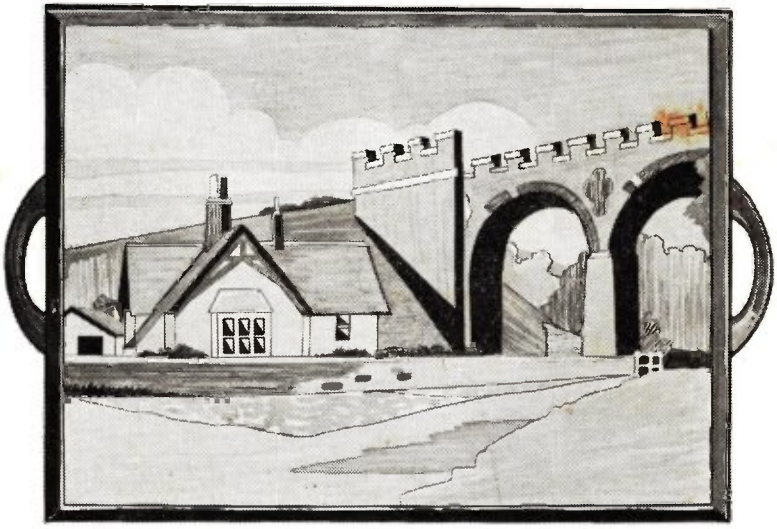
HOBBIES weekly

8th APRIL 1964 VOL. 138 NUMBER 3565

Free Design for making this

MARQUETRY TRAY



THE VIADUCT

Hobbies

FOR CRAFTSMEN OF ALL AGES

6D.

CENTENARY ISSUE FROM SWEDEN

TO celebrate the centenary of the birth of the Swedish poet Erik Axel Karlfeldt the Swedish Post Office issued on 3rd February, two new postage stamps of the values 35 öre (blue) and 1 krona 5 öre (red). The design is the same for both.

* * *

AMERICA has announced that commemorative postage stamps will be issued this year for the New York World's Fair and to mark anniversaries in Nevada and in New Jersey.

As a companion piece to the World's Fair commemorative stamp, a 5-cent embossed envelope will also be issued. In maroon and white, it will feature a stylized representation of the World, encircled by an ellipse.

U.S.A. Commemoratives

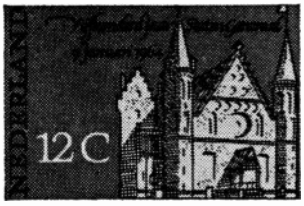
Four new postal issues for 1964 had previously been announced. In production are a Battle of the Wilderness stamp in the Civil War Centennial series, a postal card commemorating the 175th anniversary of the founding of the U.S. Customs Bureau, reproduction of a painting by Charles M. Russell, and a stamp commemorating Naturalist John Muir.

The World's Fair stamp will first be issued on 22nd April, opening day of the fair. Date and place of issuance have not been set for the Nevada stamp commemorating 100 years of Statehood or one for the 300th anniversary of English acquisition of New Jersey. The stamps are to be of 5-cent denomination.

★★★★★★★★★★★★★★★★★★★★
★ NOTE TO CORRESPONDENTS ★
★ All correspondence on any subject covered in this magazine *must* be addressed to: The Editor Hobbies Weekly, Dereham, Norfolk. If a reply is required, queries should be accompanied by a stamped addressed envelope and reply coupon inside back cover. ★
★★★★★★★★★★★★★★★★★★★★

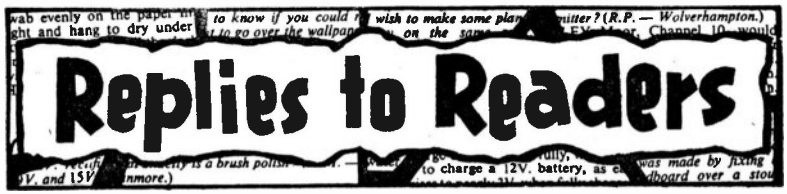
NETHERLANDS 500th ANNIVERSARY

IN commemoration of the 500th anniversary of the first meeting of the States General on 9th January 1464, a 12-cent commemorative stamp without surcharge was issued on 9th January by the Netherlands.



The stamp, which is yellowish green, represents the Knights' Hall at the Hague. Besides the word: 'Netherlands' and the denomination, the stamp bears the legend: 'Five hundredth Anniversary States General 9th January 1964'.

The series of stamps on the '150th anniversary of the foundation of the kingdom of the Netherlands' has been extended by a 5-cent value. The illustration is the same as on the 4-cents stamp, viz. the arrival of the Prince of Orange at Scheveningen. The colours are green, brick red and black.



Radio Interference

I RECENTLY purchased a new radiogram and then came to reside next door to an aircraft company. During the day I get an awful lot of interference on the radio. Is there anything that would help to lessen or remove this interference? (A.R.—Farnworth)

IF interference remains with the aerial disconnected, it is probably carried on the mains. A mains suppressor may then be added. Or a 0·05μF 750V. condenser may be wired from each mains lead to earth. If interference ceases with the aerial disconnected, the aerial may be moved farther from sources of interference and mains wiring. It may also help to move the receiver. Various anti-noise aerial systems are available.

* * *

Gaps in Floorboards

PLEASE recommend a filling for gaps between floorboards. (B.C.—N. Wales).

IF the gaps are quite big, then obviously a sealer would be quite expensive to use. It is therefore best to use a filler such as pulped newspaper to more or less fill the gap, then level off with a plaster or wood sealer.

* * *

Biro Stains

CAN you tell me how to remove the marks of a Biro pen from a suite covered in a red plastic. (P.O'N.—Coalisland).

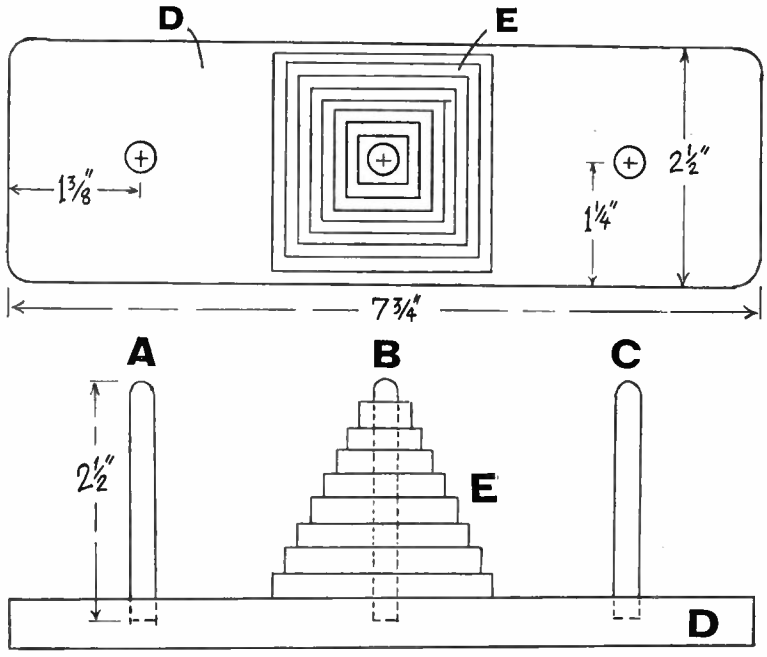
WE would suggest any of the following: petrol, benzene, methylated spirit, carbon tetrachloride. Any of these on a swab should prove satisfactory.

To set you thinking

PYRAMID PUZZLE PASTIME

ALL those readers who like to get their teeth into a problem will get amusement from this simple-to-build but not-so-simply-solved puzzle. Start with the pyramid squares on 'A'. The puzzle (for grown-ups!) is to transfer the pyramid to 'C' by moving only one piece at a time and always moving small squares on to larger squares.

By T. S. Richmond



It can be done, but time and patience are needed.

To make the puzzle cut piece D to the size indicated (top plan), from ¼ in. wood. Mark the positions for the three rods, and drill a ¼ in. hole at each, halfway only through the base. Glue the dowel rods (A, B, C, side view) in place, and smooth round the ends with glasspaper.

The pieces used for the pyramid E are best cut round in shape with the fretsaw after marking out with compasses; but to keep the cutting simple, square shapes, cut from ¼ in. plywood are suggested here.

Mark out eight squares on to the wood, making the largest 2¼ in. by 2¼ in., the others stepping down by ¼ in. to the smallest piece measuring only ½ in. square. Holes through the centres of each can be drilled before cutting the squares out with a fretsaw. Clean up all pieces with fine glasspaper. Make sure the pyramid shapes fit smoothly on to the rods.

The base board and the pegs may be varnished or painted as desired. The squares may be painted alternate colours of, say, red and yellow. Or each shape may be a different colour to aid identification when building the pyramid puzzle. They may also be numbered to correspond with numbers in the list of moves. A list of moves for solving this puzzle will be given in next week's issue for the benefit of those who cannot work it out.

SECRET PAPER MARKINGS

STAMP collectors know all about watermarks — those generally invisible and unappreciated symbols, numbers and letters on postage stamps, that magically appear when the stamps

By A. E. Ward

are soaked in spirit and studied against a black background.

These seldom-observed identification marks are produced in water-saturated paper by stamping machines that squeeze the paper fibres together.

As the paper is allowed to dry, the watermarks fade away to invisibility, but they appear again whenever the paper is wetted. This is because the compressed fibres, when wet, reflect light differently from the unprepared paper.

It's easy to make watermarks in paper which has first been well soaked in water and then placed upon a sheet of clean glass (or other hard smooth surface).

Put a sheet of dry paper over the wetted one, before drawing or writing upon the top paper — using a hard pencil point. Apply firm pressure to the pencil as you do this.

When you remove the dry pencilled paper, you will see your picture or letters clearly defined in the damp squashed fibres of the paper below.

Hang up the wet paper to dry and notice how your home-produced watermarks vanish.

Use the method to make novel 'magic portraits' or secret writing. The impressions will re-appear when the paper is wetted again.

Begin to take notice of the watermarks in good-quality note-paper and papers produced for use in departments of the government.

Often, but not always, watermarks can be studied by holding papers up against daylight, or a lamp.

Radio Servicing:

TESTING AN AC/DC CIRCUIT

A MAINS powered radio receiver will work either on an AC supply only (in which case it incorporates a transformer with separate windings for HT and heater voltages); or on both AC and DC, when it has no transformer and the valves are so chosen that all the heaters draw an identical current. They are connected in series with a suitable dropping resistor and share the mains voltage among themselves in proportion to their resistance in the same way as the resistors described in the previous article. This arrangement, which is much cheaper to manufacture than a circuit using a transformer, is found in most modern radios and nearly all television receivers. So we will consider it first.

The circuit diagram shows a typical AC/DC power supply. Once we know how it operates we shall have no difficulty in finding any fault that occurs. Its purpose is to supply a steady high voltage to the valve electrodes and a much lower AC voltage to each of the heaters. You will see that it consists of a rectifier to convert the AC mains voltage into positive pulse of current, a smoothing circuit which converts these pulses into a steady DC voltage, and a dropping resistance in series with the chain of valve heaters. Also, there is a safety device to protect the valve heaters from the heavy surge of current which would otherwise occur when the set is switched on. Let us consider the heater chain first.

Suppose we have an AC/DC receiver that does not work. The thing that we *do not* do first is to plug it in to the mains, blithely switch on, and hope for the best. If there is a short circuit we may at best blow the mains fuse, or at worst have a serious burn-up inside the receiver. So our first checks must be cold checks, i.e., resistance checks with no power connected just as we did with the battery receiver.

By C. N. G. Matthews

The first step is to take the receiver out of its cabinet. This is usually just a matter of undoing a few screws, pulling out the chassis and putting the cabinet out of harm's way. Not only does this allow you to get at things properly, but it protects the cabinet from accidental damage — a most important consideration if you are doing repairs for others.

Now connect your meter on a high resistance range to the two pins on the mains plug. If it happens to be a three-pin plug, connect to the two smaller pins. Switch on the receiver. If the meter, which up to now should have been reading infinity, shows a high resistance, then you are safe in assuming that both the lead and the switch are in good order. Measure also between the larger pin of the three-pin plug, if one is used, and the two smaller pins in turn. If either gives a low resistance reading instead of infinity, then you have a short circuit in your mains input circuit. This can only be in the plug, the lead, the switch, or the short leads from the switch, and should give you very little trouble.

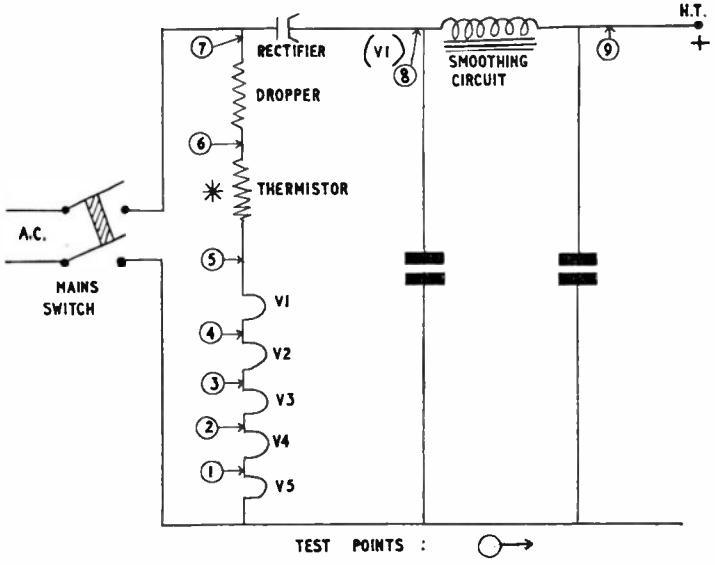
Once the mains input circuit has been cleared, we can carry on with checking the heater circuit proper. In all AC/DC receivers one side of the mains is lead direct to chassis and the other side to the heaters and rectifier circuits. This is why these sets usually have a label warning users that the chassis is live. So for the rest of our resistance checks we can leave one meter lead permanently clipped to any convenient point on the chassis.

Once this has been done, touch the other lead quickly to points 1 to 8 in turn. The first reading should be a low resistance, the next a little higher, the next a little higher still and so on up to point 5. The next point should bring quite a big increase — usually well over 100 ohms, and point 7 should show a further increase which is usually about 100 ohms. Between points 8 and 9 and chassis, the resistance should be a few thousand ohms.

If all of these readings are satisfactory, you will know that the heater circuit, including the valve heaters themselves, is satisfactory, and that the set can safely be switched on. Do this, and watch for the glow in each valve. If they do not light up at once, do not immediately assume that you have made a mistake. They should take at least thirty seconds to reach full brightness, and this can seem a remarkably long time when you are waiting.

The cause of this delay is the safety device, known in the trade as a thermistor or a barristor. Note that in the diagram it is drawn as a resistor with star against it. This is the usual symbol, and whenever you come across a circuit with one of these components in it, you can safely assume that the receiver will take some time to warm up. The thermistor looks rather like a heat-blackened resistor and in use it gets very hot indeed, so be careful not to touch it in a receiver that has been switched off after running for some time. It is made from a titanium composition that has a high resistance when cold, but a resistance of practically zero at working temperature. When the set is switched on it does not allow a dangerous surge through the heaters, but turns on the current quite slowly.

But why do all this? It seems at first



that a simple check for a reasonably high resistance between the mains input leads, followed by a resistance test between the HT line and earth, would tell us that it was safe to switch on the receiver. Provided that you know the set has recently been in use this is good enough. But if you know absolutely nothing of the history of the receiver, the longer process is by far the safest.

Suppose, for instance, that there was a short-circuit to chassis at point 4. Nearly all of the resistance of the heater line when cold is in the dropper and the thermistor. So the meter would still show what appeared to be a safe resistance. When the set was switched on though, the heater current path would be through dropper, thermistor and V1 heater only. So all the heater voltage would be developed across this single valve which would almost certainly burn out at once.

Another advantage of making the complete test is that it immediately shows up any fault that is present. For example, the short-circuit just discussed would be detected because the meter would show a higher resistance at point 2 than point 1, then a lower reading at point 3, and finally zero at point 4. A little thought will show that this could mean only that there is a short-circuit to chassis between V1 and V2. With the fault localized so closely as this, there should be no difficulty at all in removing it.

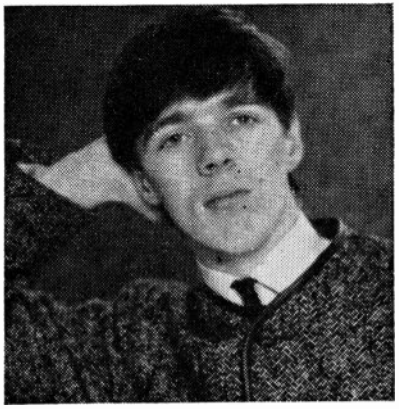
Of course, these tests indicate open circuits as surely as they show up short circuits. Suppose the resistance reading increased properly up to point 4 but went up to infinity or several thousand ohms at point 5. This could mean nothing but an open circuit, which could only be a broken lead, a bad joint or an open circuit heater to V1, between V2 and the thermistor. So again the fault is very closely localized.

So these tests not only show that it is safe to switch on the receiver, but they show up any fault except a high-voltage breakdown that exists in the heater circuit and more or less tell you exactly what to do about it. It pays to get into the habit of carrying them out automatically. With a little practice they take only a few minutes, and in the long run they save far more time than they consume.

Once you have mastered this technique, you will never be baffled by a heater fault in an AC/DC receiver. Because in a series heater chain all the valves go out when a single valve develops an open-circuit heater, it is the quickest way to find even so simple a fault as this.

In the next article we will take a look at HT supplies.

TONY RIVERS



TONY Rivers was born in Shildon, Co. Durham, on 21st December 1942. His family moved south to London when he was six years old and after going to school in Stepney, he went to work in an office at the age of 16. He was 18 when he went to work at Butlin's Holiday Camp at Clacton — as a stores clerk — and it was during his second season there that he got up to sing in the staff show and then went around looking for a singing job.

Tony found it in a pub at Dagenham where he met the Castaways — then called the Cutaways — and soon they were appearing together at pubs and dance halls.

Manager Terry Oates arranged a recording test with E.M.I. recording manager Norman Newell. *Shake, shake, shake* — it has *Row, row, row* as the coupling — was the result. (Columbia DB7135).

It was shortly after first recording test that the boys turned professional at the same time changing their name to The Castaways. Their sound radio dates have included *Pop Go The Beatles* and *Saturday Club* and a six-month weekly series on Radio Luxembourg.

Tony Rivers is 5 ft. 8 in. tall, has blue eyes, dark brown hair and weighs 10 stone. His spare time hobbies include listening to records — and football.

The Castaways line up as follows:

STEVE SCOTT, lead guitarist, was born in Barking on 18th April 1940. He started playing the guitar with The Tremeloes and joined the Castaways in September 1962. He has green eyes, red hair, is 5 ft 10 in. tall and weighs 12 stone.

BRIAN TALBOT plays drums and was born in Radlett, Herts., on 10th December 1943. As a youngster he played trombone in the Salvation Army band — and trumpet in the school orchestra. In 1960 he joined a trad band on drums, three months later meeting Ray Brown and joining his Midnighters group (later the Cutaways). He is 5 ft. 8 in. tall, has dark brown hair, brown eyes and weighs 8 stone.

RAY BROWN, bass guitarist, was born in Radlett, Herts., on 15th October 1942. He started playing rhythm guitar in 1960. He has fair hair, blue eyes, is 5 ft. 9 in. tall and weighs 14 stone. He likes food, any variety (which possibly explains his nickname of 'Dustbin').

JOHN LYON plays rhythm guitar, nicknamed 'Lon', was born in an ambulance in Brentwood High Street on 5th October 1943. He joined a skiffle group in 1959 and turned professional with the Castaways, in October, 1962. He has fair hair, is 5 ft. 10 in. tall and weighs 12 stone.

Out with a Camera

THE IMPORTANCE OF FIGURES

THE inclusion of a human figure will often lift an otherwise mediocre photograph into a pleasing composition. There is little worse can be said of a photograph than that it is a 'picture postcard'. In fact, many picture postcards of the present time are really attractive, but there is usually a lack of human interest.

By S. H. Longbottom

We must remember that the professional picture postcard photographer knows quite well that he could improve his composition with a figure, but he must avoid this at all costs. He wants the picture to be a selling proposition for a long time, and changing fashions in clothing would soon make his efforts out-of-date. Again, it is essential that the viewcard be kept impersonal.

Fig. 1—Correct position for a figure

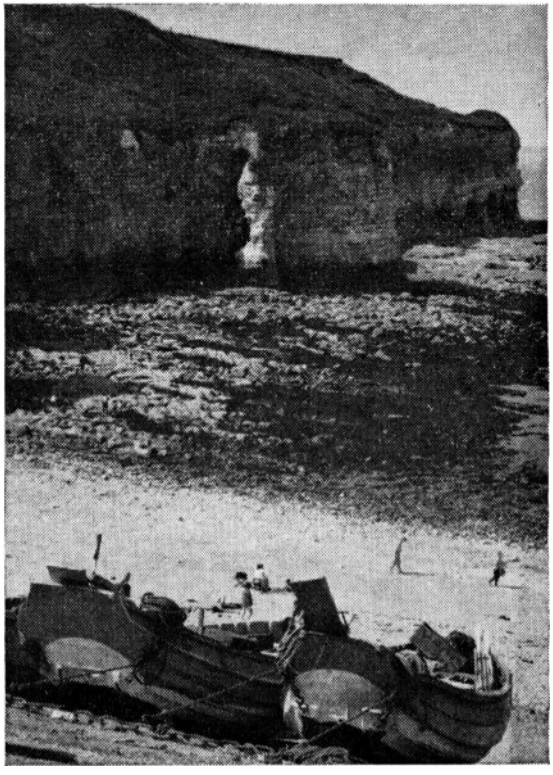


Fig. 2—Boats act as figures

The amateur need not trouble about these restrictions, and he is free to use a figure if it will improve the composition. Nevertheless the figure must be properly placed or the result might look worse than the despised picture postcard, so let us examine the principles involved.

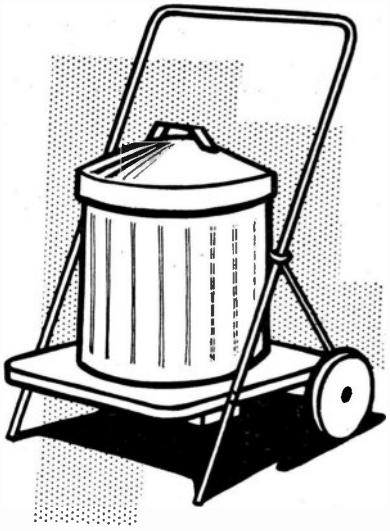
If we wish to avoid the snapshot appearance the first rule is to avoid the figure looking towards the camera. We may have a side or back view, but never frontal. Neither should the figure be too near the camera.

As a general rule it is safe to say that the best position is as shown in Fig. 1. Try to imagine the picture divided into three equal parts horizontally, and you will see that the figure is exactly on the dividing line on the right of the picture. This is the strongest position of the entire composition, although a similar effect would be obtained by placing the figure on the left. Test this yourself by holding the picture towards a mirror. So when you look in the viewfinder of your camera, imagine it divided into thirds, then arrange your figure accordingly.

There are times when the grandeur of the scene may demand that the figure should be a little more distant, but the same remarks apply concerning the position. In this case we then produce a basis for comparison. Unconsciously we compare the known size of the human

● **Continued on page 7**

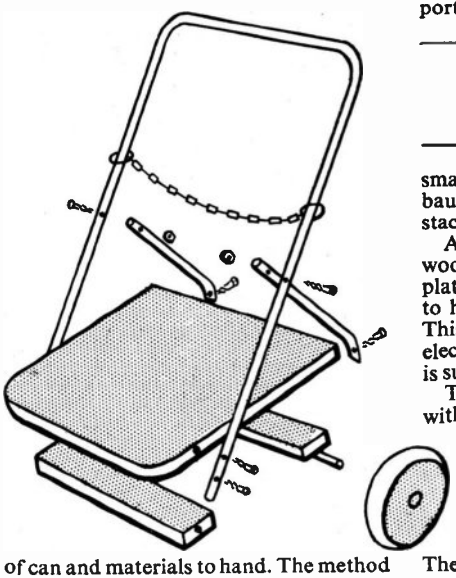
A Transporter for your Garbage Can



By A. Liston

CARRYING out a heavy garbage can for emptying is an onerous task for the housewife. A neat wheeled platform, on which the garbage can stands permanently, and which is easily wheeled out for collection, saves both bending and lifting, and is a useful piece of equipment for which many housewives would be grateful.

It is very simple and inexpensive to make, and the dimensions given here can be readily modified to suit different sizes of can and materials to hand. The method of construction is shown in the accompanying illustration.



The platform is an 18 in. square of 1 in. thick wood with the front corners rounded off. If block-board is being used, the interior strips of the board should run front to back of the trolley. An 18 in. length of 2 in. by 1 in. wood is screwed to the underside of the platform at the rear, and the axle is screwed to this. The two rubber-tyred disc wheels which are used are 6 in. in diameter. After they are fitted, the ends of the axle are burred over. Alternatively, an old pair of wheels from a discarded pram or push-chair can be used; the size of the wheels is not important, except for the fact that those smaller than 6 in. in diameter are easily baulked by comparatively small obstacles.

A second 18 in. length of 2 in. by 1 in. wood is screwed to the underside of the platform, 1 in. back from the front edge, to help anchor the tubular steel handle. This is a piece of metal rod, such as scrap electrical conduit rod. A 7 to 8 ft. length is sufficient.

The rod is bent to a U-shape as shown, with its two arms 18 in. apart. It is placed in position at an angle so that the top of the handle is above the rear edge of the platform. The platform is propped up at its front end so that it is level, and the lower ends of the handle rest on the ground. The positions of the screw holes are marked on the rod, which is then drilled. There are two fixing screws on each side, one through the platform and one through the woodstrip below it.

Two supporting struts, made from 15 in. lengths of similar rod to that of the handle, are drilled at the top ends and bolted to the handle, which is drilled on each side for this purpose. The lower end of the supporting struts are flattened slightly, bent as shown, then drilled and screwed to the rear of the platform and the woodstrip below it.

A length of chain or a leather strap is attached to the handle to prevent the garbage can from slipping off when the trolley is tilted for wheeling about.

The finish must be hard-wearing and weather-proof — either varnished wood and white enamelled metal parts, and grey and red or green and red enamel all over are attractive combinations. For smartness, the opportunity can be taken at the same time to paint the garbage can to match the trolley. This should not be done, of course, if hot ashes are customarily put in the can.

●Continued from page 6

IMPORTANCE OF FIGURES

figure with the surroundings, and we thus gain some idea of the proportions.

We agree that it is not always possible to have a willing companion on your outings who will supply this element for your compositions. There is no need to be dismayed, however, for if we look around we may find some stationary object to serve the same purpose. It may be a small building, a tree or even a lamp-post. In Fig. 2 you will see how we have introduced some boats, which not only add a touch of the sea, but also provide a strong foreground. Here we should have had some difficulty in placing a figure — unless suspended in mid-air!

There is one other item we may mention with regard to the human figure, and that is to endeavour to arrange him, or her, so that he appears to be doing something interesting, or posed as in action.

We can also introduce animals into our pictures for the same purpose, for example, cows, horses or sheep drinking at a stream, but remember to limit the number, or you would change the character of the picture entirely.

It is also possible to introduce figures by trickery, that is by cutting a suitable figure from another picture, and arranging it just as required. This takes some time, and demands some skill in combination, but it can be done.

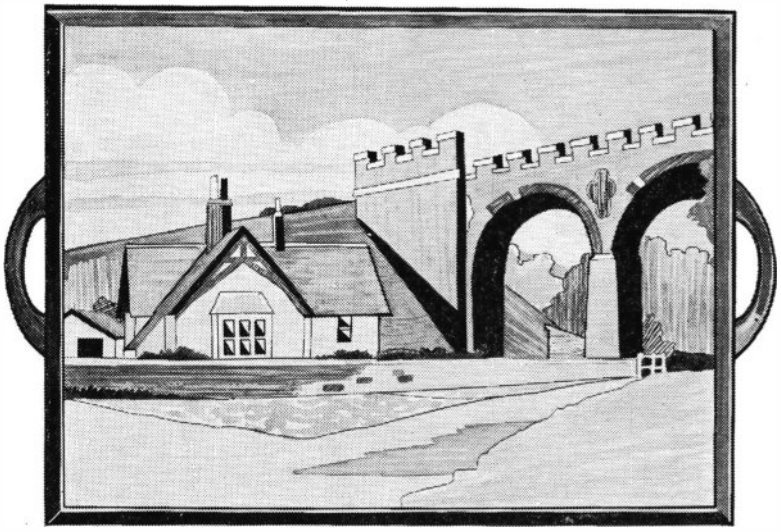
Using a figure in your pictorial studies as suggested is a sure way of creating pictures as distinct from mere snapshots or 'picture postcard views'. Try it for yourself, and note the difference.

Instructions for making

Marquetry Tray: The Viaduct

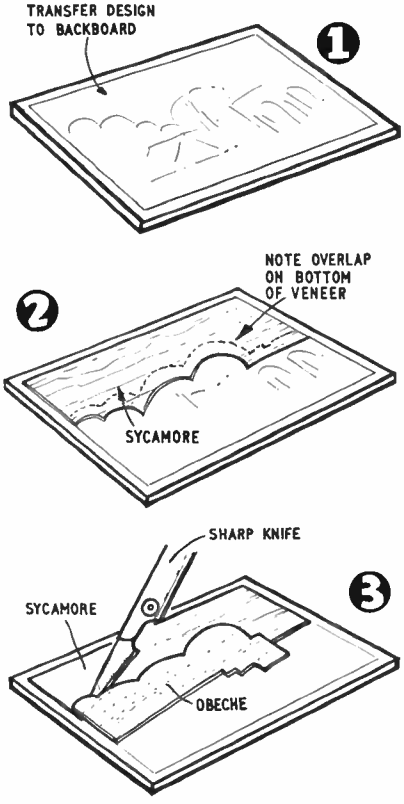
THIS scene was suggested to us by a photograph from a marquetry enthusiast living in Northumberland and it lends itself admirably to making a charming picture in wood. The parapets and deep arches of the viaduct stand out in striking detail and the house nestling by the embankment adds an air of peaceful seclusion.

It can be used as a hanging wall picture, strutted at the back for standing on a sideboard, or given a more practical use as a handy serving try with handles. The overall size, inclusive of the border moulding, is 14 in. by 10½ in.



Big range of colours

The Hobbies kit for making up the tray includes a piece of ¼ in. plywood, size 15 in. by 10½ in., which has to be reduced to the base size of 14 in. by 10½ in. A pack of named veneers gives a big range of wood colouring and also included in the kit are mouldings for the edges, handles, screws, etc.



The picture is completed in knife marquetry, and the veneers to be used for each part are marked on the design sheet. Wnere arrows are shown, this indicates the direction of the grain of the veneer.

Transfer the complete details of the picture from the design sheet with carbon paper on to the plywood base (Fig. 1).

Make a start on veneering by transferring the sky shape from the design sheet on to the sycamore veneer. When tracing, it will be seen that the top and sides are cut exactly to shape, but that there is an overlap of approximately ⅛ in. all round the bottom outline of the piece of sycamore. This overlap will also be cut away later when adjoining veneers are added (Fig. 2).

Fixing the veneers

Cut neatly round the sky shape. Use a metal rule and sharp knife for getting the top and sides straight. After cutting out the shape plus the overlap, fix the veneer in position on the baseboard (Fig. 2) using a recommended adhesive. Press down well, and make sure that there is no lifting, particularly at the corners.

Now trace the shape of the adjoining cloud on to the indicated obeche veneer. Again cut neatly to the outline and hold it in position on the sky veneer (sycamore). This cloud piece is now used as a template. Hold it perfectly still and cut round this outline in the sycamore veneer (including the overlap) with a sharp knife (Fig. 3). Place the cloud veneer on one side and prise up the unwanted sycamore shape from the baseboard as shown in Fig. 4. It can now be seen that the cloud shape should be a perfect fit where it joins the sycamore veneer and it can next be stuck down in place as previously described. It will be appreciated that by using this overlapping and template method a perfect fit for each subsequent piece is ensured.

All the remaining cloud effects are worked into the picture in this same manner. Now continue working down the picture, adding new features as they adjoin previous pieces. For instance, the bridge parapet, embankment, etc, can be added in succession. In all cases allow an

overlap where the next piece is to come, so as to ensure perfect fitting of the veneers.

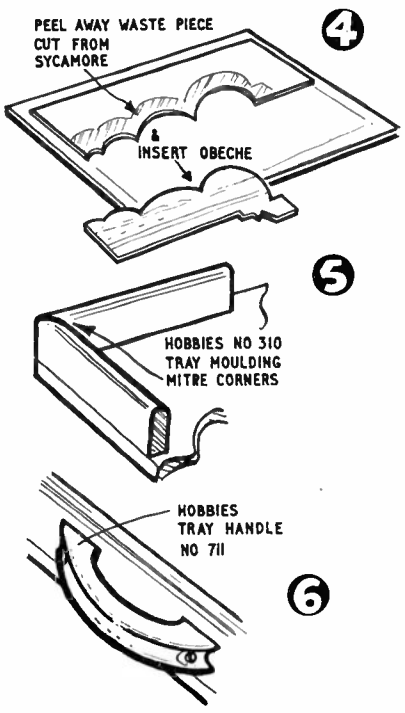
Take care with finish

The attractiveness of the finished tray will depend a great deal on the result obtained when polishing the veneered surface. Begin by scraping and glass-papering. A very satisfactory method is to use the edge of a piece of glass for scraping until a fair level has been obtained. Then finish with a glasspaper block. Work down from medium to fine grade until the surface is perfectly smooth. Sawdust mixed with glue will fill any obvious gaps.

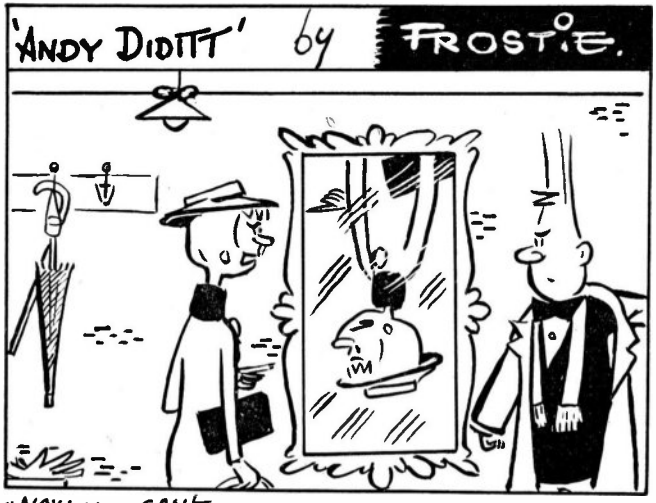
A word of caution is, perhaps, necessary. Be careful not to apply too much pressure with the scraper or glass-paper so as to rub away the veneers completely and thus reveal the base.

When as flat a surface as possible has been attained, the picture is ready for polishing. Apply white wax polish with the finger tips, rubbing well into the veneers. Then go over lightly with a duster, and give a rub down with a fine grade glasspaper. It will be necessary to change the paper about frequently, because the wax will fill it up. Repeat this process of waxing, polishing, and glass-papering until such time as a high gloss finish has been obtained on the surface. Remember that the more work you put into this operation, the better will be the finish.

The addition of the tray moulding is shown in Fig. 5. Mitre the corners and glue in position, pinning if necessary. The moulding can be painted, stained and polished or varnished as desired.



To finish your work, the handles are screwed to the end of the moulding as shown in Fig. 6. Alternatively, add a wooden strut at the back of the picture for free standing or fix picture rings and a chord for hanging on the wall.



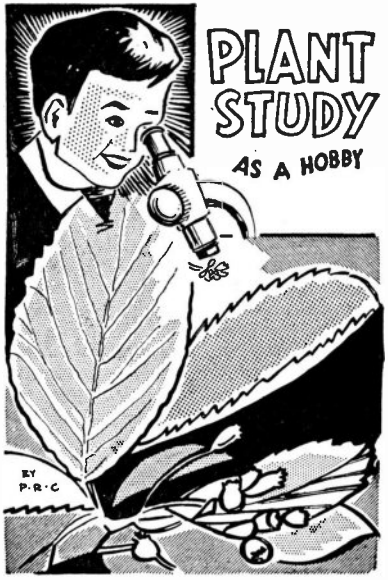
Make an 'Electrified' Dancer

CHOOSE a little picture of a girl in a newspaper advertisement and cut her out carefully with scissors. Then thread her upon a loose string tied between two chairs. Your toy 'high wire performer' will swing up and 'dance' energetically if you hold an electrified plastic tumbler near her body. Rub the dry tumbler vigorously with a piece of dry woollen blanket to obtain your 'static' electric charge.

Scientists believe that atoms contain negatively charged electrons whizzing like very small planets around central clusters of positively charged 'sun-like' protons. We can conveniently think of invisible atoms in this way, but nobody really knows what an atom is like. The positive protons in an atom apparently balance the number of negative electrons, so normally atoms have no 'odd' electric charges.

Rubbing the tumbler with wool causes electrons to be torn away from atoms in the cloth. Thus the wool becomes short of electrons and its unbalanced surplus of protons gives the wool a positive charge. Meanwhile, electrons are added to atoms in the plastic and the tumbler is charged negatively. Because these charges 'stay still', unlike current electricity which flows in wires, we call this kind of electricity, static.

Negative electrons repel, or push each other apart, when they are brought together. Your paper girl has no odd electric charge to begin with, but when you bring up the electrified tumbler, electrons upon the plastic push away electrons in atoms upon her surface. These surface atoms thus acquire positive charges because they have a deficiency of electrons. Negative and positive charges attract each other. Therefore your paper circus girl dances and swings when the tumbler approaches her. (A.E.W.)



IN the previous article on the flowering plants we looked at the structure of a typical flower. We must now consider the leaves, stems and roots, so necessary to the existence of a plant. The leaf itself is a marvellous and intricate structure; the varied forms and shapes of leaves will be well-known, and the study of leaves alone can form a fascinating pastime. Leaves can be easily collected and pressed.

A leaf of lime, showing veins

LEAVES, STEMS AND ROOTS

By P. R. Chapman

In order to understand just what a leaf looks like inside the examination of a microscope section is necessary. In the first article of this series, we described how to cut a section and now we have an opportunity of putting it into practice.

A good leaf to use is a privet. Since this is an evergreen plant, the leaves are always obtainable, and there can scarcely be a residential road without privet bushes in some of the gardens; one leaf will scarcely be missed! Since the leaf is a soft structure and difficult to hold when cutting a section, it is usual to grip it between something firmer. In botany courses elder pith is used, but two pieces of raw carrot make an excellent substitute.

Only a piece of the leaf is needed, but some of the mid-rib should be included. Thin slices should be cut transversely, that is, across the mid-rib, and mounted on a slide as described earlier. If the section is a good one, a permanent stained preparation can be made. You can try sections of various leaves; some will be easier to cut than others, some will show hairs on the outside.

Inside the leaf

The mid-rib is the main conducting channel for water and food supplies to the leaf. From this branches the delicate network of veins, supplying the whole of the leaf. These can be seen in the photograph of a lime leaf.

A sketch of a typical leaf section is illustrated. Starting from the upper surface of the leaf, we have first the cuticle, a waxy covering, then a layer of epidermis cells. Below that is what is called the palisade tissue. These are long cells with air spaces between them, and they are very important since they contain the green chlorophyll, the substance which enables the plant to make its food from water and carbon dioxide. The cuticle and epidermis are transparent to light so that the latter can reach the chlorophyll containing cells.

Below the palisade cells (usually two rows) is a mass of roughly round cells, also with air spaces. This is the spongy mesophyll. Finally there is the lower epidermis and the cuticle. Since the chlorophyll containing cells must have access to the air, the cuticle and epidermis are pierced by numerous tiny holes, known as stomata. These can be opened or closed, according to the temperature and dryness of the atmosphere, since although the plant needs air inside its leaves, it must not lose too much water.

Leaves do however lose a considerable amount of water, and this constitutes the transpiration stream. Water is taken in at the roots and a constant stream passes up the whole plant to be lost by evaporation from the leaves. Provided it is not excessive, this transpiration is useful to the plant since it is able to take in mineral salts at the roots, together with water. The evaporation from the leaves also helps the latter to remain slightly cooler in hot weather. The plant will wilt if the rate of water lost from the leaves is greater than the water taken in at the roots. This may happen in the garden during a hot summer day, when some plants, particularly tomatoes,

wilt in the day but recover in the evening.

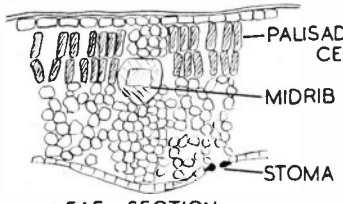
Even if well watered, they are sometimes not able to take in water fast enough. This is temporary wilting. A pot plant, however, if neglected, may suffer from permanent wilting, the water stream in the stems is broken, and the plant will die, even if watered later.

The stem

The stem of a flowering plant can of course vary greatly in size; the tiny fragile stem of a buttercup and the trunk of a giant oak tree have essentially the same structure, the main difference is that in the latter there is a large quantity of what is called secondary thickening, giving rise to the woody tissue. The function of the stem is to give support to the plant and to contain the conducting vessels to carry water and mineral salts up from the roots, and other vessels to carry dissolved foodstuffs.

The inside of a stem

A section of a suitable stem, such as a marigold or geranium, can be cut and stained as described in the first article of this series. This will show the internal structure, which is really quite complex.

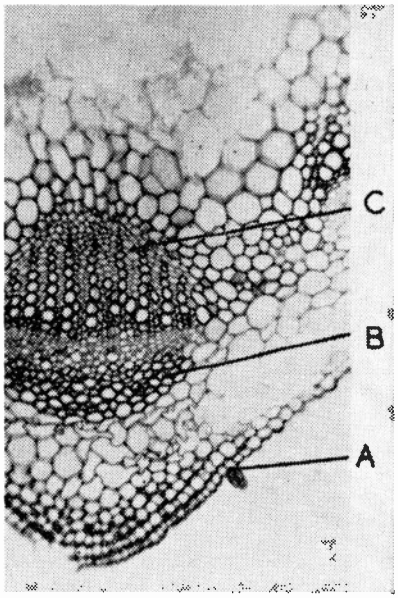


LEAF SECTION

We cannot go into great details here but the most important parts to be seen are the conducting tissues, the so-called xylem and phloem. The former is concerned with the conduction of water in the plant, and the latter with food materials.

In the stems of the plants mentioned, these tissues will be found in bundles arranged as a ring towards the outside of the stem. In the centre is the pith, and around the outside the epidermis and cuticle. If instead of a normal, broad-leaved plant, or dicotyledon, you examine the stem of a monocotyledon, such as a daffodil, hyacinth or iris, you will find the bundles to be scattered over the section instead of a definite ring.

We shall mention the division between monocotyledons and dicotyledons shortly. In a tree, which is a dicotyledon, this ring becomes closed and the woody tissue, formed by the xylem, is inside it. This wood is added to as the tree becomes older. We shall have more to say about trees in a later article.



A microphotograph of a stem section.

A—Cuticle B—Phloem C—Xylem

The root

As the shoot of a developing seed grows upwards, so the root grows downwards. This is a response to gravity and may seem obvious, but if you give it a little thought, it is quite intriguing, since if a bean, partly developed, with a short shoot and root, is turned on its side, both growths will turn at right angles so that they will be in the same direction as before. This of course has to be so otherwise it would matter which way up we planted seeds, and as everyone knows, it doesn't matter.

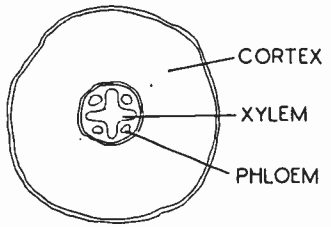
In examining different types of plant, you will find that some have a main, more or less straight, root with smaller roots coming from it (tap roots, such as dandelion) and others have a mass of small roots of about the same size (adventitious roots). You can cut a section of a root in the same way as a stem.

A diagram of a root is shown. It is different from a shoot in that the bundles are grouped in the centre, the xylem being in the form of a cross or star with the phloem bundles between the arms or points. Dicotyledons have much the same structure as monocotyledons, except that the latter have usually more arms. Some sections will show the root hairs, special elongated cells which serve to take in the water and dissolved salts from the soil.

You can see the root hairs if you grow cress seedlings on damp blotting paper. Remove them carefully and examine the tiny roots with a powerful magnifier. It is these tiny, fine root hairs which it is important not to break when transplanting seedlings.

Monocotyledons and Dicotyledons

We have already mentioned this division, and the names really refer to



A ROOT SECTION

the number of rudimentary leaves on the developing seed. The leaves of the adult plants are different (your examination of different leaves will have shown this), those of dicots having the typical leaf shape, whilst the monocots are strap-shaped with parallel veins. Amongst these are included all our bulb plants, irises and grasses. There are no British trees in this group, but exotic palm trees are monocotyledons.

In the next article, we shall take a look at well-known monocotyledons.

CHEMISTRY AT HOME

CASTOR OIL EXPERIMENTS

By L. A. Fantozzi

CASTOR oil consists of glyceryl ricinoleate, $(C_{17}H_{32}OH{\cdot}COO)_3C_3H_5$. There is also present some glyceryl palmitate, $(C_{15}H_{31}.COO)_3C_3H_5$, but the proportion of this is so small that it may be ignored for general experimental purposes.

As a fatty oil castor oil forms a soap when treated with alkalis. The soap formed with sodium hydroxide, NaOH, is sodium ricinoleate, $C_{17}H_{32}.OH.COONa$, and glycerine, $C_3H_5(OH)_3$, is liberated:

$$(C_{17}H_{32}OH.COO)_3C_3H_5 + 3NaOH = 3C_{17}H_{32}OH.COONa + C_3H_5(OH)_3.$$

To prepare a specimen first put 20 grams of sodium hydroxide and 20 ml. of water, H_2O, into a bottle, close the bottle and leave it aside for some hours until the solid has dissolved. Both the solid sodium hydroxide and this strong solution are skin corrosives and any coming in contact with the fingers should be rinsed off with water and vinegar applied.

Pour the solution into an old but clean handleless cup, add 20 ml. of castor oil and suspend the cup in a boiling water bath Fig. 1. Stir the mixture every few minutes. It gradually becomes lumpy, showing that the soap formation is taking place.

After about an hour take out a tiny piece. This will give a clear solution in hot soft water (distilled or filtered rain water, if your supply is hard) if the reaction is complete. If the solution is cloudy, continue heating the mixture in the cup until a sample gives a clear solution.

Let the reaction mixture cool, add about 60 ml. of cold water, break up the lumps of soap and stir for a few minutes. Filter off the sodium ricinoleate and when drained transfer it to a porous tile, press another tile upon it and squeeze out as much of the mother liquor as possible. This soap still contains a considerable amount of free alkali and may be purified by dissolving it in about 100 ml. of hot soft water and adding 35 grams of sodium chloride (common salt), NaCl. As the salt dissolves the soap is thrown out of solution. The alkali remains dissolved.

The mixture should now be left aside for a few hours so that the precipitated curds of soap may rise and aggregate at the surface. Remove the soap and as before press it as dry as possible between two porous tiles. Dry the squeezed soap in a warm place until it falls readily to powder when crushed.

That this sodium ricinoleate or castor oil soap behaves like any other may be shown by dissolving a little in a few ml. of warm soft water in a test tube. On closing the tube with the thumb and shaking a good lather forms and the solution feels slippery between the fingers. It also forms a scum with hard water. If you are not in a hard water district, you can get the same effect by adding a few drops of calcium chloride solution, $CaCl_2$, to the soap solution. A scum forms.

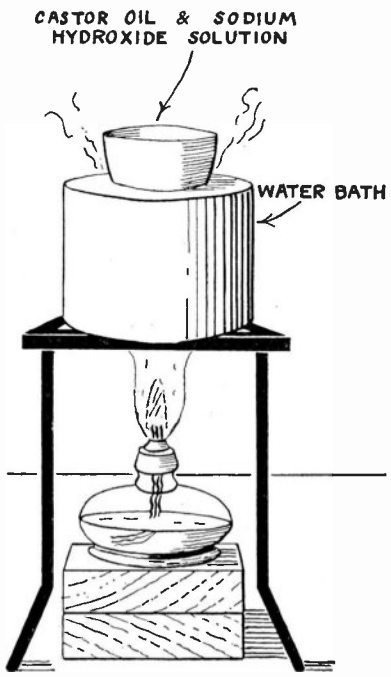


Fig. 1—Preparing castor oil soap

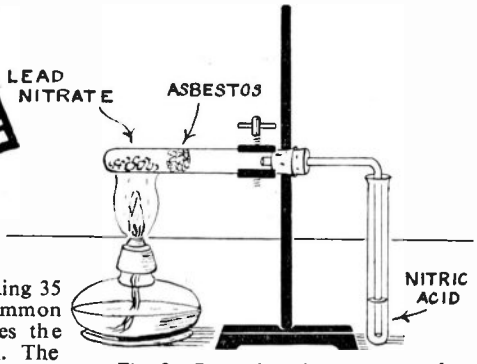


Fig. 2—Preparing nitrogen peroxide solution

The parent substance of this soap is, of course, ricinoleic acid, $C_{17}H_{32}OH.COOH$. This is readily isolated by acidifying the soap solution with hydrochloric acid, HCl, when the ricinoleic acid is liberated as an insoluble oil and sodium chloride remains in solution:

$$C_{17}H_{32}OH.COONa + HCl = C_{17}H_{32}OH.COOH + NaCl.$$

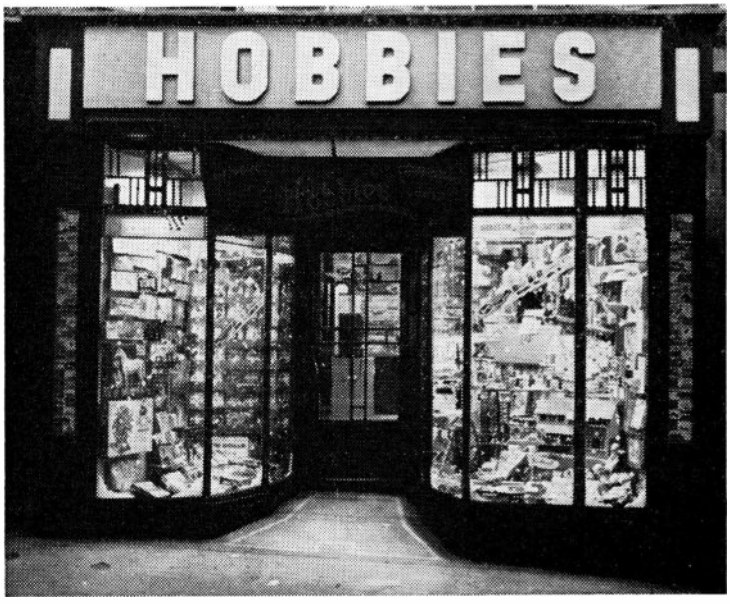
To prepare it dissolve 10 grams of sodium ricinoleate in 80 ml. of hot soft water. Stir in dilute hydrochloric acid until a drop of the mixture reddens blue litmus paper. The ricinoleic rises to the surface as an oil. Pour the mixture into a separating funnel and when the layers have separated sharply run off the lower watery layer of sodium chloride solution. Pour out the ricinoleic acid from the top of the funnel into a dry bottle. Though normally fluid, this acid freezes to a waxy mass in wintry weather.

Before passing to other experiments it is well to know that castor oil, unlike most other fatty oils, is insoluble in petrol at ordinary temperatures. So if you have spilled a drop or two on your clothing it is no use rubbing with this solvent. Again unlike most other oils, castor oil is soluble in alcohol, C_2H_5OH, so the remedy is to use methylated spirit.

It does, however, behave like many fatty oils by becoming solid when it comes in contact with the gas nitrogen peroxide, NO_2. The liquid glyceryl ricinoleate is changed to solid glyceryl ricinelaidate, $(C_{17}H_{32}OH.COO)_3C_3H_5$. Though they have the same composition their atoms are arranged differently in the molecule and this confers differences of physical and chemical properties. Such substances are known as isomers.

The nitrogen peroxide is best used as a solution in nitric acid, NHO_3. To prepare this rig the apparatus shown in Fig. 2.

● **Continued on page 14**



There's no need for our readers in Devon to wonder what to do in their spare time. There are kits to suit all modelling tastes at Hobbies branch at 9 North Street, Exeter, ranging in price from a few pence to pounds. The windows, shown here, are chock full of tempting offers -- and there's plenty more inside, as at all Hobbies branches.

HOBBIES BRANCHES

LONDON
78a New Oxford Street, W.C.1
Telephone: MUSeum 2975
87 Old Broad Street, E.C.2
Telephone: LONdon Wall 4375
81 Streatham Hill, S.W.2
Telephone: TULse Hill 8796
151 High Street, Walthamstow, E.17
Telephone: COPpermill 3928

GLASGOW
328-330 Argyle Street, Glasgow, C.2
Telephone: CENtral 5042

MANCHESTER
10 Piccadilly, Manchester, 1
Telephone: CENtral 1787

BIRMINGHAM
18 Moor Street, Ringway
Telephone: MIDland 0219

SHEFFIELD
4 St. Paul's Parade, Sheffield, 1
Telephone 26071

LEEDS 10 Queen Victoria Street
Telephone: 28639

HULL 42 Savile Street
Telephone: 32959

SOUTHAMPTON
134 High Street (Below Bar)
Telephone: 25947

BRISTOL 65 Fairfax Street, Bristol, 1.
Telephone: 23744

NEWCASTLE
42 Dean St, Newcastle-on-Tyne, 1
(*continuation of Grey Street*)
Telephone: 21465

EXETER 9 North Street
Telephone: 76661

● Continued from page 12

CASTOR OIL EXPERIMENTS

In the horizontal test tube (hard glass) put 4 grams of lead nitrate, $Pb(NO_3)_2$, and a small loose plug of woolly asbestos to prevent scattering of the nitrate by decrepitation. In the upright test tube are 4 ml. of strong nitric acid (caution, corrosive; any on the fingers should be flushed off with water and wet sodium bicarbonate, $NaHCO_3$, dabbed on).

On heating the lead nitrate, nitrogen peroxide and oxygen, O, are given off and lead oxide, PbO, remains behind:
$2Pb(NO_3)_2 = 2PbO + 4NO_2 + O_2$.
The red-brown nitrogen peroxide dissolves to a green solution in the nitric acid. The oxygen escapes.

Put 40 ml. of castor oil into a wide mouthed rubber stoppered bottle, add the green acid, close the bottle securely and shake well. The oil turns orange and during about 48 hours becomes gradually solid and waxy. Press it between filter papers between two porous tiles so as to remove excess acid. Then break it up and stir with water to remove remaining acid. Finally filter it off and let it dry at room temperature.

Like castor oil, glyceryl ricinelaidate forms a soap when acted upon by sodium hydroxide. Namely, sodium ricinelaidate, $C_{17}H_{32}OH.COONa$. To prepare a specimen use the same method and quantities of materials as were used for preparing the soap from castor oil, but substituting glyceryl ricinelaidate for castor oil.

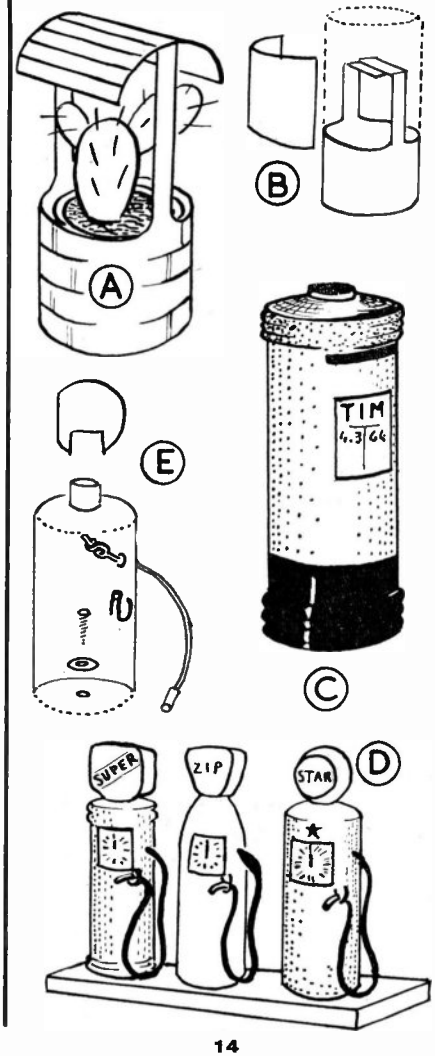
You will note that this soap is not so pleasant smelling as that made from castor oil. Another difference is that the parent acid ricinelaidic acid, $C_{17}H_{32}OH.COOH$, is solid. Dissolve 10 grams of sodium ricinelaidate in 100 ml. of hot soft water. Add dilute hydrochloric acid until a drop of the mixture reddens blue litmus paper. An oil rises to the surface of the hot liquid, but on cooling this solidifies to a waxy cake. Remove the cake of ricinelaidic acid, wash it with cold water and press it dry between filter paper.

Here we have another striking example of isomers. Ricinoleic acid and ricinelaidic acid contain the same elements in the same proportions, yet one is a liquid and the other a solid.

More Novelties from Detergent Containers

ATTRACTIVE novelties of various kinds can be made at very little cost from empty plastic containers used for detergents.

Colourful and unusual covers for pot plants, such as the 'wishing well' style shown at A, can be made in a few minutes from one container. It is cut with sharp scissors B, with the sides of the cover just high enough to hide the pot which it is to hold. The strips which support the roof should be about ¾ in. wide. These strips are bent over and cemented together with adhesive. The roof, which is made from one of the sections cut from the side of the container, is trimmed until its length is 1 in, greater than the diameter of the container and it is then fixed in place along the top of the strips.



The lower part of the cover is enamelled in grey, to represent stonework. A little dry sand, mixed well with the paint, gives an attractively rough stone-like finish. Black lines painted on simulate the stones or bricks, and the roof and supporting strips are enamelled in a chocolate brown colour, with black lines on the roof to represent planking.

Unusual banks for children can be made in a variety of styles. The shape of the container will, in most cases, suggest the treatment. A soldier design, for example, uses a container with a table-tennis ball fitted and glued over the cap on top, the whole figure being suitably painted. Even simpler is the pillar-box bank at C. Here, the neck is sawn off close to the container top and plugged with wood or cork glued in place. A slot, large enough to take half-crowns, is cut with scissors just below the shoulder of the container, and the bank is enamelled red and black, with a white panel bearing the child's name and possibly the date when saving started. These inexpensive banks are, of course, expendable, and are cut open when filled.

A row of petrol pumps D makes a fascinating toy for a young child. All it consists of are 3 containers on a wooden base made of ½ in. thick wood. Each container is treated as shown at E. The cap is unscrewed, a hole is bored in the side, and a plastic or rubber tube is passed through and knotted on the inside. The other end of the tube is fitted with a piece of cane or thin dowel rod. A paper clip, bent as shown, is fitted into a small hole in the side of the container to form a rest for the end of the tube.

The container is screwed to the base with a washer and screw, using a long-bladed screwdriver to fix the screw from the inside. The pump is topped by a 2 in. diameter wooden ball, drilled to take the plastic cap to which it is glued. A slice is cut off one side of the ball to form a flat face on which the brand name is printed. Alternatively, wedges or cubes of 2 in. thick wood can be used to make the tops for the pumps.

The finished model is then enamelled in bright colours, with white dials and pump tops. Details such as dial markings, brand names are painted in black. (A.L.)

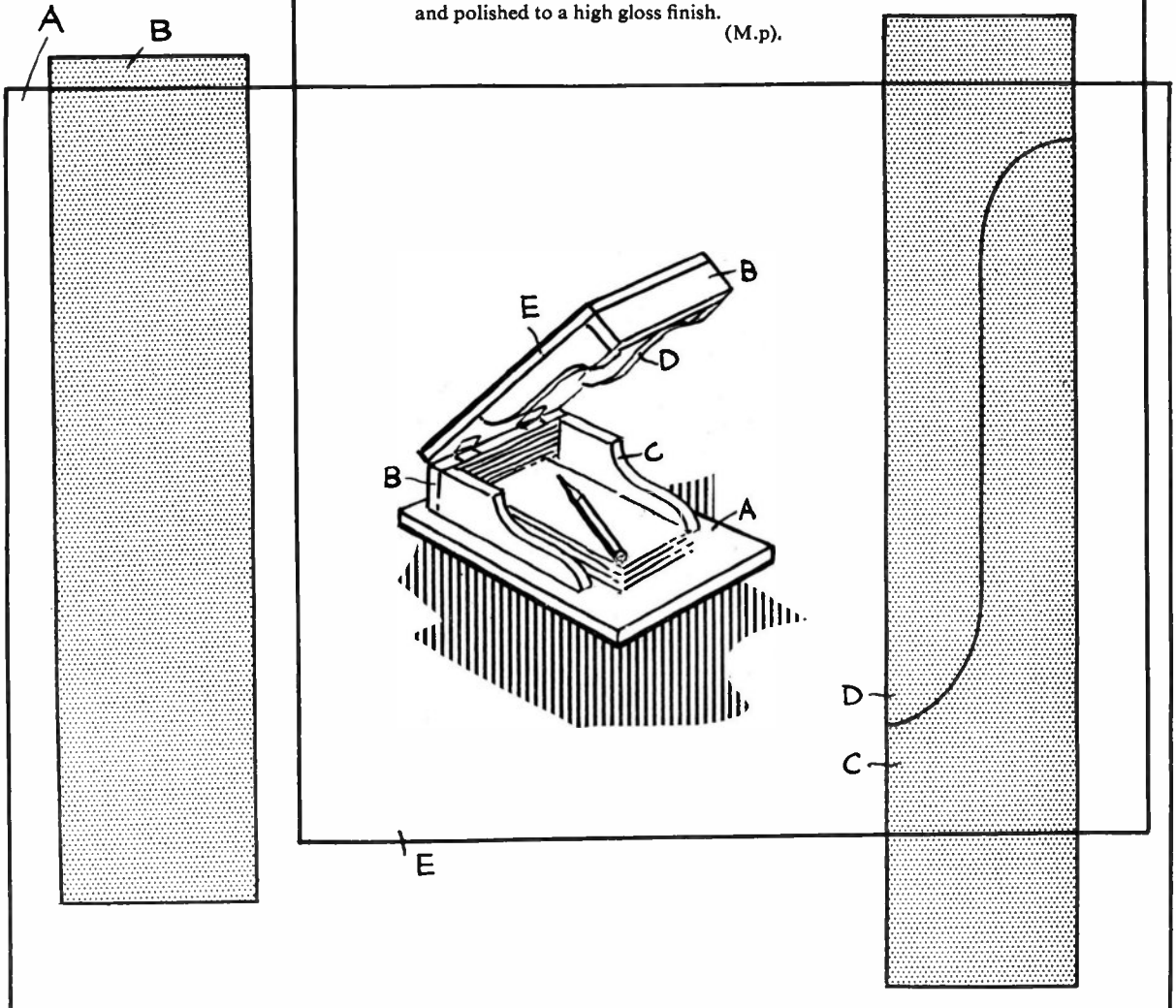
A fretsaw project to complete in an evening

MEMO PAD

A SMALL box to contain a note-pad ensures that notes are not thrown away and also provides a neat and tidy place for pad and pencil.

Cut one of A, two each of B, C and D, also one of E, from ¼ in. wood, using a fretsaw. Glue the parts together as shown in the sketch, hingeing piece E to piece B as shown. The wood should be stained and polished to a high gloss finish.

(M.p).



Printed by BALDING + MANSELL, LTD., London and Wisbech, and Published for the Proprietors, HOBBIES LTD., by HORACE MARSHALL & SON, LTD., Temple House, Tallis Street, E.C.4. Sole Agents for Australia and New Zealand: Gordon & Gotch (A'sia.) Ltd. For South Africa: Central News Agency Ltd. Registered for transmission by Canadian Magazine Post.

READER'S REPLY HW APL. 1964

All sets contain a book of instructions

CHEMISTRY SETS

No. 13. An excellent low-price set containing a bunsen burner with rubber tubing, flask, and a good supply of chemicals, test tubes, filter funnel, paraffin burner, etc. **17/11** *Post 2/-*

No. 14. Contains an ample supply of chemicals and apparatus, including bunsen and paraffin burners, flask, test-tube holder, brush, pipette, asbestos square, test-tube stand, funnel, rubber and glass tubings, etc. **25/-** *Post 2/3*

No. 15. (Illustrated) A very popular set containing the new detachable sloping rack for the tubes of chemicals. Contents also include test tubes, brush, holder, stand, tripod and gauze, U-tube, pipette paraffin and bunsen burners, flask, funnel, filter papers,etc. **39/11** *Post 2/6*

No. 17. A really fine chemistry set containing an excellent selection of chemicals and apparatus to enable the young chemist to carry out the many interesting experiments set forth in the splendid new book of instructions especially written by an experienced Science Master. **59/11** *Post 2/9*

Get these modern Science Sets from

HOBBIES LTD, (Dept. 99), DEREHAM, NORFOLK

MAGNET - TRICITY

No. 1. This beginner's set contains everything necessary for elementary experiments in Magnetism and Electricity, including a powerful magnet, compass, rheostat, Morse tapper, etc. **30/-** *Post 1/9d.*

No. 2. (Illustrated) A fine set for experiments. Contents include a powerful magnet, compass, rheostat, Morse tapper, fire-alarm, etc. **50/-** *Post 2/-*

No. 3. A splendid set which includes a powerful magnet, compass, rheostat Morse tapper, fire-alarm, electric motor, pliers, Crocodile clips, eletromagnet, galvanometer, and other apparatus. **79/6d.** *Post free*

All sets contain a book of full instructions but no batteries

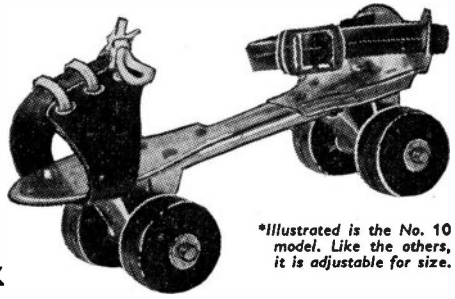
The name DAVIES is synonymous with all that is best in Roller Skates. Strong, speedy, light and durable, they are fully guaranteed as to workmanship and materials.

DAVIES Roller Skates

No. 10
Junior model with girder-type construction and rubber composition wheels. Self-lubricating nylon bearings. Amazing value.
19/11 *pair*
Post 2s. 6d.

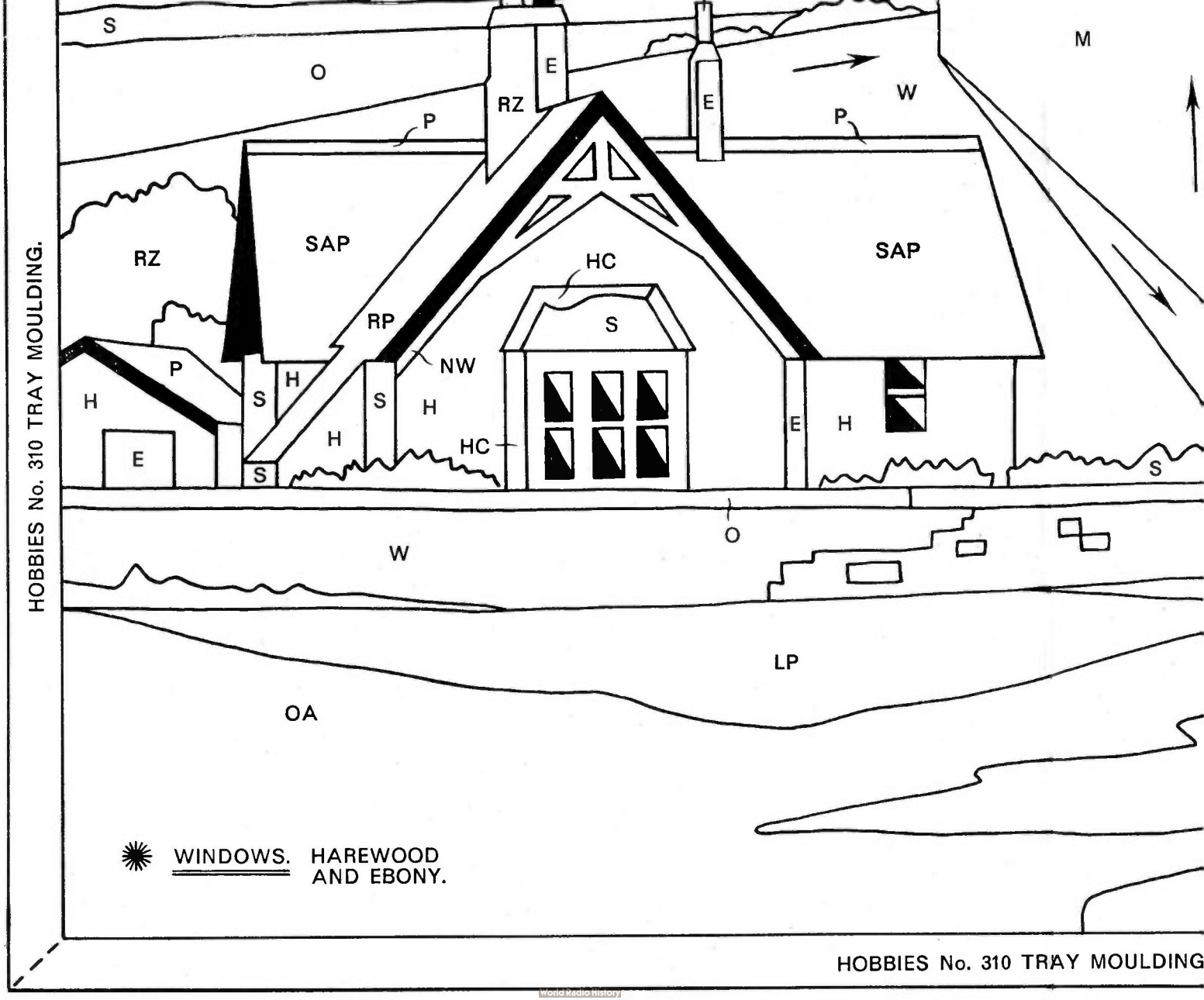
No. 9
Senior model with double ball bearings and rubber composition wheels. Electro-plated with oscillating cushion. Very good skates, indeed.
29/9 *pair*
Post 2s. 6d.

1A SPECIAL
The best of all! Chromium-plated chassis, rubber toe brakes, extra wide rubber composition wheels with 192 precision ball bearings.
37/6 *pair*
Post 2s. 6d.



**Illustrated is the No. 10 model. Like the others, it is adjustable for size.*

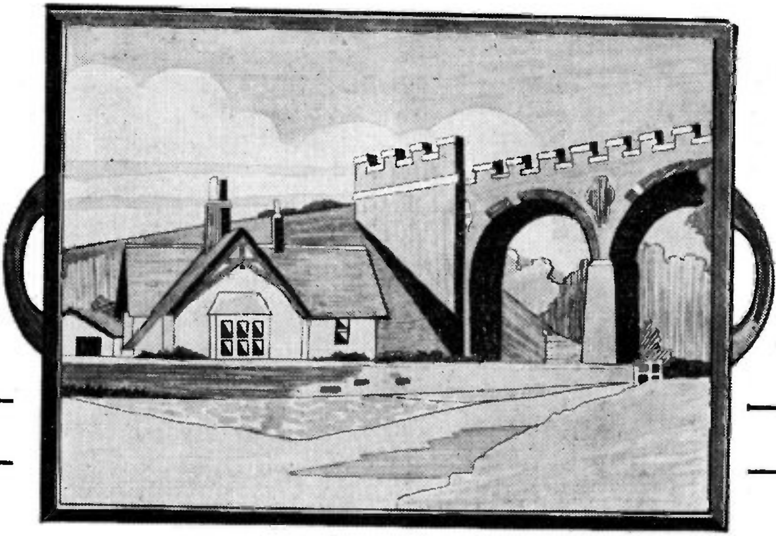
HOBBIES LTD, (Dept. 99), DEREHAM, NORFOLK


HOBBIES No. 310 TRAY MOULDING.
S
O
E
RZ
E
M
W
P
P
RZ
SAP
HC
SAP
RP
S
NW
P
H
S
H
S
H
H
HC
E
H
E
S
S
O
W
LP
OA
WINDOWS. HAREWOOD AND EBONY.
HOBBIES No. 310 TRAY MOULDING

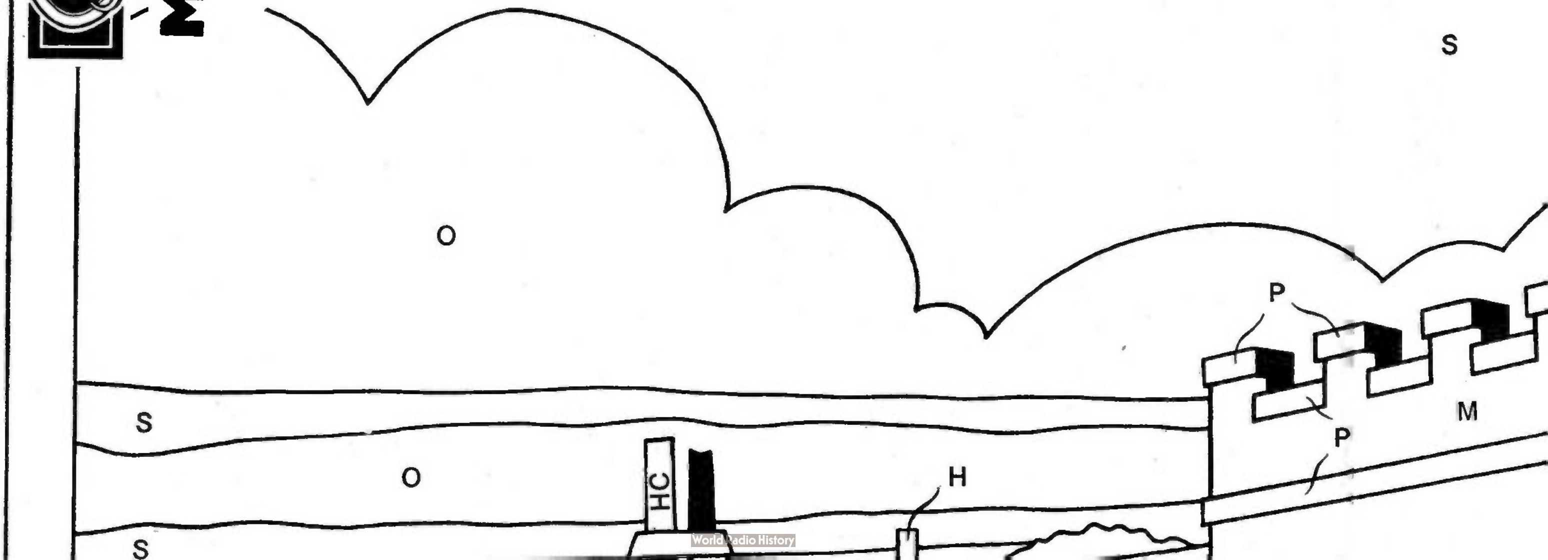
Hobbies DESIGN No. 3565

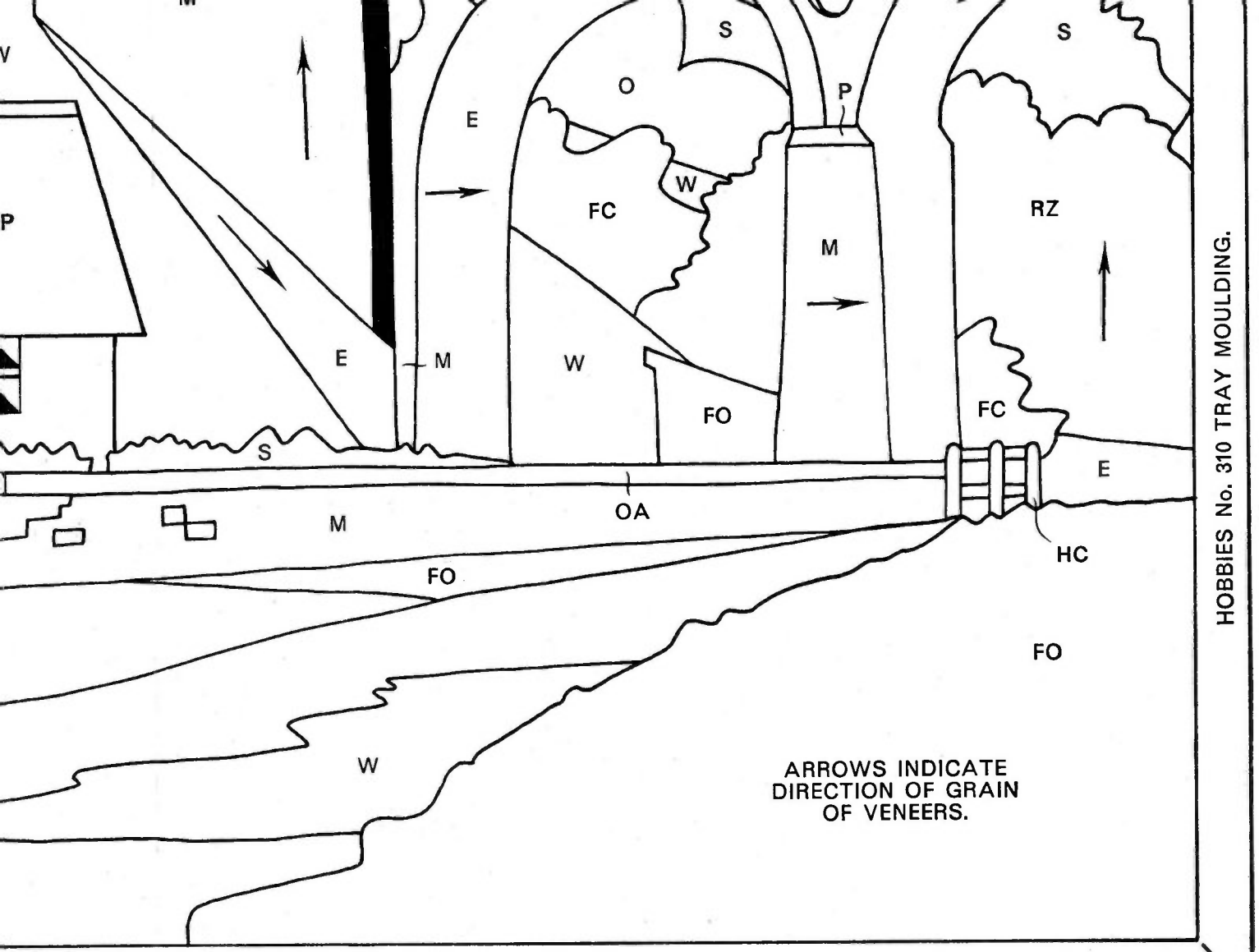
MARQUETRY TRAY "THE VIADUCT"

SIZE: 14 in. BY $10\frac{1}{2}$ in.



No. 310 TRAY MOULDING.





ES No. 310 TRAY MOULDING.

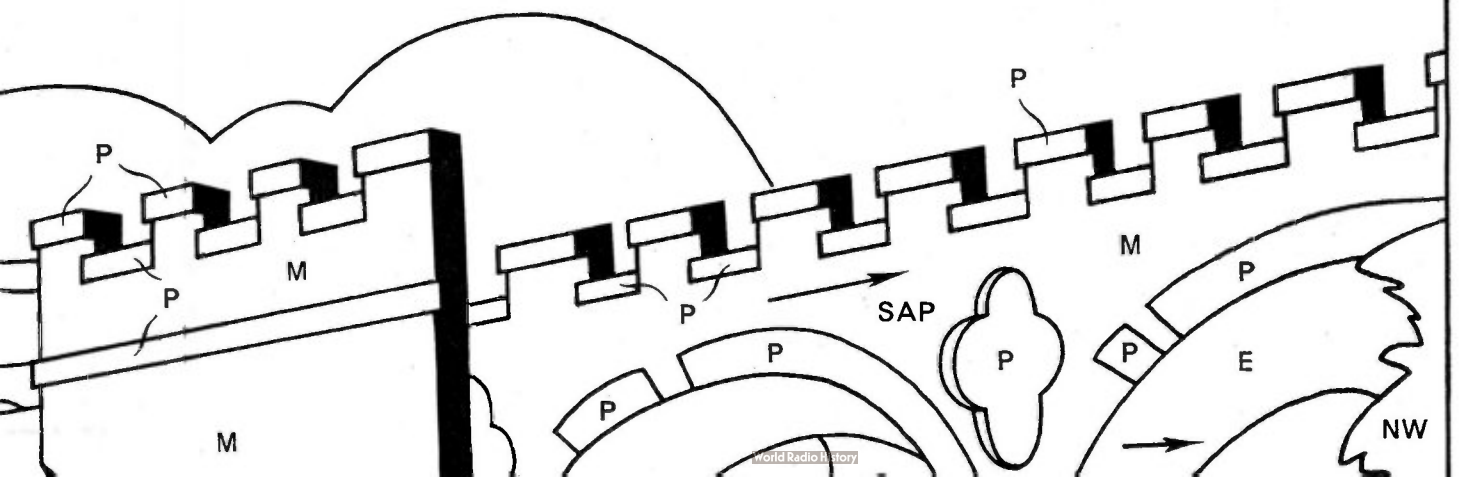
310 TRAY MOULDING.

A KIT OF MATERIALS FOR MAKING THIS DESIGN IS SUPPLIED BY HOBBIES LIMITED, DEREHAM, NORFOLK. PRICE ON APPLICATION.

KEY TO VENEERS			
O	OBECHE	M	MAHOGANY
SAP	SAPELE	HC	HORSE CHESTNUT
H	HAREWOOD	FC	FRUIT CHERRY
P	PADAUK	FO	FIGURED OAK
RZ	ROSE ZEBRANO	OA	OLIVE ASH
NW	NIGERIAN WALNUT	LP	LONDON PLANE
W	WALNUT	RP	ROSA PEROBA
E	EBONY	S	SYCAMORE

CUT PLYWOOD TO OUTER LINE
14 in. BY 10½ in.

S



PRINTED IN ENGLAND.