HOBBIES *weekly*

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Hobbies

FOR CRAFTSMEN OF ALL AGES

6D.

never be less than 2 ft. 6 in. (and preferably 3 ft.) as in severe winters the fish may be killed off. Similarly, for aquatic plants it is necessary to have a 'step' round the inside of the pool, so that the shallow rooting aquatics can be grown. These steps are usually built into the glass fibre pools.

In most cases it will be decided to have a concrete pool, and the building of a small rectangular type will be described, followed by a few words on the more informal type.

The pool is marked out to size with string and pegs, but an allowance of 9 in. is made on both dimensions, so as to provide firm foundations for the walls. The earth has then to be taken out to the required depth of the pool, plus about 5 in., the earth being thrown well clear of the hole. It has to be admitted that this is hard work, and usually takes several days to complete.

Make a firm base

The sides and bottom of the hole have to be well rammed to form a firm base, and if the soil is particularly loose, broken brick will have to be rammed into it.

The concrete is a 1:2:3 mixture of cement, sand, and ballast, the latter of $\frac{3}{8}$ in. to $\frac{3}{4}$ in. size. The ingredients are mixed thoroughly in the dry state before water is added, and the concrete must be laid as soon as the wet mixture is of proper consistency. It must be rammed well down to give a finished thickness of 5 in., spread right to the edges of the hole, and the entire base laid at the one time. The concrete is covered with damp sacking while it dries out.

Building the walls

It has been mentioned that a step for aquatic plants must be left round the inside of the pool, and Figs. 1 and 2 show how this can be done. The first method is the strongest, though not so economical of concrete, while the second means rather less digging. The full sized hole mentioned earlier is for the first method.

Timber 1 in. thick is used for the 'shuttering' for the walls. It is nailed on to cleats, so that in effect it forms a lidless, bottomless box that stands on the base, so that there is a distance equivalent to the thickness of the concrete wall between its outside face (which is given a coat of whitewash), and the edge of the hole. It must be thoroughly strutted, so that the pouring and ramming of the concrete does not affect its position.

The concrete for the walls is poured and well rammed, but to give the concrete a better grip the surface of the base to be covered by the walls is roughened with a brick chisel and hammer, and a thin layer of cement is put in before the concrete.

Something must also be done about drain and overflow pipes, but these will be described next week. (N.W.)

DRY MOUNT YOUR PRINTS

THE easiest and quickest way of bonding a photograph to a mount is undoubtedly by means of the dry mounting process. Admitted, the commercial people use heated flatbeds and there are small, special irons made for this purpose but we can use an ordinary domestic iron with every success.

Mounting tissue, sold under proprietary names, is made in various sizes to accommodate your prints and we will now describe the practice which is really nothing more than the bonding of a print to a mount with the aid of a thin, resinous tissue, sandwiched between the two. Heat is used to effect the fusion.

Before mounting proceeds it is essential that both the print and mounting board are bone dry. This is important. Place the picture between double thicknesses of greaseproof paper and iron with a moderately heated iron. Treat the mount in the same fashion and using the same precautions.

If you possess a thermostatically controlled iron you should find the correct heat if the switch is adjusted to SILK. If a print is placed between paper as mentioned there should be no danger of scorching, but to avoid any impressions of the shape of the iron — the toe in particular — keep it moving. Moreover, it is as well to work on a hard surface, such as a piece of hardboard or a drawing board.

Having dried the print and mount we now attach a piece of tissue to the back of the print, achieved by touching the tissue momentarily with the tip of the iron somewhere about the centre. This is necessary to keep the tissue and print together while trimming. Again, you may purchase a special tool for this job but I use an old dessert spoon handle. The latter is moderately heated in a gas ring held by the spoon end and then touched on the tissue.

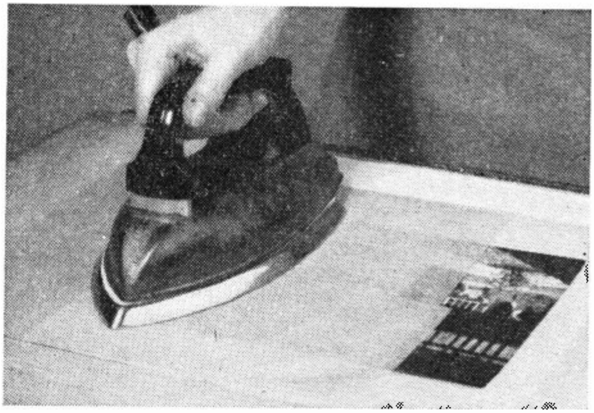
If you care to make a better job of this primitive tool you may saw off the spoon and fit it into a round piece of wood. This action is sufficient to effect adhesion to the back of the print. Note that if the spoon handle is too hot the tissue will sizzle and be spoiled and that this is only a preliminary expedient for holding the two components together, so minimum adherence is all that is necessary.

With the tissue thus fixed in position on the back of the print, trimming is completed as desired and we can proceed to the mounting.

You will now require a substantial book and a piece of plate glass as large as the mount. Lay the mount on the table and set the iron to the heat already mentioned. Position the print on the mount as required, ensuring that it is perfectly square, the sides parallel with the sides of the mount and that the margins are equal at both sides. Hold the picture in this position with one hand, cover with a double thickness of greaseproof paper and apply the iron.

Work from one end, proceeding slowly to the other with a slow, gliding action. You may find it better to turn the print round so that you are working lengthways across the print. For example, the usual iron is large enough to cover the width of a trimmed whole-plate print.

Remember what has been said earlier about leaving an impression of the iron on the print or mount, so use minimum pressure with the slow, continuous movement.

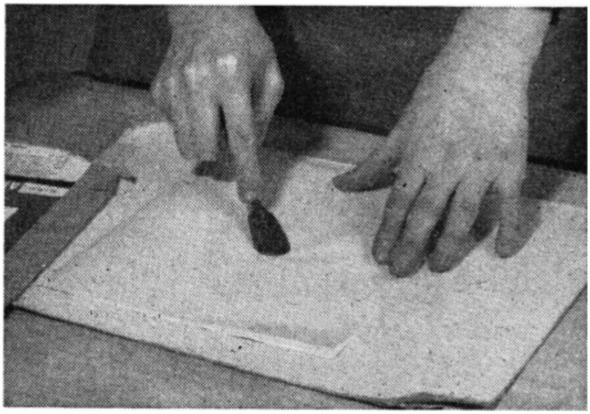


Mounting the print — note the protective greaseproof paper covering the print

On removing the greaseproof paper the print should be quite flat. It is immediately placed under the plate glass for five minutes and allowed to cool.

Some lightweight mounts, or album leaves, may buckle a little but the use of a heavy book while ironing will counteract this. We apply the iron in just the same way as described but when a few inches have been treated we push the book into position. Continue ironing, moving the book forward as you proceed and finally placing under the glass as directed.

Occasionally you may come across a few difficulties, some of which may be due to alterations in the electric voltage and which we cannot control so we will now provide the remedies.

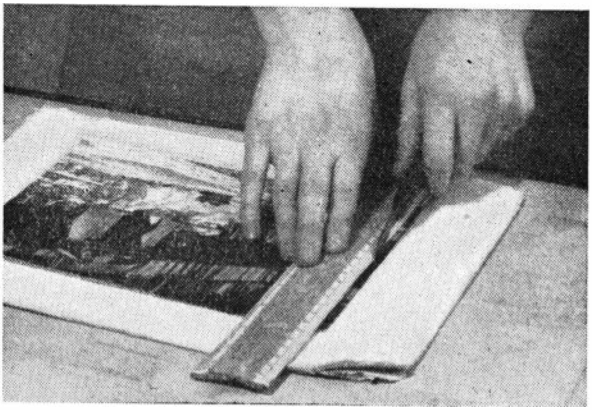


Attaching the tissue to the back of the print, using a spoon handle

When the iron is too hot the tissue will adhere to the mount but not to the picture. The remedy is to reduce the heat by either switching down the iron or by using additional sheets of greaseproof paper.

When the iron is not warm enough we get the reverse — the tissue sticks to the picture but not to the mount. Here we can either increase the heat or take away a sheet of greaseproof paper. In the first instance you will see that the print rises from the mount, leaving the tissue behind on the mount, and vice versa in the second instance. These errors will be detected immediately the greaseproof paper is removed from the print, can be quickly remedied and placed under the glass.

Velvet-like surfaces of supermatt papers can be fairly tricky to handle and can be ruined unless other precautions are taken. In this instance we do not use a piece of greaseproof paper on top of the print when ironing but instead an old print *with the same surface*. Lay the old print face down on top of the one being mounted and if you iron on top of the old print the surface will be unimpaired.



The tissue has been attached to the back of the print and here the print is being trimmed on an old sheet of cardboard

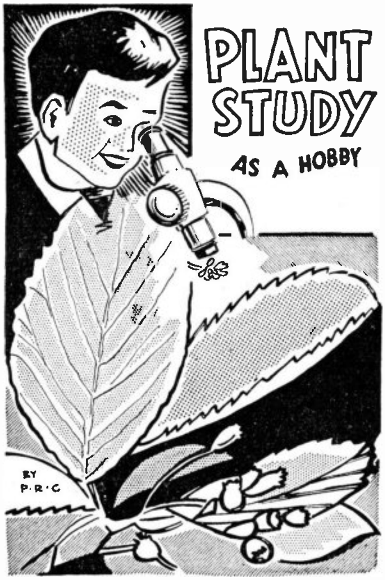
When dealing with glossy papers it will be found better to fix these in a combined hardening bath.

Finally, you may not have a thermostatic iron or the temperatures may vary so here is a good test. Switch on the iron and allow it to heat. Now moisten a finger tip and lightly touch the sole. You should hear a low pitched sizzle, indicating a low heat. Repeat the process again when the iron has warmed up a little more and you should hear a higher pitched sizzle which will be correct.

You may then switch off the current of an old iron and if it should be a little too hot or cold make adjustments by using more or less greaseproof paper. If in doubt make a few tests with the trimmings from the print on scraps of cardboard.

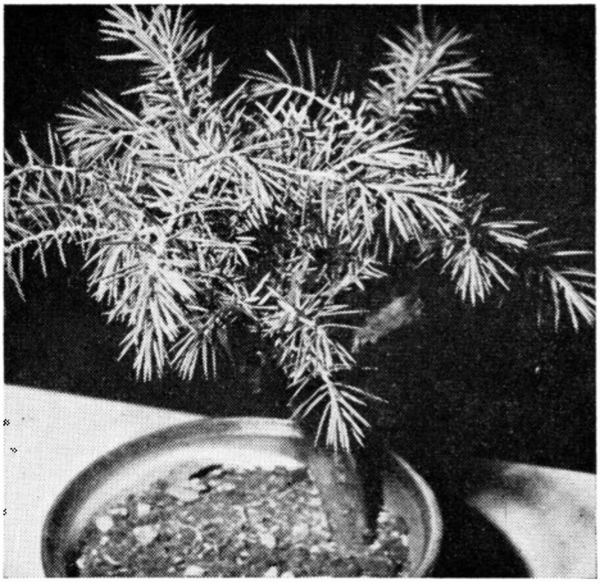
Mounting tissues are quite cheap and will keep indefinitely and do not dry up like many mountants. There is no time lost in waiting for the mounted prints to dry, no leaving under pressure and practically no possibility of soiling the mount with excessive mountant oozing from underneath the edges of the print.

Once you have grasped the simple efficiency of dry mounting your prints will look much better. (S.H.L.)



THE ART OF BONSAI

Growing Miniature Trees



A species of Juniper, often used for Bonsai

In many of the previous articles, we have mentioned experiments that the amateur botanist can carry out during his study of plants. However, it has been unavoidable that much space has been taken up describing the plants, and the way in which they live. In the present article, therefore, it will make a change to describe a possible branch of our hobby that is entirely practical, and which can give a great deal of interest. This is the 'production' of miniature trees, or 'Bonsai'.

The word 'Bonsai' comes from the Japanese, and means 'growing in a shallow container', and although these trees are associated with Japan, the art originated in China, where miniature trees were used in celebrations. The Japanese, however, took over the cultivation of dwarfed trees, and with their characteristic thoroughness developed it to a fine art. From there it has spread to America and Europe.

The Bonsai seen offered for sale in the more exclusive florists in this country are usually restricted to a very few types of trees, such as Japanese juniper maple and elm, but since the definition of Bonsai says nothing about the particular tree, it might be expected that many others could be grown in this way, and in Japan almost any tree or shrub is considered suitable for this culture. Also the shop specimens are expensive, often extremely so, since many of them are imported, and have taken years to grow; many of the trees used are slow growing, and some may be centuries old.

Originally the Japanese used to search for naturally stunted trees from cliffs and mountains, and to start the formation of Bonsai from these, but, naturally, this supply is limited, and it is usual to begin with a small seedling tree. Some nurseries in this country sell, in addition to the Japanese Bonsai, partially trained British-grown trees. These are very much cheaper, but it is even still cheaper and far more interesting to create one's own specimens.

We have spoken about 'training' trees without having yet explained what this means. A Bonsai tree is artificially dwarfed and shaped by pruning and bending to resemble, as far as possible, an ordinary tree in miniature. Although the trunk is often gnarled and twisted, it should always have a natural appearance.

The dwarfing only affects the size of the tree itself, not the leaves, which will tend to grow to the size normal for the particular tree. For this reason, large leafed trees are not really suitable for Bonsai culture; it looks a little odd if a tiny tree has full-sized leaves! If a large-leafed tree is used, however, a better appearance can be maintained by removing the leaves as they grow too large, keeping the new, smaller ones.

How to obtain them

As we have seen, the trees with small leaves make the best Bonsai, and this probably explains why the conifers are so often used, for their needle-like leaves do not grow out of proportion to the tree. Suitable trees in this country would be pine and yew, although the latter is very slow-growing, and the average amateur cannot wait a century for his Bonsai! Probably the easiest ones to obtain and grow are birch and oak, although it is certainly worth experimenting with any seedling tree you may come across, and, of course, the types of tree you can find will depend to some extent on the part of the country in which you live.

Obviously, cultivated trees must not be touched, but often naturally occurring seedlings can be found in waste places, and if taken, these must be carefully dug up, so as not to tear the roots.

An interesting and easy way of obtaining suitable trees is to grow them from seed. Some tree seed can be bought quite cheaply, but that of birch, beech and oak (acorns) should be easy to find. The seed should be sown in moist soil in pots, and not allowed to dry out; some such as acorns germinate fairly quickly, but others may be very slow.

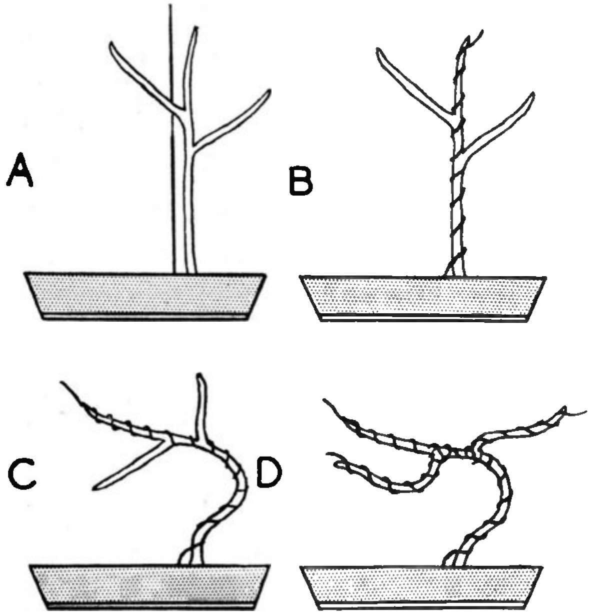
When the little trees are large enough, they should be transplanted into 3 in. pots. Any tap roots (the roots growing straight down, and usually thicker) should be cut back to encourage the formation of smaller, side roots (laterals). These should be spread out to keep them near the surface of the soil. The tap roots of collected trees also need to be cut back, so that they can be fitted into a shallow container.

Any good soil may be used, but your Bonsai is going to live for quite a while in a small dish or shallow pot, and it should have reasonable nourishment. The potting compost John Innes' No. 2 is suitable, or you can mix your own from approximately equal parts of loam, sand, and leaf mould. Although you can choose any type of container for your dwarf trees, for a true Bonsai it should be shallow, with the roots spread out. The best type of container is an earthenware tray; a home-made concrete one would be very suitable, but in any case, the container should have a drainage hole.

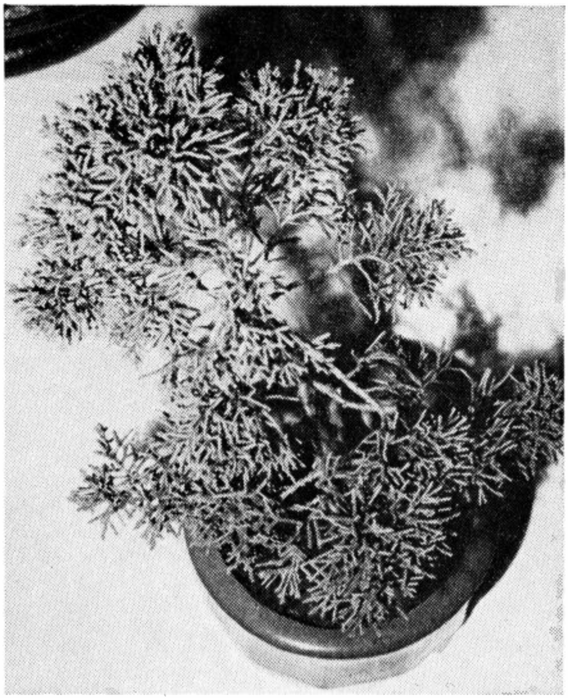
Training the Bonsai

This is, of course, the most important part, since on it depends whether you just have a little tree in a pot, or a true Bonsai. The training is carried out by means of wire, and copper wire is usually employed, but if this is not available, thin galvanized iron wire is suitable. Copper is better, especially if softened in a flame before use.

Having planted the little tree firmly in its container, a length of wire is pushed into the soil near the base of the stem; it is then coiled around the trunk in a spiral, as far as the part to be bent, the excess then being cut off. The stem, or 'trunk-to-be' can then be quite easily bent to the required shape, the wire holding it in position.



Four stages in making a Bonsai from a young tree:
A.—*A wire is inserted near the base of the tree.*
B.—*The wire is twisted round the stem.*
C.—*The stem is then bent to the required shape.*
D.—*Branches may be bent by means of wires attached to the main stem.*



A Chinese Juniper, as a Bonsai tree.

Some judgment must be exercised here, since the aim is to produce a naturally twisted shape, as one would expect an old tree to show. Unnatural positions should be avoided. To bend a branch, the wire is first twisted around the trunk or stem, below the branch to be bent, then around the branch, which is bent as the stem. Sometimes branches can be held down with thread tied between them and the trunk. The wire or thread serves to keep the little tree in shape until growth causes it to set in the required position. Wire must be removed before it cuts into the trunk or branches.

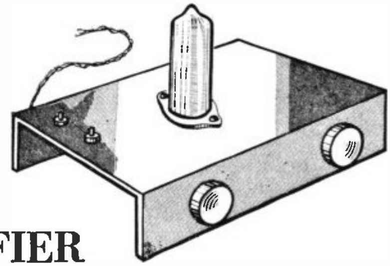
When the soil is exhausted, your Bonsai needs to be repotted. How soon depends on the rate of growth; a slow grower, such as a conifer, will last for several years in the same soil, whilst a quick-growing tree may need fresh compost every year. After removing the plant, the roots should be cut back, and the little tree replaced, with fresh soil.

Bonsai are not really intended as house plants, and if they are brought indoors, it should only be for short periods; they need plenty of fresh air and light. An outside window-sill is a good place to keep them. They should, however, be protected from heavy frosts, and also from heavy rain, if only to avoid the soil from being washed away.

If the containers are well drained, watering should not be a problem, but, owing to the restricted root system, it should be carried out with care. They should not be sodden, but must not be allowed to dry out completely; a friendly neighbour would come in useful whilst the owner is on holiday! With care, these little trees can give their owners a great deal of pleasure for many years, and, incidentally, a nicely grown Bonsai makes an unusual and attractive present.

Next: Other Miniature Trees.

6—GRAM AMPLIFIER



IN Part 2 of this series it was explained how a valve amplifies. The 6CH6 valve is a television pentode, which provides so much amplification that it can be used by itself, for record playing. The loudspeaker volume which is obtained, from 78, 45, and 33 r.p.m. records, is easily enough for the home. Some commercially-made record players of moderate cost employ a single valve only, in this way.

The amplifier circuit is shown in Fig. 18, and only a few components are necessary. These are given in the list. The unit is run from the mains, current being obtained from the power pack described in Part 5. If a ready-made power pack is to hand, this will probably be suitable. The valve requires 0·75 ampere at 6·3V. for its heater, and about 250V. at 50mA. for high tension.

If the power pack previously described is to be constructed at the same time, then both amplifier and power supply circuits can be on the same chassis, to obtain a compact A.C. mains amplifier.

In Figs. 18 and 19, a 0·01μF capacitor is connected across the loudspeaker output transformer. This will be found quite satisfactory, but some constructors may prefer a variable tone control. If so, this is added, as shown later.

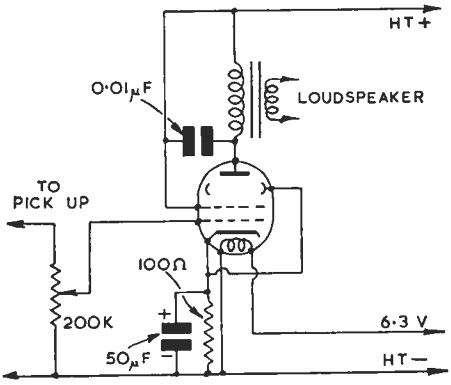


Fig. 18—Amplifier circuit

Chassis

A small aluminium chassis is most suitable, and one about 4 in. by 6 in., and with 2 in. runners, is satisfactory. This can be bought ready shaped, or can be made by cutting a piece of aluminium 8 in. by 6 in., and bending 2 in. runners. Bending is quite easy if the metal is gripped between two boards in a vice.

Wiring and components under the chassis are shown in Fig. 19. The volume control is placed to one side, so that the variable tone control can be fitted later, if wanted. The volume control is fixed with a large nut on its bush. The knob is held with a set screw.

The valveholder has nine tags, which are positioned so that connections will come as in Fig. 19. A twin socket strip is used for the speaker, and large holes are needed in the chassis runner, so that the sockets do not touch the metal.

Pick-up socket

The turntable pick-up will have a screened lead. This has outer braiding, and an inner insulated wire. The outer braiding is the earth side of the circuit.

Co-axial plugs and sockets are often used, and are very suitable. With these, the outer braiding is clamped by the screw-up sleeve of the plug, and the inner insulated wire passes down the hollow pin of the plug, and is soldered. Co-axial plugs fit a socket like that in Fig. 19. The outer sleeve is bolted to the metal chassis, to form the earth return. A lead passes from the centre pin to the volume control.

If the pick-up lead already has a jack plug, or other kind of plug, it is most convenient to provide a socket to suit on the amplifier. All the usual types of plugs and sockets will be satisfactory, but remember that the outer braiding of the pick-up lead must go to the amplifier chassis.

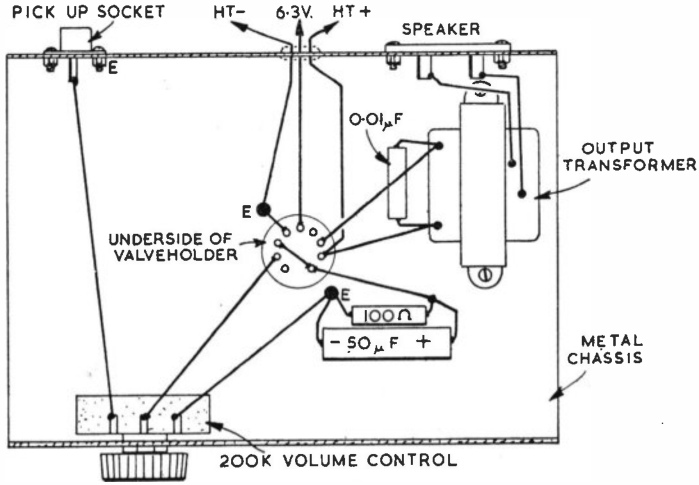


Fig. 19—Wiring plan of the amplifier

Wiring

Connections are shown in Fig. 19, and wiring is simple. E at the pick-up socket is an earth to the metal, as explained. The other points marked E are tags secured to the chassis by the same bolts which hold the valveholder.

For power supply connections, three

pieces of coloured flex, twisted neatly together, will be handy. It is a good plan to use black for High Tension Negative, and red for High Tension Positive. Green, blue, or some other colour can be fitted for the 6·3V. supply, and circuits can then always be easily identified. The power supply leads pass out through a rubber grommet, and are afterwards connected to the H.T. negative, H.T. positive, and 6·3V. terminals

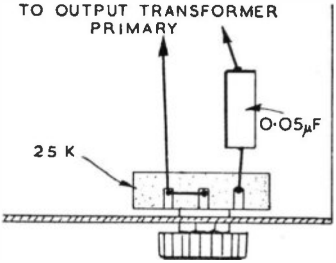


Fig. 20—Tone control

of the power pack, Fig. 17.

Note that the 50μF capacitor has positive and negative ends, and that negative goes to chassis.

Output transformer

This can have a ratio of about 50:1, for a 2 ohm speaker. The type of transformer intended for use with a mains output pentode is satisfactory. Transformers for battery operated equipment will be too small, and cannot carry enough current, so should not be used. A 50mA 50:1 ratio transformer is very easily obtained.

The transformer has primary and secondary. The primary is a large number of turns of fine wire, and the ends may be connected to tags. The secondary has few turns, of stout wire, and with inexpensive transformers these leads are often simply the ends of the actual winding. Primary goes to tags 7 and 8 of the valveholder, and secondary to the loudspeaker.

Using the amplifier

A fairly large speaker is most suitable, but any ordinary speaker should give satisfactory results. Remember that it should be enclosed in a cabinet, for proper reproduction. Its leads are fitted with plugs to insert in the amplifier speaker sockets, Fig. 19.

When the pick-up has been plugged in, and the power pack is connected and switched on, everything should work without difficulty. The amplifier is intended for use with the normal kind of crystal pick-up.

Tone control

If this is to be added, omit the 0·01μF capacitor shown in Fig. 19. Fit a 25k potentiometer to the front runner, as in Fig. 20. The 0·05μF capacitor is also needed, and leads go to the primary of the output transformer, or to tags 7 and 8 on the valveholder. This tone control reduces high frequencies, thus making reproduction more mellow or bassy.

PARTS LIST

- Small metal chassis.
- Pick-up socket and speaker sockets.
- 6CH6 valve and miniature 9-pin holder.
- 200k volume control and small knob.
- 100 ohm ½-watt resistor.
- 25μF or 50μF 25V. or similar capacitor.
- 0·01μF 250V. paper or similar capacitor.
- 50:1 or similar 50mA output transformer (for 2 ohm speaker).

Microphone

Enough amplification is obtained for carbon microphones, which are employed with a step-up transformer and battery. But other microphones do not provide enough output.

To overcome this, a pre-amplifier can be added to the 6CH6 amplifier. This pre-amplifier is simply an extra valve, added between input socket and 6CH6. Wiring for this pre-amplifier will be shown in the next article in the series.

In Part 4, Fig. 13, it was shown how bias was obtained by a cathode resistor. If a meter is available, and it is connected across the 100 ohm resistor in Fig. 19, or from chassis to pin 9, it should show about 4½V. cathode bias. For this test, the chassis is negative.

Next: A pre-amplifier.

CHEMISTRY AT HOME

1—BROMINE EXPERIMENTS

By L. A. Fantozzi

THE only non-metallic element which is liquid at ordinary temperatures is Bromine, Br. It is red-brown, gives off fumes which are very irritating to the nose and throat and causes nasty wounds on the skin. Not a suitable substance for use in the home laboratory, you may think, and rightly so.

Yet by using it in the form of bromine water, which is usually an approximately 3 per cent solution in water, its 'teeth' are removed and many of the interesting reactions of bromine can safely be carried out. We have an analogy in hydrogen peroxide, H_2O_2; 100 per cent hydrogen peroxide is a dangerous substance, yet its 20-vol. solution in water and which contains 6 per cent is safe.

To make bromine water there is no need even to dissolve the neat substance in water. It may be made by acidifying a mixed solution of potassium bromide, KBr, and potassium bromate, KBrO, with dilute sulphuric acid, H_2SO_4:

$$5KBr + KBrO_3 + 3H_2SO_4 = 3Br_2 + 3H_2O + 3K_2SO_4.$$

When made with the following quantities the solution contains about 3 per cent bromine and 1 per cent potassium sulphate, K_2SO_4. For nearly all purposes the potassium sulphate is of no consequence and is removed during the purification of the reaction product.

Dissolve 5·56 grams of potassium bromate in 100 ml. of hot water, let the solution cool and add a solution of 19·83 grams of potassium bromide in 300 ml. of cold water. Put the mixed solution into a glass stoppered bottle. Add 100 ml. of 10 per cent sulphuric acid and stopper the bottle.

The liquid becomes yellow at once from liberation and solution of bromide. In a few hours the reaction is complete and the solution is deep orange. Keep the bromine water in a dark place, for light causes gradual decolourization and decomposition into hydrobromic acid, HBr, and oxygen, O:

$$2Br_2 + 2H_2O = 4HBr + O_2.$$

Bromine is a sister element of chlorine, Cl, and some of its chemical properties are similar to those of chlorine. It bleaches some dyes, for instance, though less powerfully. Dip a slip of litmus paper into bromine water. The litmus paper loses its colour. Add some bromine water to a solution of potassium iodine, KI. A brown precipitate of iodine, I, appears, just as in the case of chlorine:

$2KI + Br_2 = 2KBr + I_2$.

It forms a coloured product with starch, which can be seen by adding a little bromine water to starch paste, when the latter turns orange-yellow.

Bromine water gives us an easy way of making a dilute solution of hydrobromic acid. In the open air generate hydrogen sulphide, H_2S, from ferrous sulphide, FeS, and dilute hydrochloric acid, HCl, in the apparatus shown in Fig. 1:

$FeS + 2HCl = H_2S + FeCl_2$ (ferrous chloride).

Bubble the gas through bromine water. The latter is gradually decolourized and a precipitate of sulphur, S, forms:

$H_2S + Br_2 = 2HBr + S$.

Heat just to boiling to expel excess of hydrogen sulphide, filter into a flask, connect the flask to a condenser and distil almost to dryness. The potassium sulphate remains in the flask and the receiver contains the purified hydrobromic acid.

To some bromine water add a solution of sodium hydroxide, NaOH, drop by drop. The colour of the bromine is discharged and the solution contains sodium bromide, NaBr, and sodium hypobromite, NaOBr:

$Br_2 + 2NaOH = NaBr + NaOBr + H_2O$.

Note the volume of sodium hydroxide solution which has been needed and add about two volumes more.

Add some of this alkaline hypobromite to solution of ammonium sulphate, $(NH_4)_2SO_4$. An evolution of gas occurs, due to formation of nitrogen, N. Sodium bromide and sodium sulphate, Na_2SO_4, remain in solution:

$$(NH_4)_2SO_4 + 2NaOH + 3NaOBr = 3NaBr + Na_2SO_4 + 5H_2O + N_2.$$

Repeat the experiment with a solution of urea, $CO(NH_2)_2$. Nitrogen is again evolved and sodium bromide and sodium carbonate, Na_2CO_3, remain in solution:

$$CO(NH_2)_2 + 2NaOH + 3NaOBr = 3NaBr + Na_2CO_3 + 3H_2O + N_2.$$

These reactions are used to estimate both ammonium salts and urea, the calculation being based on the volume of nitrogen evolved.

To show that this is nitrogen rig up the apparatus shown in Fig. 2. In the generating bottle put either a solution of ammonium sulphate or of urea. Add alkaline hypobromite through the thistle funnel until no more gas is evolved. The nitrogen displaces the water in the test tube in the bowl. Close the test tube under water with the finger, remove it from the water, bring it upright, light a spill and plunge it into the gas. The spill is extinguished, showing that the gas neither burns nor supports combustion. Both of these properties are possessed by nitrogen.

Bromine finds considerable use in the dye industry, mainly for converting existing dyes into bromo-compounds, which have different colours. A simple case is that of fluorescein, $C_{20}H_{12}O_5$. Make a strong solution of fluorescein in a mixture of equal volumes of water and methylated spirit. Dip a small circle of filter paper into it, let it dry and then use it to cover the mouth of a test tube containing a little bromine water. The fluorescein paper is yellow. Now warm the bromine water gently. The bromine vapour turns the filter paper red due to conversion of the fluorescein into tetrabromofluorescein, $C_{20}H_8Br_4O_5$:

$$C_{20}H_{12}O_5 + 4Br_2 = C_{20}H_8Br_4O_5 + 4HBr.$$

Tetrabromofluorescein is insoluble in water and hence useless for dyeing purposes. By combining it with an alkali metal, however, it forms a soluble product. Sodium hydroxide, for instance, produces sodium tetrabromofluorescein, $C_{20}H_6Br_4O_5Na_2$:

$$C_{20}H_8Br_4O_5 + 2NaOH = C_{20}H_6Br_4O_5Na_2 + 2H_2O.$$

which is marketed as the dye Eosin. It gives yellowish-red shades on wool and silk.

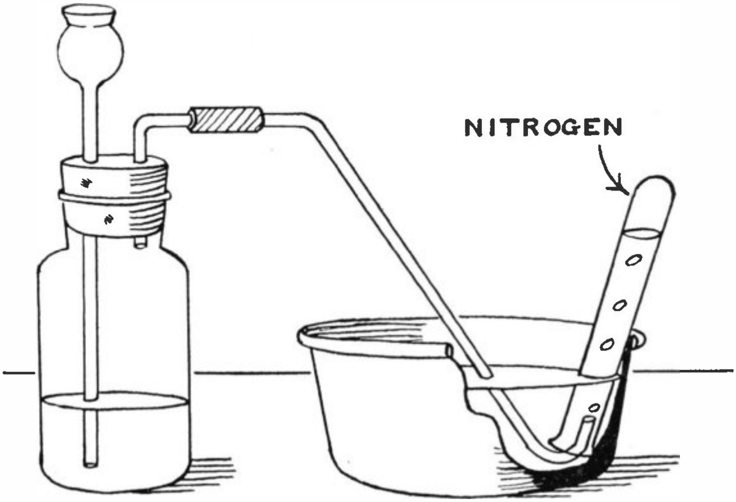


Fig. 2—Production of nitrogen

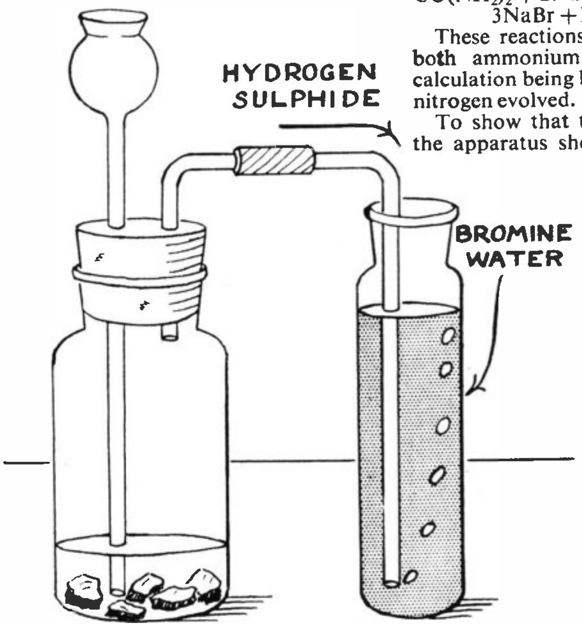
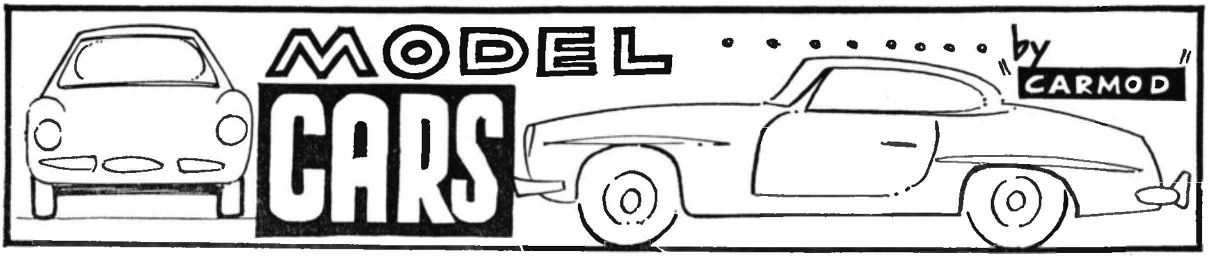
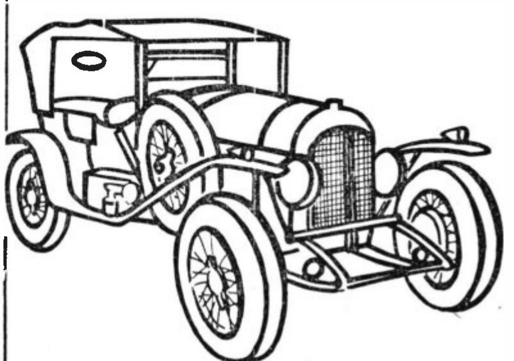
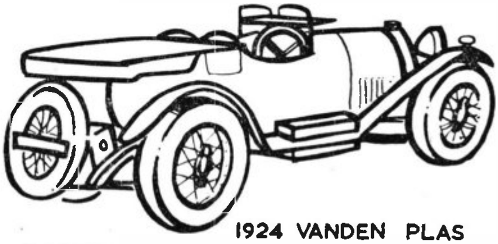


Fig. 1—Preparing hydrobromic acid

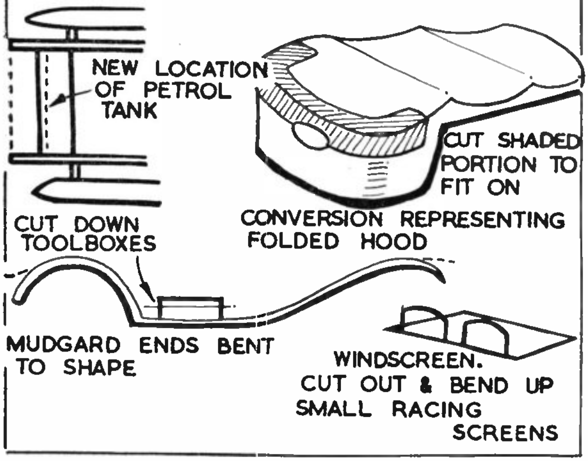




1927 3-LITRE BENTLEY (OLD NUMBER SEVEN AT LE MANS) "CORGI CLASSIC" MODEL



1924 VANDEN PLAS BODIED 3-LITRE BENTLEY



TODAY we have constructors like Cooper and Lotus who have established tremendous reputations as builders of sports cars upholding the British Racing Green, but looking back in history there can be no more illustrious marque than that of Bentley.

W. O. Bentley was a man of considerable engineering background, and even before 1914 he was a dedicated designer working on rotary aero engines and cars built by Humber. The first vehicle to bear his name was produced in 1921, and during the 20s the name Bentley became synonymous with British made high-performance machinery.

BENTLEY 3-LITRE

Model-wise, we have seen a spate of 1928–29–30 dated 4½-litre Le Mans Bentleys in kit and die-cast miniature forms, and how refreshing it was to see Corgi's break-away in the form of the 1927 Le Mans winner released early in 1964. This is the car Sammy Davis and Dr Benjafield drove to victory in such an incredible way after one of the most famous crashes of all time — at White House.

The Corgi miniature of this car is so good that it would be impertinent of me to suggest improvements. What I have attempted is a replica of the first version of a 3-litre Bentley which was made in 1924 with body-work by Vanden Plas, a concern now famous for their part in the production of the B.M.C. *Princess*, and the Rolls-Royce powered *Princess-R* cars.

The conversion from the Corgi miniature of the Le Mans Bentley to the Vanden Plas body is not radical, but it does involve considerable patience because of the amount of metal to be sawn through to make the change. The 1924 3-litre Bentley is a most attractive vehicle, and well worth the effort involved in the conversion.

The Corgi miniature has to be stripped down to its basic components by drilling or filing away the spun-ends of the locating peg at the front end of the underside of the car. By lifting the front end from the chassis, the car will fall into its several components with a somewhat terrifying admixture of parts.

Most of the cutting has to be done on the chassis, and the hardest part of this is the relocation of the petrol tank, which has to be set forward to a considerable extent; hacksaw between the petrol tank and the rear springs on each side as far as the rear axle. It will be impossible to cut across the chassis between the terminations of these two incisions, and the only way of removing the petrol tank is to bend the metal to and fro until it comes apart. The metal between the break and the petrol tank will have to be cut off vertically, and so leave the tank as an entire unit.

The tank can now be re-set in its new position, as shown in the illustration. Use Uhu cement for this, and also to fix the exhaust pipe through the brackets under the tank, and in its locating hole under the engine. Pull off the brown plastic covers of the tool boxes on the running boards and, from the right-hand lid, cut off the horn and bracket. The die-cast boxes themselves must be reduced in height by cutting through horizontally ⅛ in. above the running boards. The plastic covers may now be set back into place on these boxes.

The mudguards should be bent to the shape shown in the illustration — this can be done with pliers or a small vice. (Care should be taken while doing this to get the 'feel' of the metal, and so avoid any jerky movement which could fracture it. This completes the work on the chassis.

Attention can now be given to the body. Take off the spare wheel by removing the 'nail' with pliers. File away the mounting stub flush with the side of the bonnet. The spare wheel can now be positioned at the rear of the chassis, fixing the nail on top of the tank with Plastone and Uhu.

The brown plastic interior should be replaced, and the edge at the top cut off with a razor blade flush with the body. Trim off the top of the back seat in the same way.

Cut off the upper part of the windscreen level with the lower edge of the driver's 'vision slit'.

Paint the car at this stage. Appropriate colours for the 1924 car are black or midnight blue, the model looking very attractive in the latter shade.

When the paint is dry the car may be reassembled, taking care to remember to replace the brake lever. Use Uhu to keep the locating peg in its hole at the front of the car.

Cut out and bend to shape the windscreen, as shown in the illustration, and cement into place on the original screen. It only remains to cut out and cement in place the folded hood, the forming of this being described in the illustration.

TOPICS FOR COLLECTORS

BUTTERFLIES AND MOTHS

To net or not to net? That is the question. Whether it is better to collect butterflies and moths in their adult state or rear them from ova, larvae and pupae.

Well, although catching the winged insects can be an exciting sport, there is a good deal to be said in favour of procuring one's specimens in their earlier stages of development. For one thing much more perfect specimens may be obtained in this way. Even after its very first flight a butterfly looses some of its initial beauty and it is difficult to catch and handle one without further destruction of the delicate wing-scales.

Then of course, by only collecting the winged lepidoptera one loses much of the fascination of the hobby. More can be learned and greater pleasure derived by rearing a butterfly or moth through all its successive stages and seeing it eventually emerge in all its splendour. Furthermore, whilst running around the countryside brandishing a butterfly net is not everyone's idea of a pastime, caterpillar hunting can be enjoyed by young and old alike.

I well remember the thrill I experienced on finding my first hawk moth caterpillars. It was during an evening ramble in early September some years ago. Coming upon a patch of waste land decorated with the pink flower-heads of the Fireweed or Rose-bay Willow Herb, I noticed a number of large black looking caterpillars clinging to the stems.

Never before had I encountered such giants, but from my reference book they were easily identified as being nearly full grown larvae of the Elephant Hawk moth.

Collecting several, by breaking off the stems on which they were resting, I placed them carefully in a paper bag and continued on my way. Then a little further on, along an avenue of Lombardy Poplar trees I found, by a strange coincidence, my first Poplar Hawk caterpillar, a species I had previously searched for in vain.

I kept my discoveries in an improvised cardboard shoe-box cage, feeding them on the leaves of their respective food-plants, and in due course they pupated. The moths emerged the following June, the Elephant Hawks resplendent in pink and olive green, the Poplar Hawk with scalloped wings of pearly grey.

A few years later I came across another interesting species. It was a hot day in late July and I was sitting on an old log in the shade of a willow tree, watching the courtship display of a pair of Small Copper butterflies. Suddenly I spotted a large green caterpillar on a branch of willow overhanging the nearby brook. A closer search revealed several more and I identified them as those of the Eyed Hawk moth, so named because of the eye-like markings on its hind wings, normally hidden when at rest but useful for scaring away potential enemies if disturbed. I took a few home and was able to see my first Eyed Hawk moth emerge the following May.

To collect and rear caterpillars like this, shielding them from parasites and predators, and later releasing a number of adult insects, is to perform a valuable act of conservation. The very existence of a rare or local species can be endangered by indiscriminate collecting. Such was largely responsible for the extinction of the British Large Copper butterfly way back in 1848.

We must not let anything like that happen again. A butterfly, being such 'a thing of beauty,' should indeed be 'a joy for ever'. (J.W.N.)

Part 1

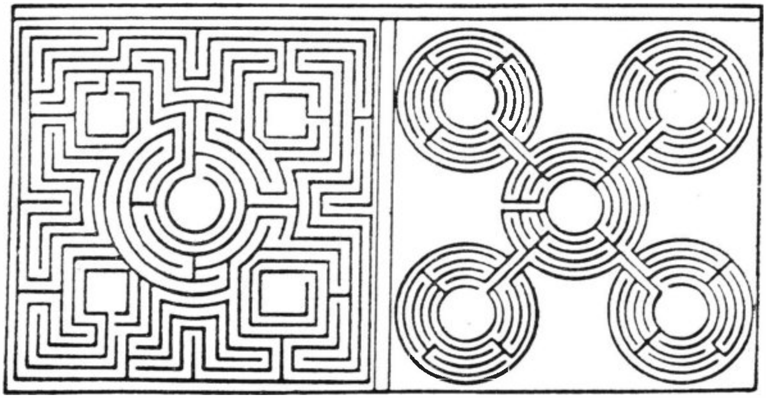
LABYRINTHS AND MAZES

WHEN we think of mazes we think of Hampton Court with its hedged maze, which you may have seen. This was laid out to amuse William III and his guests in 1690 but it is only one of many which exist throughout the world.

Mystery surrounds the entire subject of labyrinths and mazes and although the words are different their meanings are the same. Both refer to a complex path of some kind invented to misguide those attempting to reach the innermost goal.

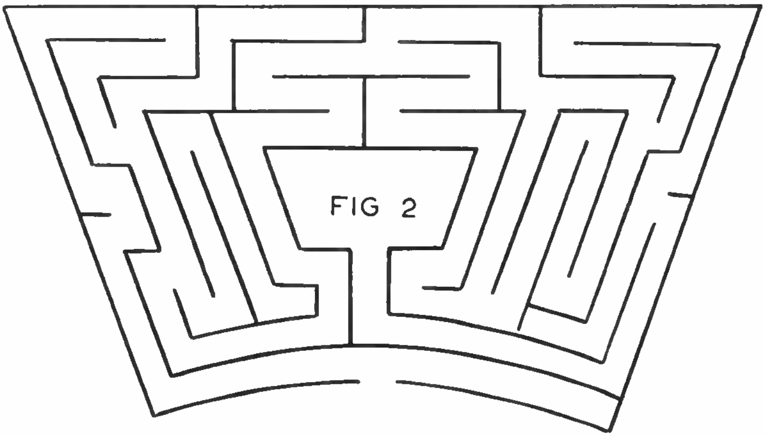
It would be wrong to think that all mazes are made with hedges like the one at Hampton Court and in many examples there are neither walls nor hedges. In fact a very famous labyrinth was composed of a complicated lay-out of rooms and columns.

Some of the earliest known labyrinths have been found in Egypt and Crete; we see a form of the pattern in Roman pavements; there is a type developed by the Christian Church in the Middle Ages; we have the horticultural type; there are turf labyrinths and there have been systems of caves and grottoes. Perhaps the most famous of the latter is the labyrinth in which Theseus is said to have tracked the Minotaur, the plan being commemorated on ancient Crete coins.



Examples of mazes by G. A. Boeckler in 1664

FIG 1



This was a round specimen, although they can be square, rectangular, triangular or of other geometrical shapes, all planned with mathematical precision, but perhaps you may like to hear the interesting story of Theseus.

At the time of our story Minos, reigning at Knossos in Crete, was a powerful king who imposed a severe penalty on nearby nations for the treacherous killing of his son. He demanded a penalty to be paid every nine years consisting of seven youths and seven maidens who were to be shipped to Knossos. This king had a clever engineer in his court who devised the ingenious labyrinth and it was said that anyone placed therein would find it impossible to discover the exit.

This particular labyrinth was especially designed for keeping the monster Minotaur, a hideous creature half man and half bull. It destroyed any human being trapped in the labyrinth and the unfortunate youths and maidens were sent into the trap one by one.

Theseus was the son of one Aegeus, who became very depressed at the thought of having to send the youths and maidens. Ultimately, when old enough, Theseus suggested that since he had become a valiant swordsman he should be one of the seven youths so that he could have a chance of slaying the monster and finish the sacrifice once and for all time.

Aegeus was hard to persuade, although he had every confidence in his son's prowess as a swordsman. At length he consented on condition that if the mission was successful his returning ship should bear a white sail instead of the black one.

In Knossos our hero met Ariadne, the daughter of Minos, who arranged for him to enter the labyrinth with a sword and a reel of thread. One end was fastened at the entrance, and he proceeded to leave a trail which would lead him back to the entrance. Theseus slew the monster, was able to retrace his steps and escape. He also liberated other prisoners, youths and maidens, setting sail for Athens with Ariadne.

Unfortunately, he delayed his return home and he stayed at the island of Delos to celebrate his escape. They enjoyed themselves singing and dancing and it is said that the Crane Dance they performed was based on the motions of threading the dreaded labyrinth. This dance became a folk dance.

He left the fair Ariadne behind and he forgot to change the sail. As a result the father Aegeus saw the black sail and thought his son had been devoured by the Minotaur. He threw himself into the sea to drown and that is given as the reason for this sea being called the Aegean.

I should mention that this is one version of the incident which has been portrayed in ancient art. Fig. 1 shows the plan of this Cretan labyrinth.

Meandering designs have been used to decorate early Egyptian amulets and tiles while lots of coins bear similar labyrinth-like patterns. Roman mosaics have been discovered bearing similar designs, which reveal its popularity in ancient times.

Many cathedrals in France, Germany and Italy have floors tiled with labyrinth patterns. Various opinions have been offered for this practice and it has been suggested that they are symbolic, portraying the perplexities which beset a Christian's path — a kind of visual Pilgrims' Progress as written by Bunyan. Although there is no evidence in support it has also been suggested that they were used for making miniature pilgrimages, or perhaps for penance.

While mazes have no practical value — excepting the fact that they can be a source of revenue — we now regard them as a form of puzzle or entertainment. Indeed, thousands of visitors try their skill each year at Hampton Court, threading their way through the hedged maze.

You may have been there but if not it is still fun to try your skill on paper. Fig. 2 shows the plan of this maze with the goal in the centre. We give no solution to the puzzle but invite you to thread your way to the centre, finding the exit on the return journey.

The solution will be given in another issue when we will describe how to invent your own labyrinths and the known methods for finding solutions. This will help you to make your own puzzles on paper, or you may make sand labyrinths on the beach, just as fascinating as trying to solve one. (S.H.L.)

? REPLIES TO READERS

Recipes for Scent

COULD you please inform me of any recipes for scent making? (M.E. — N. Wales.)

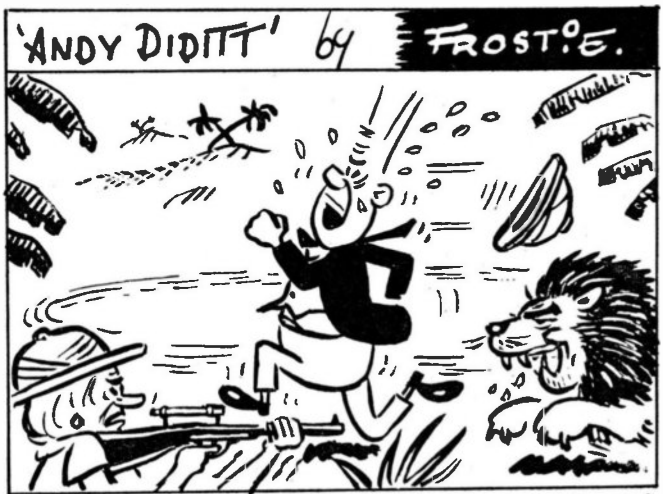
THE following popular perfumes will, perhaps, be of most use. *WALLFLOWER.* — Mix 77 ml. of isopropyl alcohol and 2 ml. of ionone. Dissolve in this 1 gram of vanillin. *EAU DE COLOGNE.* — Mix 2·5 grams petitgrain oil, 2·5 grams bergamot oil, 0·5 gram neroli oil, 0·5 gram lemon oil, 0·25 gram rosemary oil, 0·25 gram lavender oil, and 0·1 gram sweet orange oil. Add 0·66 gram of this concentrate to each 100 ml. of isopropyl alcohol. *LILY OF THE VALLEY.* — Mix 5 grams each of linaloe oil and terpineol, 0·5 gram each of bergamot oil, cananga oil and vanillin, and 0·2 gram of synthetic musk. Stand until the solid has dissolved. Add 1·17 grams of this concentrate to each 100 ml. of isopropyl alcohol. *ROSE.* — Mix 17·5 grams of French geranium oil, 5 grams each of linaloe and bergamot oils, 2·5 grams each of synthetic musk and synthetic rose otto, 1·5 grams of vanillin, and 1 gram of patchouli oil. Stand until the solid has dissolved. Add 0·35 gram of this concentrate to 100 ml. of isopropyl alcohol.

* * *

Cleaning metal utensils

I HAVE accumulated quite a lot of old brass utensils, some have been used on an open fire. Please could you tell me the best way to clean. I also have a copper kettle and fry pan. Is the same method of cleaning used for both? (W.C. — Boston.)

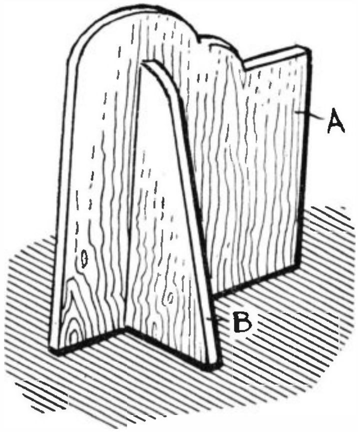
THE methods given may be used for brass or copper. Clean fire blackened utensils as much as possible with domestic scouring powder made into a paste with water, then with metal polish, and finally with a cream made by dissolving 8 grams of soap in 80 ml. of hot water, allowing to cool, and adding 1 ml. of strong ammonia (specific gravity 0·88), and 16 grams of precipitated chalk. Verdigris may be removed by rubbing with a paste made from 1 volume of household ammonia, and an equal bulk of whiting or precipitated chalk. Follow up with the special cream given above. Ordinary tarnish may be removed with metal polish, and is improved by the special cream. A buffing with a soft dry cloth will bring the final sparkle in all cases.



"PUT THAT THING DOWN MA AND GET THE CAMERA QUICKLY!"

A DECORATIVE THERMOMETER

USE a fretsaw to cut out the two pieces A and B from ¼ in. wood. Glue the strut B on the back of A, as shown in the small diagram. Clean up with glasspaper, and give a coat of clear varnish. The bird decoration is one taken from the Decorette sheet No. 1001 (four on a sheet), costing 2s. 3d., postage 4d. The thermometer is Hobbies No. 5015, price 2s. 3d., postage 4d. These can be obtained from Hobbies Ltd, Dereham, Norfolk, or from any Hobbies branch. (M.p.)



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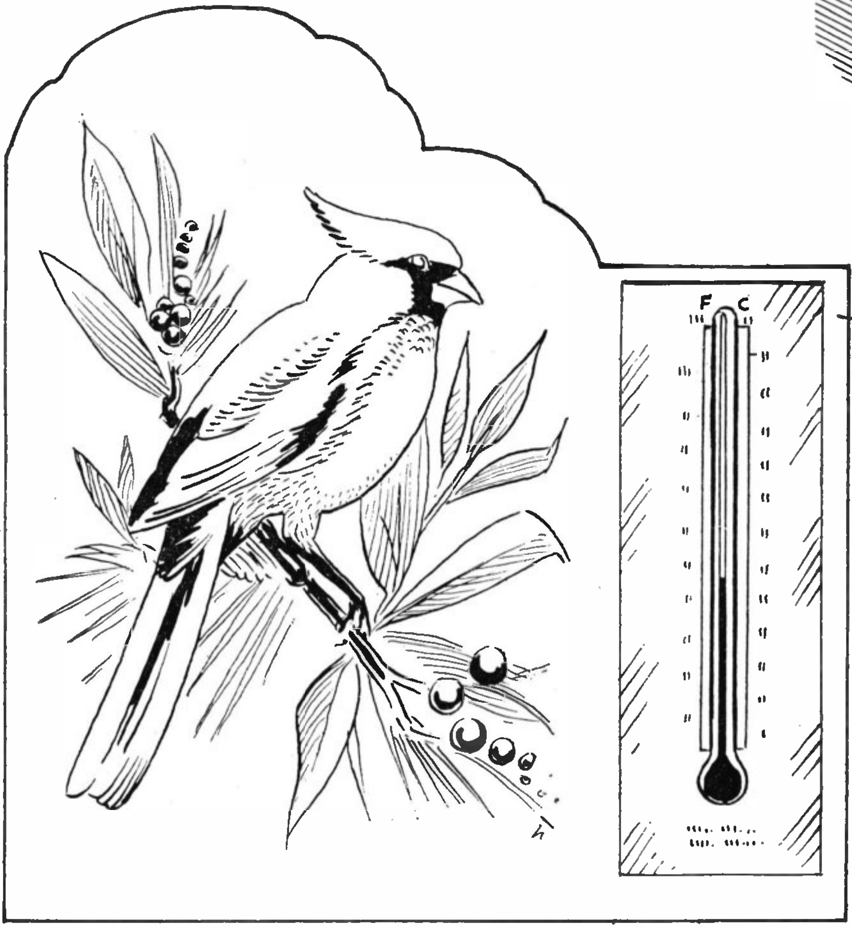

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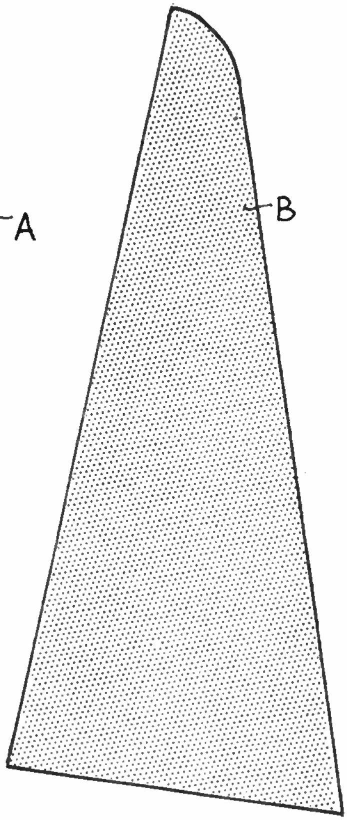

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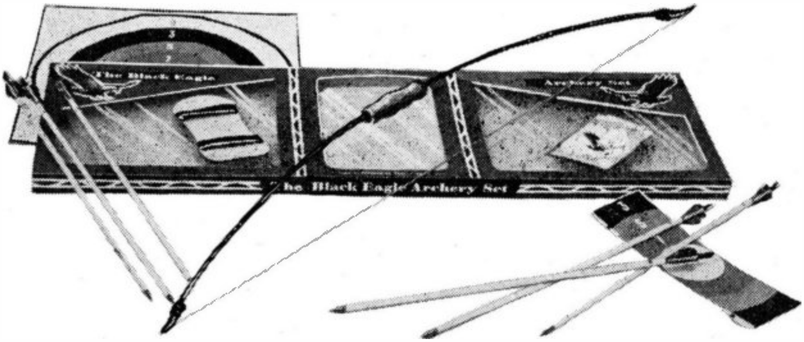

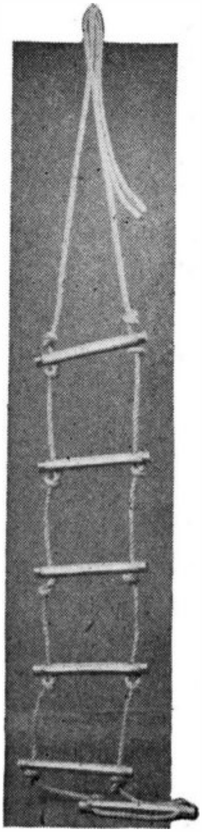

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BLOCK LETTERS PLEASE

Part 1

FORMAL AND INFORMAL

THERE are few of us fortunate enough to have a natural brook or stream running through our garden. The artificial pool is an excellent substitute, and planted out with water lilies and other aquatic plants, and with its shoals of small fish, it forms a peaceful and natural focus of interest for the whole garden scene. However small the garden, a pool can be designed for it that will fit in with the surroundings.

Broadly speaking, garden pools can be divided into two types — 'formal' and 'informal'. Formal pools are those that have a geometrical outline (rectangular or circular), often have paved surrounds, and are laid out with steps, seats and so on: they look at their best when built out in the open, and forming part of a strictly controlled, formal garden with neat paths, trimly clipped hedges, and plants lined up like soldiers on parade. The informal pool is small, usually irregular in outline (and often in cross-section), and is particularly suited for the smaller garden.

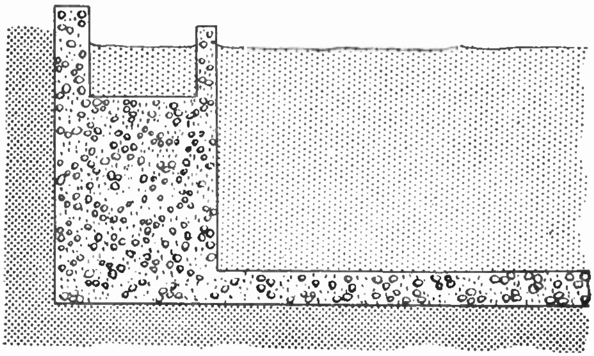

Fig. 1—Method of casting pond side with solid wall

Ponds themselves take several forms which could be classed as non-concrete, concrete, or built-up, but before considering these something should be said about the site for the pond.

Natural position

In general a pond should be sited at the lowest part of the garden. This is the natural position, as water would flow to that area. It should never be sited close to a tree, for in autumn the leaves will fall into the pond, make it untidy, and poison the water, while the roots may tend to split the construction as they grow. The best position is in the open, where some form of hedge offers protection against cold winds. It may be noted that a semi-formal pool can be built against an existing wall if the latter is strong enough to resist the thrust of the water.

The simplest possible form of pool is to dig a hole, and line it with a sheet of 500 gauge polythene. The pressure of the water will force the polythene into close contact with the earth, however irregular the shape of the hole, but the edges of the sheet must overlap the sides by at least 1 ft. This overlap can be covered with rockwork having small pockets of earth in which alpines can be planted. Such a pool will last for years without any maintenance, but may cause problems as regards emptying and cleaning.

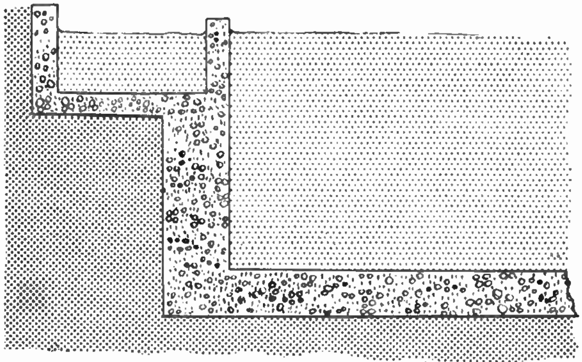

Fig. 2—Method of casting pond side with stepped wall

Another alternative is to sink a cistern or zinc bath into the ground, breaking up the outline with rocks. Such an item must be given a few coats of thin bitumastic paint, and must be filled, allowed to stand for a day, then emptied, several times before it can be taken into use for either plants or fish.

The third alternative for a non-concrete pool is the prefabricated glass fibre pond.

These are obtainable in a wide range of shapes and sizes, and they have only to be dropped in a hole of the appropriate shape and depth, ramming the earth well down around the shaping.

If it is intended to keep fish in such pools, the depth must