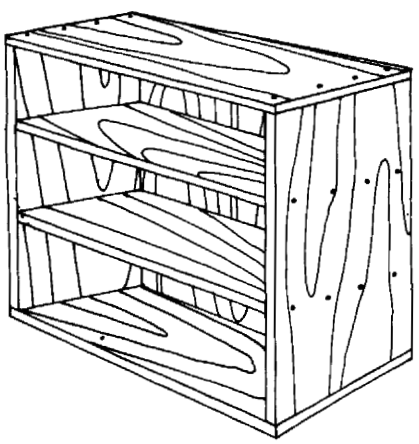


Fig. 7

Exercises

1 Vocabulary

Here are two lists of words. Each word in A is opposite in meaning to a word in B. Write these words in pairs.

A	B
join	push
pull	together
apart	lower
upper	separate

2 Comprehension

A. Answer these questions in sentences:

a. How can we separate the pieces of wood in Figure 2?

b. Why is the cupboard in Figure 4 not very strong?

c. Why is the cupboard in Figure 5 much stronger?

d. How can we stop the cupboard in Figure 6 from leaning over?

B. Choose the true sentences:

a. We can separate the pieces of wood in Figure 1 by sliding one piece over the other.

b. We can separate the pieces of wood in Figure 3 by pulling them apart.

c. The cupboard in Figure 5 is stronger than the cupboard in Figure 4.

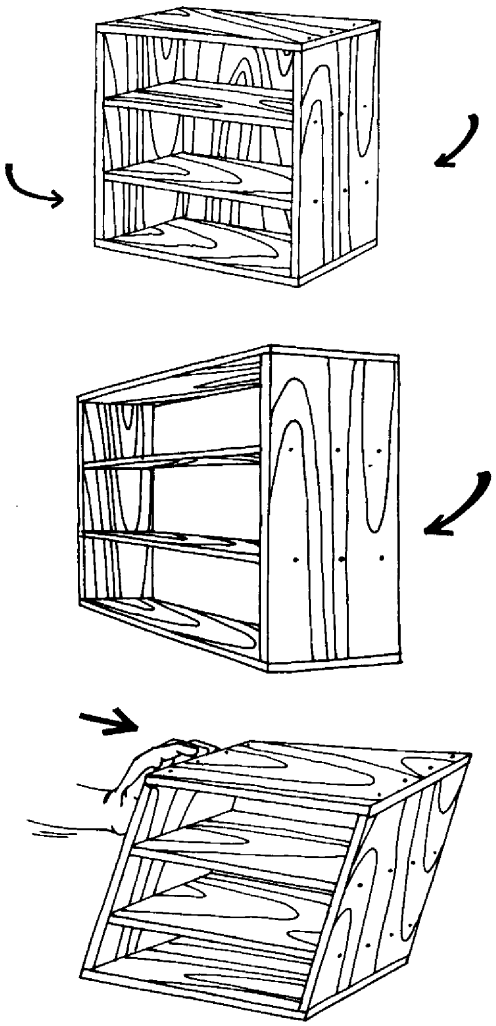
d. We can make a cupboard completely strong by putting a back on to it.

C. In the pictures the arrows show the direction of the stress. What will the stresses do to the cupboard in the pictures? Choose the correct answer a, b or c for each of the three pictures.

(i) a. knock the cupboard into pieces

b. knock the nails more firmly into place

c. make the cupboard lean over



3 Language Practice

A. Read these sentences:

(i) There is a single nail. It joins the two pieces of wood together.

(ii) There is a single nail joining the two pieces of wood together.

Write these sentences like (ii):

a. There is a small cupboard. It hangs on the wall.

b. There is a fuse box. It connects the main electricity supply to the house.

c. There is a large pipe. It brings water to the block of flats.

d. There is a handbook for the appliance. It gives full instructions.

B. Read these sentences:

(i) The sides of the box are separating. What will stop them? (Nails)

(ii) Nails will stop the sides of the box from separating.

Write sentences like (ii) for the following:

a. The door is opening. What will stop it? (a wedge)

b. The pieces of wood are coming apart. What will stop them? (glue)

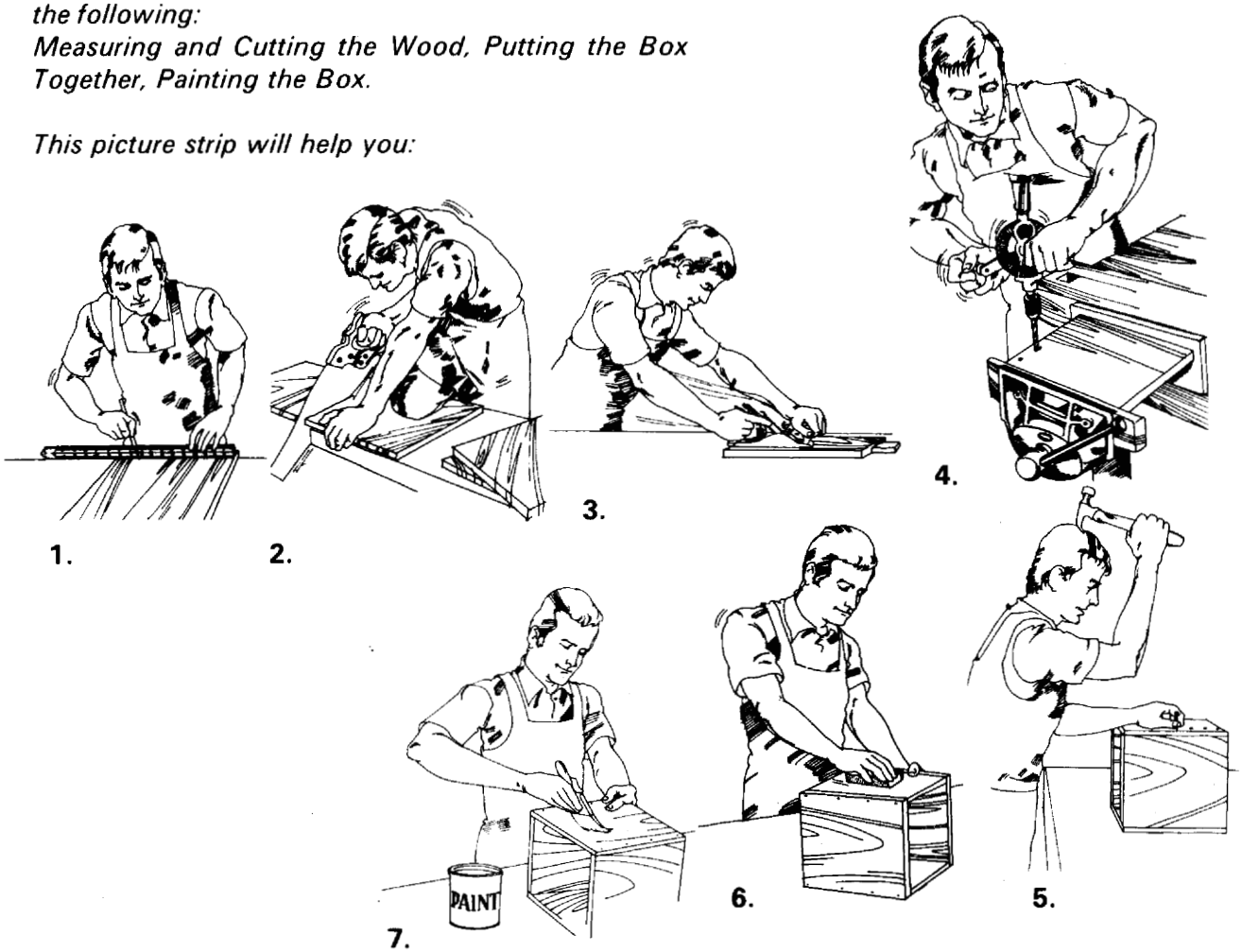
c. The metal is getting too hot. What will stop it? (water)

d. Too much electric current is flowing into the appliance. What will stop it? (a fuse)

4 Composition

Give detailed instructions on 'How To Make a Box'. Write your instructions in the Imperative. Write about the following:
Measuring and Cutting the Wood, Putting the Box Together, Painting the Box.

This picture strip will help you:



1. 2. 3. 4. 5. 6. 7.

19. GRINDING AND SHARPENING

When the edge of a cutting tool becomes blunt, we must sharpen it. However, before we sharpen the tool we often need to grind it.

Place the tool on the rest of the grindstone and press the tool against the wheel. Turn the wheel and hold the edge of the tool against it. Hold it steady and move it from side to side. Do not move it up and down. Keep the tool wet by dipping it often into water. If the tool is not wet it will get hot. Too much heat will make the steel soft and spoil it.

Grind the edge until it is quite thin. The slope of the cutting edge of a wood chisel should be about 25°. It should be straight and at right angles to the side.

Sharpen the tool on an oilstone. Rub a little oil onto the stone. Hold the blade on the stone at an angle of about 30°. Move the blade on the stone. Do not change the angle of the blade. Start with a few backwards and forwards strokes, then continue with circular strokes. Keep the same pressure along the whole edge.

Small pieces of metal from the edge will float on the oil. The edge will soon get very thin and will bend over. This is the wire edge. When you have got a wire edge, turn the blade over and lay it flat on the stone. Move the flat edge backwards and forwards on the stone a few times.

Now move the edge up and down a strop* a few times. This is called stropping the edge. The leather will remove the last pieces of wire edge. It will make the tool ready for you to use.

*A strop is a strip of leather used for sharpening tools.

Exercises

1 Vocabulary

Complete the answers to these questions with words from the box:

a. What can we do to a blunt tool? We can _____ it.

b. What must we do before we sharpen it? We must _____ it.

c. What will too much heat do to the steel? It will _____ it.

d. What do we do to the wire edge with a strop? We _____ it.

grind	**sharpen**	**strop**	**spoil**
float	**remove**	**press**	

2 Comprehension

A. Answer the questions about each of the pictures below:

a. What is wrong with this tool?

b. What is the man doing to the edge of the tool?

c. How is he moving the tool on the grindstone?

d. What is the man doing wrong?

e. What is the man doing now? Why is he doing it?

f. What is the man doing?

g. What kind of stroke is the man using?

h. What is the man doing wrong?

i. What is the man doing now? Why is he doing it?

a. 

b. 

c. 

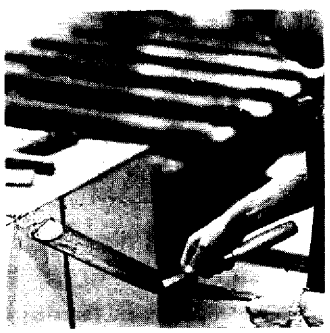
d. 

e. 

f. 

g. 

h. 

i. 

B. Here are ten sentences about sharpening a tool. Only three are correct. Choose the correct sentences:

a. Hold the tool steady on the grindstone.
b. Move the tool from side to side on the stone.
c. Move the tool backwards and forwards on the grindstone.
d. Let the tool get hot.
e. Keep the tool straight on the grindstone.
f. Hold the tool at right angles to the surface of the oilstone.
g. Do not keep the same pressure along the whole edge of the tool.
h. Remove the wire edge by grinding it.
i. Finish sharpening the tool by grinding it.
j. Rub some oil onto the strop.

3 Language Practice

A. Read these sentences:

(i) First we must remove the blunt edge of the tool. Then we sharpen it.
(ii) We must remove the blunt edge of the tool <u>before</u> we sharpen it.

Write these sentences like (ii):

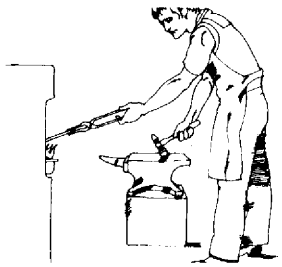
a. First we must put on some priming paint. Then we put on the undercoat.
b. First we rub some soap on to the piece of aluminium. Then we heat it.
c. First we wind the copper wire round a paper tube. Then we connect the wire to a galvanometer.
d. First we draw the plans of the house. Then we begin to build it.

B. Read this sentence:

Grind the edge of the tool <u>until</u> it is quite thin.

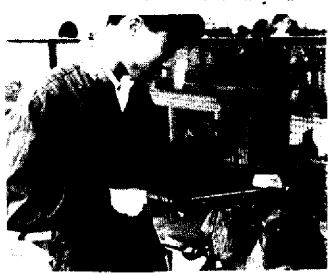
Now write sentences like this about these pictures:

a. wash/clean



b. heat/soft

c. rub/smooth



d. file/smooth

4 Composition

In Unit 3 you learned some Safety Rules. Write out some rules for grinding and sharpening. What must we do? What mustn't we do?

20. STEEL WIRE

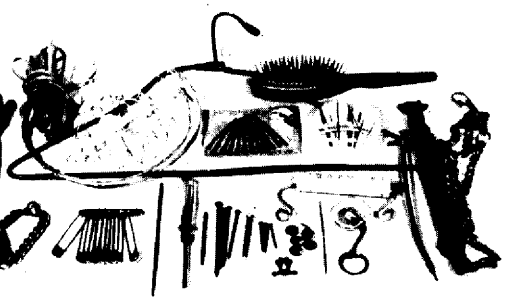
Steel wire has thousands of uses. For example, it is used for fences, paper clips, coat hangers, safety pins, needles and nails.

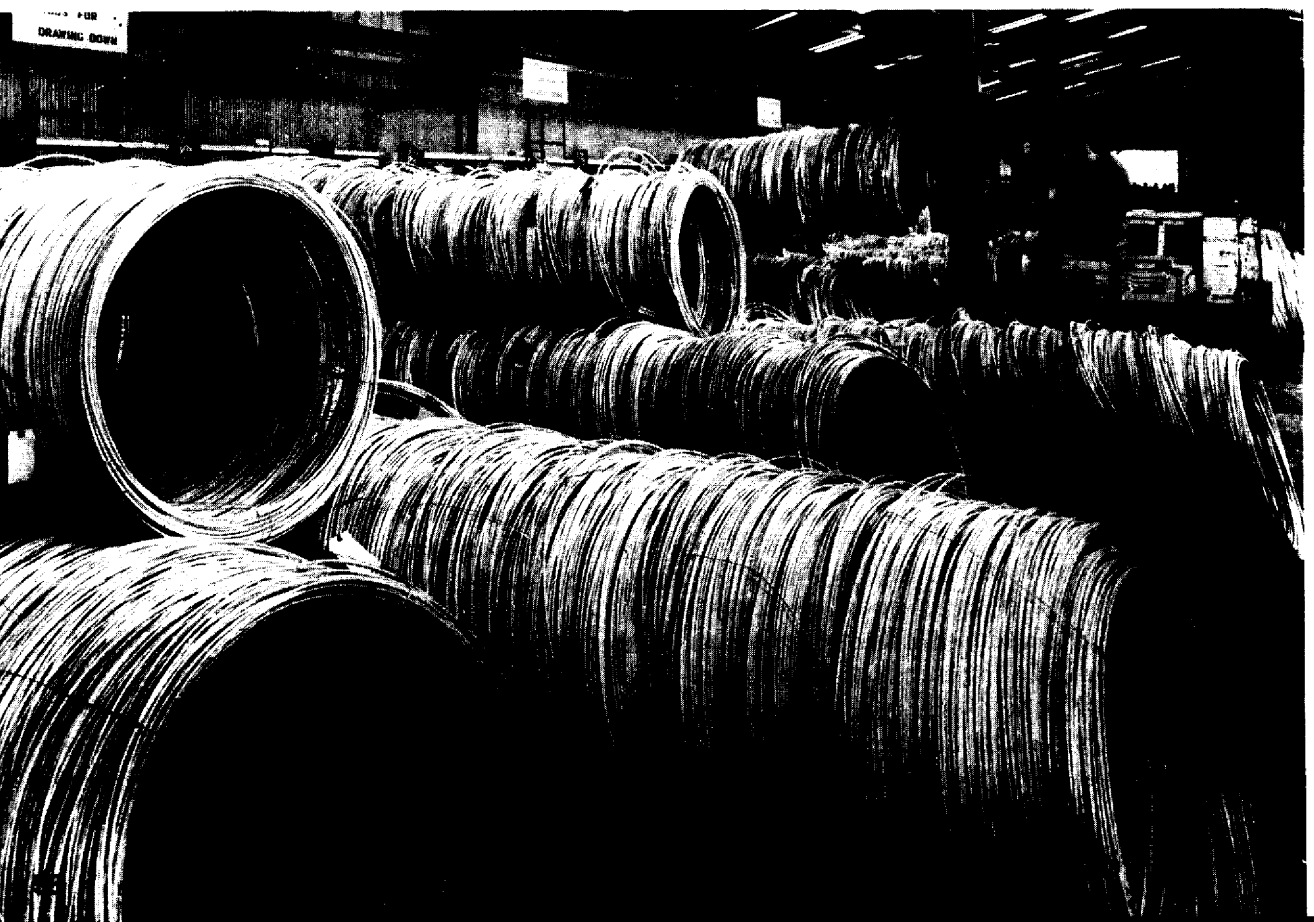
Steel wire is made by pulling steel rods through smaller and smaller holes. The steel rods are made into wire when they are cold. They are pulled through a hole in a die. There is a coating of lime on the rods. This coating of lime keeps them from sticking to the die.

The cold steel rod is wound round a spool. One end of the rod is pointed. This pointed end is threaded through a hole in a die. It is then fixed to a drum. An electric motor turns the drum, and the steel rod is pulled through the hole in the die.

The rod is pulled through a die several times. Each time it is pulled through a smaller hole. Each time it becomes longer and narrower. It becomes steel wire.

Articles made from steel wire



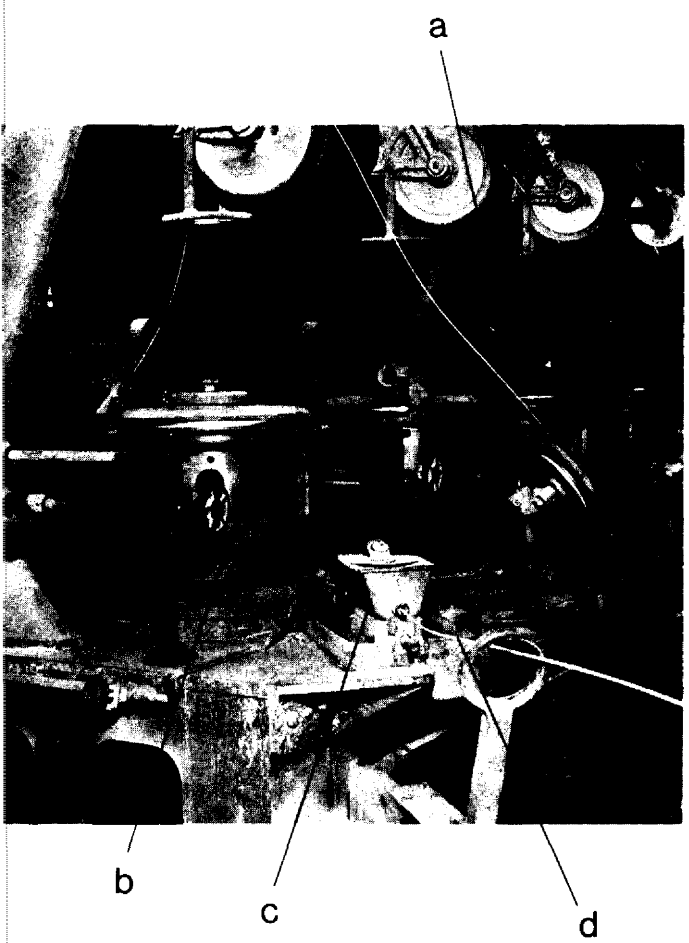


Exercises

1 Vocabulary

Look at the picture and label a, b, c and d with words from the box:

die	**rod**	**spool**	**lime**
drum	**electric motor**		



2 Comprehension

A. Which of the answers a, b, c or d is correct?

(i) How are steel rods made into wire?
- a. They are pulled through holes of different sizes.
- b. They are wound round a drum.
- c. They are fixed to a spool.
- d. They are coated with lime.

(ii) Why don't the steel rods stick to the die?
- a. They are pulled by an electric motor.
- b. They are pulled through large holes.
- c. They are coated with lime.
- d. They are pulled when they are cold.

(iii) What pulls the rod through the holes?
- a. a drum b. a spool
- c. a die d. an electric motor

(iv) What happens to the rod when it is pulled through smaller and smaller holes?
- a. It sticks to the die.
- b. It becomes longer and narrower.
- c. It becomes pointed.
- d. It winds round the spool.

B. Answer these questions in sentences:

a. Why is steel wire useful?
b. Why do we use lime when we make steel wire?
c. Why do we make a point at one end of the steel rod?
d. Why do we pull the wire through smaller and smaller holes?

3 Language Practice

A. Read these sentences:

(i) The steel rods are pulled through a hole in a die. (An electric motor)
(ii) An electric motor pulls the steel rods through a hole in a die.

Write these sentences like (ii):

a. The wire is made by pulling steel rods through smaller and smaller holes. (We make ____)
b. The cold steel rod is wound round a spool. (The workmen wind ____)
c. The pointed end is threaded through a hole in a die. (The workmen ____)
d. The end of the rod is fixed to a drum. (The workmen fix ____)

B. Read these sentences:

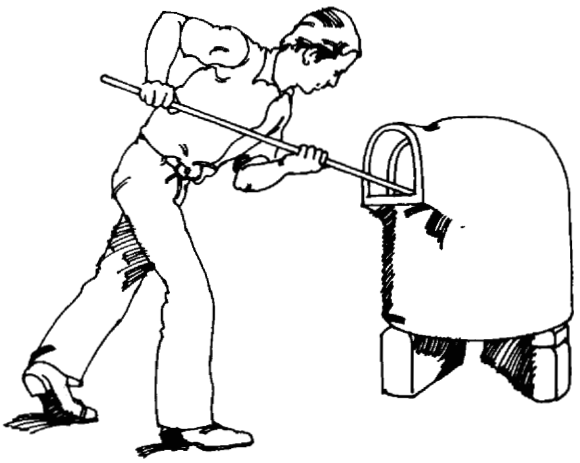
(i) Rub the surface of the wood with glasspaper. (____ is rubbed.)
(ii) The surface of the wood is rubbed with glasspaper.

Write these sentences like (ii):

a. Fill up nail holes and cracks in the wood with putty. (____ are filled up ____)
b. Brush away the dust. (____ is brushed ____)
c. Brush the paint well into the wood (____ is brushed ____)
d. Dip only the tip of the brush into the paint. (____ is dipped ____)

4 Composition

Read the sentence about the picture.



is dipped

The blow-pipe <u>is dipped</u> into the molten glass.

Turn to Page 47 and write the sentences 2–8 in this way.

a. is rolled
b. is placed/is turned/is made
c. is blown/is formed
d. is made
e. is added to/is cut away from
f. are made
g. is added to/is fixed to

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D.D. Waters, the co-author, has had many years' practical experience in craft education, both as teacher and technical college principal. He has suggested many of the passages and checked all the exercise material and illustrations for the accuracy of the technical content. This co-operation between a language teacher and a technical expert has resulted in a series of textbooks that craft and vocational schools can use with confidence.

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