HOBBIES weekly

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KENNEL & RUN
FOR THE LARGER DOG

KENNEL 5FT. X 4FT. —— RUN 6FT. X 4FT.

Hobbies

FOR CRAFTSMEN OF ALL AGES

6D.

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.

JUDGING from the great variety seen in the average collection of old cards, the Rotograph Company was probably one of the leading distributors of cards in the early part of the century. Most of their cards were made in Germany and thus the workmanship and details are excellent. They have never been as popular with the majority of collectors, probably because they were more plentiful than those of other distributors of the same period.

ROTOGRAPH POSTCARDS

A great many Rotograph views are plain black and white but because of the fine workmanship and detail they are most attractive. Most of the black and whites are of the 'A' Series, the 'A' appearing before the number. These are mostly undivided and have a narrow white band at the bottom or side for a brief message.

Of those with divided backs, a great many are in the Boston & Maine Series and show scenes in the territory served by the Boston & Maine Railroad. These are not numbered. Another large series is the 'D' Series which are printed in a bluish ink. The majority of these have undivided backs although a few have been found divided.

The hand-coloured group is one of the most popular and are mostly undivided. They do not seem to belong to any particular series but are mostly low numbers, usually under 5,000 with a few higher.

Of the other coloured cards, most are undivided backs and belong to the 'G' Series. The numbers range from under 1,000 up into the 20,000. The divided backs in the coloured cards do not carry a series letter and numbers are mostly in the 50,000 and 60,000 range. There are exceptions, of course, such as E6171a which is on a divided back.

Some Rotographs were made for other distributors and do not bear the Rotograph name but can be identified by the 'Sol-Art Prints' trademark. Others have both the distributor's name and the Rotograph name. Occasionally one is found that appears to be hand-tinted. A few are printed in sepia although judging from the comparatively few seen, these were never very popular.

Rotograph also published a few of the folded or panorama cards. These were marked 'Mail Card' and marked 'Printed Matter' to comply with postal regulations. No message was permitted on these cards. The printed side is undivided and is for address only. The instructions under the words 'Mail Card' are quite interesting. It says, 'Write on back of this card only your name and address. Put rubber-band around folded card.'

Rotograph also produced a number of receptacle cards, such as the strip views under panel, known as 'Souvenir Mail Card'. These were made in Germany and were patented in the U.S. December 5, 1905, under Patent Number 806631. They had a view on the face of the card, a panel in the centre lifted up to reveal a strip of views of the same city.

Rotograph also distributed the Stengel art cards. These were imprinted on the back with Rotograph's name but carried the same number as Stengel's own card of the same design.

They also handled some greeting cards but these were apparently not in as large a variety as the views. Probably the most popular with the collector are the Rotograph 'Cats'. These were printed on bromide paper, some flat and some glossy. The subjects are very cute — kittens in various poses, some in baskets or other containers, some showing children with kittens, and a few with kittens dressed as people.

For the collector who likes old cards but can't afford some of the more popular cards, Rotograph furnishes a fertile field. The black and white views can often be bought quite cheaply, while the coloured ones seldom bring more than a few pence each. A nice collection can still be assembled without a great deal of expense and we believe they are sure to become more valuable as time goes on and the more popular lines continue to go up and up.

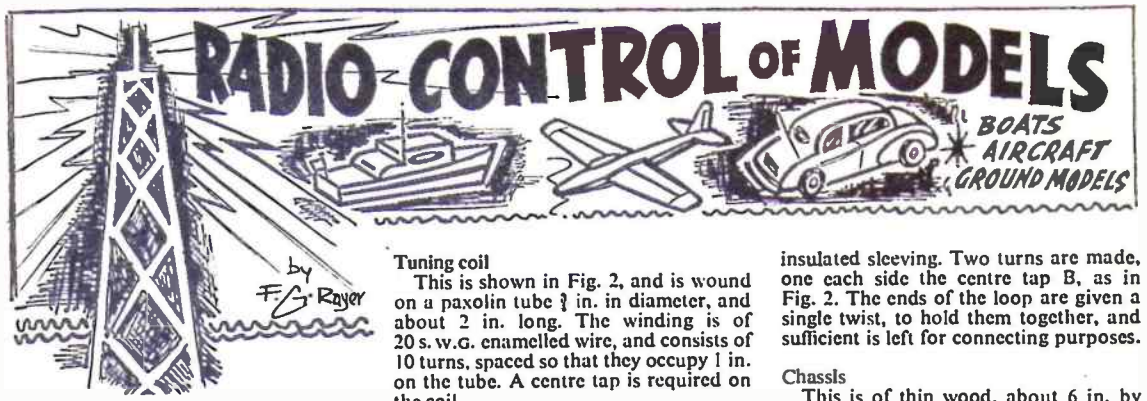
U.S.A. 'WEST VIRGINIA' COMMEMORATIVE

One hundred years ago, on 20th April, President Lincoln of America proclaimed West Virginia a state as a 'war born measure' to be effective sixty days later. The 5-cent, multi-coloured stamp was first issued on 20th June on the centennial of statehood in Wheeling, the original capital. It features the State map and capital.

When the Civil War flared, Virginia was split over loyalty to the Union. Many of the residents of the state that is now West Virginia refused to bear arms against the United States. To protect them, and to strengthen the Union, President Lincoln proclaimed the 'war born' state of West Virginia.

* * *

The 8 cent commemorative air stamp issued by America on 24th July features Amelia Earhart, the noted flier.



THE circuit of this model control transmitter is shown in Fig. 1, and it is a popular type to use, as it requires few components, and is easy to adjust. It can be employed to control any home-built or ready-made CW transistor or valve receiver. The maximum range obtained naturally depends on aerials, and the receiver, but a transmitter of this kind is usually regarded as having a maximum range of up to about 1 mile, working from ground to a plane, or about half a mile, for ground to ground control.

Two 3V4 valves are used, each driving the other in a push-pull circuit. Quite often somewhat reduced power is sufficient, and the transmitter can then be run with either of the valves withdrawn. This is a useful feature, when testing equipment at short range.

The 3V4 valves have tapped filaments, and these are wired so that each valve operates with filament sections in parallel. The two valves then require 0·2 ampere, at 1·4V. This is provided by a number of 1½V. dry cells in parallel, or from a 1½V. dry portable radio battery.

Very many other valves will function well in this circuit, but wiring to the valveholders will have to be changed to suit. Various octal valves are also satisfactory, and would require octal holders. The 3V4's fit miniature B7G holders.

In addition to the two valves, with holders, two 27K 1-watt carbon resistors are required, and two 30pF mica or ceramic fixed capacitors. The 0·1μF capacitor is a 250V. or similar tubular paper one. The 30pF trimmer is of the air-spaced beehive type. Any small on-off switch is suitable for the filament circuit, and two sockets or terminals for the control key leads.

Tuning coil

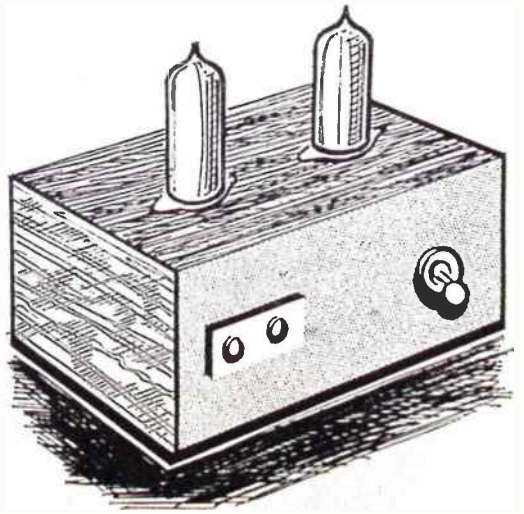
This is shown in Fig. 2, and is wound on a paxolin tube ¾ in. in diameter, and about 2 in. long. The winding is of 20 s.w.g. enamelled wire, and consists of 10 turns, spaced so that they occupy 1 in. on the tube. A centre tap is required on the coil.

Part 2

2-VALVE BATTERY TRANSMITTER

The wire is first anchored at A, by passing it through two small holes. Five turns are then wound, and the wire is then scraped, and lead B soldered on. The winding is then continued for a further five turns, and the wire is anchored at C. Turns should be tight, and may be held by a few touches of adhesive.

The loop is made from insulated wire, such as flex, or single strand 20 s.w.g., rubber or plastic covered wire. Or some of the enamelled wire can be inserted in insulated sleeving. Two turns are made, one each side the centre tap B, as in Fig. 2. The ends of the loop are given a single twist, to hold them together, and sufficient is left for connecting purposes.



Chassis

This is of thin wood, about 6 in. by 4 in., the exact size not being important. All parts except the valves are underneath. The side runners must be high enough to clear the coil — say, 2½ in. if the coil tube is 2 in. long.

The chassis front carries the filament switch and key sockets strip. No back runner is fitted, so that the 30pF trimmer can be reached.

Wiring and components are shown in Fig. 3. All leads should be short and direct, yet must be reasonably clear of each other where they cross. Pins 1 and 7 on each holder are joined together, and connected to the switch.

The coil is cemented to the baseboard. A small bracket, with a single insulated tag, is screwed near the coil, as in Fig. 3. The bottom tag of the trimmer is soldered to this, so that the trimmer is supported as in Figs. 2 and 3.

The end A of the coil, Fig. 2, goes to the second pin of the left-hand valveholder, Fig. 3. The trimmer and 30pF fixed capacitor are also joined to this lead, as shown.

Point B is the centre tap, and goes to the 0·1μF capacitor, which stands almost vertically. The remaining end of the coil, C in Fig. 2, goes to the tag supporting the trimmer, and to pin 2 of the right-hand valveholder, and remaining 30pF capacitor, as in Fig. 3.

Wiring in the tuned circuit, and between valves, should be run in a similar manner to Fig. 3.

For most purposes, a single upright rod or wire aerial will be wanted. For this kind of aerial, one end of the 2-turn loop should be taken directly to the negative end of the 0·1μF capacitor (LT negative), and soldered. The remaining end of the loop is then taken to a terminal, clip or socket on the side of the transmitter box, for the aerial.

In a few cases dipole (2-element) aerials are used, for maximum range. It will then be necessary to have both ends of the loop free, and to connect them to a 2-wire feeder, which is taken to the inner ends of the dipole. This may be disregarded, however, when single vertical aerials are to be used.

If a 1 or 2-valve receiver is used (or transistor receiver of equal sensitivity) the vertical aerial can be some 4 ft. to 5 ft. or so, for ranges up to 50 yds. to 100 yds. This is sufficient for many small ponds, etc. For greater range, the aerial should be 8 ft. 6 in. long, when ranges of some 500 yds. to 1,000 yds. or so should be obtainable on the ground. Actual range, naturally, depends very greatly on the receiver, and its adjustment.

Batteries

The LT supply is provided as already described. For HT, any voltage from 90V. to 150V. may be used. For general purposes, with good range, a 120V. battery is satisfactory. Quite a useful range for house or garden can be expected with a voltage much lower than 90V., but low voltages do not give enough signal strength for distant working. The full available output is also useful for short range working when a very simple, insensitive receiver is fitted in the model.

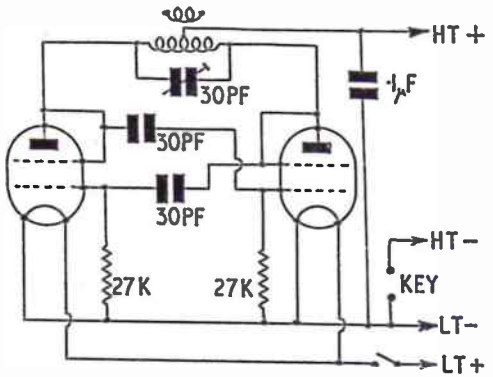


Fig. 1—The transmitter circuit

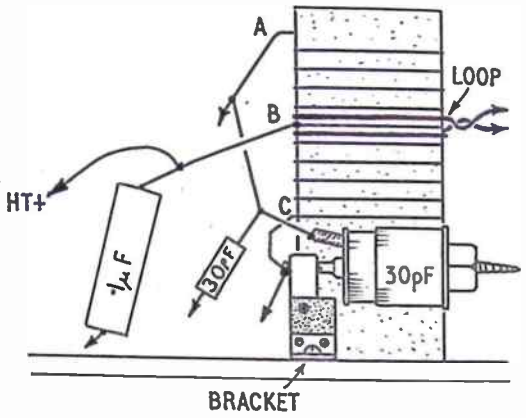


Fig. 2—Coil and 30pF trimmer

The transmitter is best housed in a wooden box, being fitted near the top. The loop can then be wired to clips, which are screwed to the side of the box, and will take a vertical rod aerial. No separate support is then wanted.

A clear space of about 3 in. is left under the transmitter chassis, and the batteries occupy the bottom of the box. When the box is placed on the ground, capacity effects between the large body of the batteries, and ground, provide earthing.

When the transmitter is in use, the control key should be connected by two fairly short flexible wires. If long wires are used, they can influence the radiation from the aerial, especially if a person stands near the transmitter, holding the switch fairly high. Wires some 2 ft. or so long, extending sideways away from the aerial, will not matter.

If long leads are wanted, short wave high frequency chokes should be added in series with each, at the transmitter. For relatively short range, or when loss of control will not result in damage to the model, possible effects of the keying leads may be disregarded.

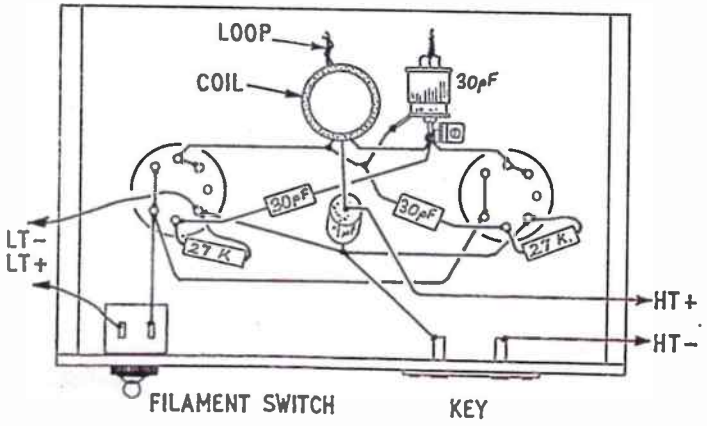


Fig. 3—Underside of the chassis

Testing and tuning

A lamp loop is used to check that the transmitter is producing radio frequency energy. Two turns of insulated wire about 1 in. in diameter, soldered to a 6V. 0·04A. bulb, will be satisfactory.

With the transmitter switched on, and the key sockets shorted, or the keying switch closed, the bulb should light, when brought near the transmitter coil. Initially, no aerial should be connected.

A test can be made that the bulb lights, at reduced brilliance, with either valve withdrawn from its holder. With a single valve, and small HT voltage, the bulb will only glow weakly. But with a high voltage, and especially with both valves in, the loop must not be too near the coil, or the bulb may be burnt out.

A piece of small diameter insulated tubing or rod, several inches long, should be cut or filed, so that it will engage with the shaped end of the trimmer.

To tune the transmitter, a calibrated

● Continued on page 53

THE REDCAPS

Out to challenge the success of the famed Liverpool groups are The Redcaps who hail from Birmingham. They made their disc debut with a rousing version of the Isley Brothers number 'Shout'.

In the search to find beat groups from different parts of the country to rival the Liverpudlians, Decca A & R men Dick Rowe and Mike Smith visited Birmingham to see the Redcaps, who were nominated the most popular group by the teenagers of Birmingham. The group consists of five boys, two of whom are twins. The Redcaps line up is:

Roy Brown (17½), lead guitarist and singer. Roy was born in Walsall, and worked as a furniture salesman.

Michael Walker (18), bass guitarist and singer. Mike was born in Walsall, and worked as a furniture salesman.

David Walker (18), rhythm guitarist and lead vocalist. David was born in Walsall, and worked in a travel agency.

Malcolm Broadhurst (23), tenor sax. Malcolm was born in Walsall, and worked as an electrical engineer.

Alan Morley (18), drummer. Alan was born in Blackheath near Birmingham, and worked in an optical laboratory.

The Redcaps met up 18 months ago when the youngest, Roy Brown, decided to start a group. The original members were the Walker twins and Roy Brown, who were later joined by Malcolm Broadhurst and Alan Morley. They first played at local dance halls, and were later booked to play at the large ballrooms in Birmingham.

The boys, who recently turned professional, have had a successful month's tour of U.S. bases in France.

● Continued from page 52

2-VALVE BATTERY TRANSMITTER

bulbmeter or wavemeter is held near the coil, and the trimmer is turned until the bulbmeter or other instrument gives the best indication. Coupling between coil and bulbmeter should be kept low, by moving the bulbmeter away, so that the filament only just glows at the exactly correct tuning point.

Retuning is necessary after removing or inserting a valve, or connecting, disconnecting, or changing the aerial. It will be remembered that the regulations which apply to the use of model control equipment (mentioned in the first of this series) make it essential that the transmitter shall only work in the permitted frequency band, and shall not radiate more power than allowed. If wrongly adjusted, a transmitter of the kind shown here may, for example, cause interference to TV reception over a wide area.

The next in this series describes the construction of a bulb-meter, which can be used to tune a transmitter of the kind shown here.

CHEMISTRY AT HOME

FORMALDEHYDE EXPERIMENTS

WHEN a mixture of the vapour of methyl alcohol, CH_3OH, is passed over a heated catalyst a pungent smelling gas is produced together with water, H_2O. This gas is formaldehyde, H.CHO, and is formed from methyl alcohol and the oxygen, O, of the air:

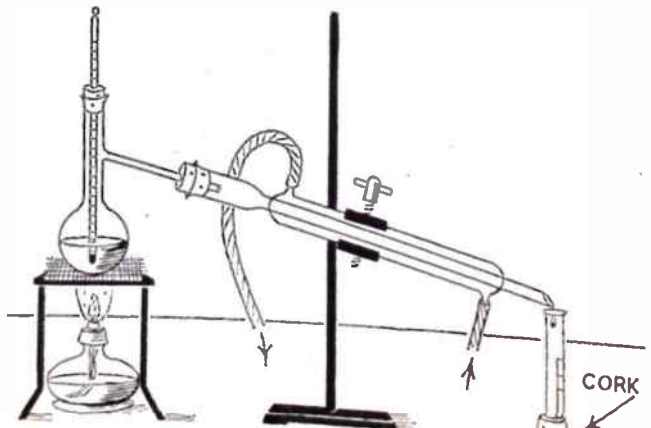
$2CH_3OH + O_2 = 2H.CHO + 2H_2O$.

As the gas is soluble in water it is marketed in the convenient form of a 40 per cent solution in water known as formalin. Formalin also contains a small percentage of unchanged methyl alcohol. This inhibits formation of a sediment, though the latter may be seen in old specimens or those which have been exposed to extremes of temperature. A suitable storage temperature is 15 to 30 degrees Centigrade.

This white sediment consists of mixtures of compounds due to the union of formaldehyde molecules in various numbers with water and is known as paraformaldehyde, $(H.CHO)_n.H_2O$, n representing a variable number. As the sediment is much less than it looks, it is best to prepare a specimen by heating formalin.

As some formaldehyde is given off during the heating, this should be done in the open air. Pour 50 c.c. of formalin into an evaporating basin and evaporate it to dryness on a water bath. A white residue of paraformaldehyde is obtained. Heat a few specks of it in a dry test tube. The solid disappears and if you smell the mouth of the tube, the penetrating odour of formaldehyde will be noted. On this property of reconversion into formaldehyde depends one method of disinfection of sick rooms. Formaldehyde is a powerful germ killer and has the added advantage that it does not affect coloured fabrics.

An indoor method free from smell, but which gives a low yield, is to treat formalin with strong sulphuric acid, H_2SO_4, (caution: corrosive; any on the fingers should be flushed off with water and wet sodium bicarbonate, $NaHCO_3$ dabbed on). Put 10 c.c. of formalin into a beaker and slowly stir in 1·4 c.c. of strong sulphuric acid. Leave the mixture aside for 8 hours, when the paraformaldehyde will have stopped forming. Filter it off and wash with cold water until free from acid, this being ascertained by one wash water not turning blue litmus paper red. The solid may then be allowed to dry on a porous brick.



The apparatus for preparing methylamine hydrochloride

Owing to its bactericidal property formaldehyde will prevent putrefaction. Hence it is invaluable as a means of preserving museum specimens. Small reptiles, animals and fleshy specimens generally may be immersed in a mixture of 100 c.c. of water, 3 parts methylated spirit, and 6 parts of formalin. If the specimen is to be kept in a soft state, 12 parts of glycerine should be added, otherwise the specimen hardens somewhat. Put one piece of raw meat in such a mixture and another in water. When the water-immersed piece has putrified, remove and rinse that kept in the formalin mixture and smell it. It will show no signs of decomposition. Since formaldehyde is harmful if swallowed this is not a permissible method of preserving the joint!

Formaldehyde is an essential raw material for many plastics, notably for those of the bakelite type. Though plastic preparations are generally intricate, a simple experiment will show the formation of one of the bakelite types.

In a crucible mix 2 c.c. of formalin, 2 grams of phenol, $C_6H_5{\cdot}OH$ (caution: skin corrosive) and 0·2 gram of solid sodium hydroxide, NaOH. Warm the mixture very gently over a low flame until it begins to boil. Maintain the boiling over as low a flame as possible until the mixture turns brown. Then pour it into cold water. Wash the solidified plastic by stirring it with several changes of water and then let it dry.

In medicine, too, formaldehyde is important. One drug prepared from it is hexamine, chemically known as hexamethylenetetramine, $(CH_2)_6N_4$. It is used to treat cystitis and similar infections.

To prepare a specimen, first mix 40 c.c. of formalin with 30 c.c. of strong ammonium hydroxide, NH_4OH (specific gravity 0.88). Boil the mixture to small bulk over wire gauze and then continue the evaporation to dryness on the water bath. As evaporation will be hindered by a surface skin which forms, stir frequently to break it. The reaction is expressed by the equation:

$$6H{\cdot}CHO + 4NH_4OH = (CH_2)_6N_4 + 10H_2O.$$

Heat a little of the substance in a dry test tube. It sublimes without melting and condenses on the cooler parts of the tube. Warm another portion with dilute sulphuric acid, H_2SO_4, and smell the mouth of the test tube. The odour of formaldehyde will be noted. This is due to its decomposition into ammonium sulphate $(NH_4)_2SO_4$, and formaldehyde:

$$(CH_2)_6N_4 + 2H_2SO_4 + 6H_2O = 2(NH_4)_2SO_4 + 6H{\cdot}CHO.$$

A similar change takes place on warming with other acids, with formation of the ammonium salt corresponding to the acid used.

An interesting conversion is that of formaldehyde into methylamine hydrochloride, $CH_3{\cdot}NH_2{\cdot}HCl$, by heating with ammonium chloride, NH_4Cl. If we write the formula of ammonium chloride as $NH_3{\cdot}HCl$, it will be clear that methylamine hydrochloride is formed by the replacement of a hydrogen atom, H, by a methyl group, CH_3. Indeed, the compound is alternatively referred to as methyl-ammonium hydrochloride.

To prepare it rig the apparatus shown in the diagram. In the distillation flask put 20 grams of ammonium chloride and 50 c.c. of formalin. Note that the thermometer dips well below the surface of the mixture. Heat the mixture to 104 degrees Centigrade and maintain it so by regulation of the flame until 5 or 6 c.c. of liquid have distilled into the test tube (which has previously been calibrated by sticking on a strip of paper and marking the levels when 5 and 6 c.c. of water are poured in).

Let the flask cool. Ammonium chloride crystallizes out. Filter this off, preferably under reduced pressure using a filter pump. Evaporate the filtrate to half bulk on a water bath and let it cool. More ammonium chloride crystallizes out, which should be filtered off as before.

Replace the filtrate on the water bath. Continue the evaporation until thin white fumes begin to arise. Formation of these fumes occurs when the liquid has lost about one-third of its volume. Let the solution cool. It solidifies to a white mass of methylamine hydrochloride. As it is deliquescent, press the mass as dry as possible between filter papers while it is still warm and store it in a well closed bottle. Its formation is indicated by the following equation:

$$2H{\cdot}CHO + NH_4Cl = CH_3{\cdot}NH_2{\cdot}HCl + H{\cdot}COOH \text{ (formic acid)}.$$

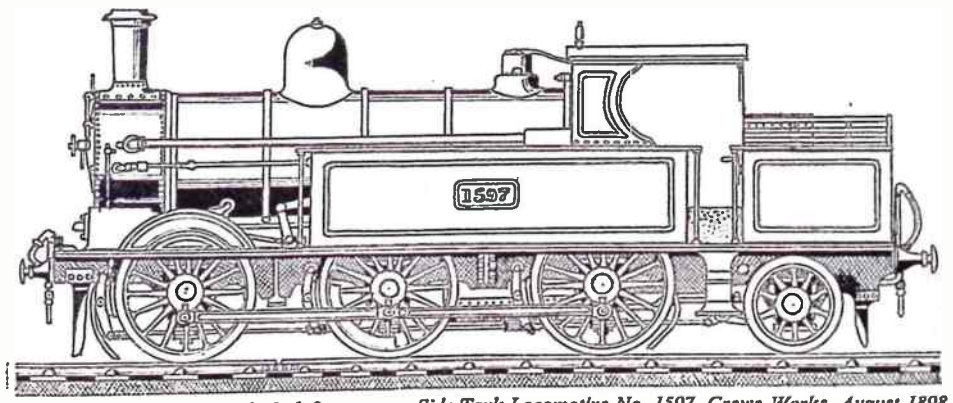
Warm a small piece of the compound with sodium hydroxide solution, and smell the mouth of the tube. An odour will be noted which is both fishy and ammoniacal. This is due to the gas methylamine, $CH_3{\cdot}NH_2$, formed thus:

$CH_3{\cdot}NH_2{\cdot}HCl + NaOH = CH_3{\cdot}NH_2 +$ NaCl (sodium chloride) + H_2O.

Methylamine is present in herring brine and is responsible for some of the smell. Again methylamine may be regarded as ammonia, HN_3, in which one hydrogen atom has been replaced by a methyl group. Like ammonia it will blue a damp slip of red litmus paper, as you will see by holding such paper in the mouth of the tube. It is distinguished from ammonia not only by its fishy smell, but by its burning when the tube mouth is turned to the flame. Ammonia will not burn under these circumstances.

Interesting Locos — No 64

THE WEBB PASSENGER TANKS



L.&N.W.Rly. F. W. Webb's 0–6–2 passenger Side Tank Locomotive No. 1597, Crewe Works, August 1898

THE 0–6–2, 18 in. passenger Side Tank Engines were first designed by F.W. Webb the Chief Mechanical Engineer for the London and North-Western Railway at Crewe in 1897. They were used for the Suburban passenger duties of the line, many being employed on the fast and numerous trains between Euston and Watford.

The design was in reality a tank version of Mr Webb's 0–6–0 18 in. express goods tender engines of 1880; the boilers cylinders, coupled wheels and Joy valve gear being interchangeable between the two classes. A total of 80 engines were built at Crewe between 1898 and 1902, 77 being taken over by the L.M.&S.R. in 1923. The boiler was Mr Webb's standard type which first appeared on his 2–4–0 'Precedent' class of 1874.

The leading details were: cylinders 18 in. diameter and 24 in. stroke with the steam chests above. Wheel diameters, coupled 5 ft. 2½ in. carrying 3 ft. 9 in. Heating surface: tubes 980 sq. ft., firebox 103 sq. ft., total 1,083 sq. ft. Boiler diameter 4 ft. 3 in., length of barrel 9 ft. 10 in. Grate area 17·1 sq. ft. Working pressure 150 lb. per sq. in. Wheelbase: coupled 15 ft. 6 in., total base 22 ft. 3 in. Centre line of boiler 7 ft. 5½ in. Weight in working order 52 tons 6 cwt. Capacity of tanks 1,420 gallons. Bunker 3 tons. The carrying axle was housed in Mr Webb's Radial axleboxes and for this reason they were often referred to as Radial Tanks.

Withdrawal began in 1920, but 15 of the class survived to be taken over by British Railways in 1948, the class finally becoming extinct in 1953, the last survivor being 51 years old.

(A.J.R.)

Illustrated on front page

DOG KENNEL AND RUN

YOUR dog deserves something better than a make-shift home. A smart kennel is not only warm and dry but hygienic and easy to clean. Made from tongued and grooved matchboarding or deal planks, it will keep out the cold winds in winter.

There are no difficult joints to construct, the frames being butted together before covering with boards. Halving joints could of course be used in place of butt joints.

The kennel, which is sectional, is intended for the larger dog, such as an alsatian, retriever, labrador or boxer, the overall size being 4 ft. wide, 5 ft. long and 6 ft. high. A sleeping bench and wooden floor are provided, whilst the double doors are of the stable type hinged in place as shown. Chain link fencing or iron bars may be used for the run.

The side and front views indicated in Fig. 1. give the measurements and show the arrangement of various parts. The boarding is broken away to clarify the construction details.

Commence by making up two sides as detailed in Fig. 2. The 2 in. square strips may be halved together if desired and then covered with tongued and grooved matchboarding. Make up the back in a similar manner as shown in Fig. 3. Allow an overlap on each side to take the thickness of the sides. The front is made up as in Fig. 4, the doors being hinged in the appropriate positions, allowing sufficient clearance top and bottom. The roof is shown in Fig. 5 and is later covered with roofing felt.

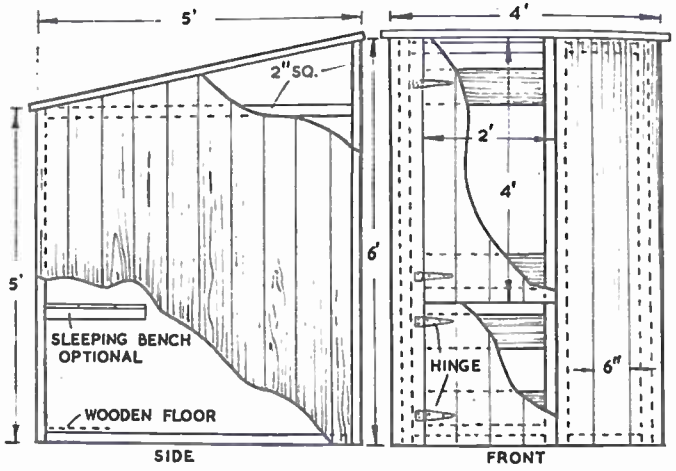


Fig. 1

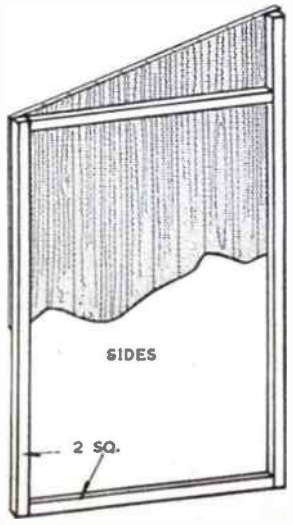


Fig. 2

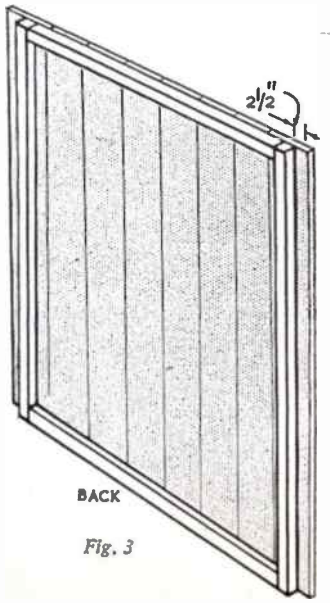


Fig. 3

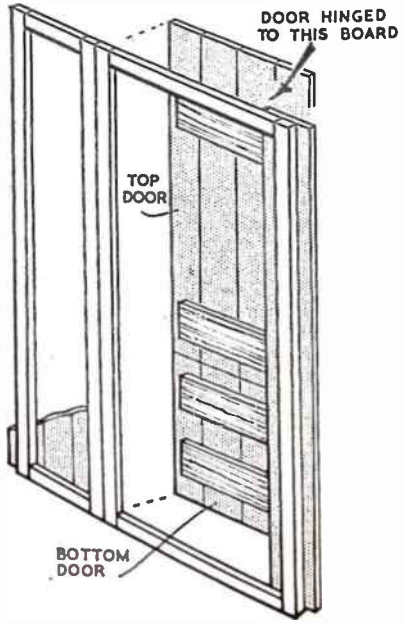


Fig. 4

Bolt the sections together as shown by the detail in Fig. 6, using washers where necessary. Add the roof, and cover with heavy quality roofing felt. Add sleeping bench and floor in the positions shown. Bore a few ¾ in. diameter holes along the back, near the roof, for ventilation.

The make up of the run is not critical, but suggestions are shown in Fig. 7. Chain link is quite suitable, although iron bars could be used as a good alternative. Hinge a gate to one end of the run as shown.

If a larger run is preferred it may be made up of posts let into concrete as suggested in Fig. 8. Chain link fencing could be let into the ground or fixed to breeze blocks. (M.h.)

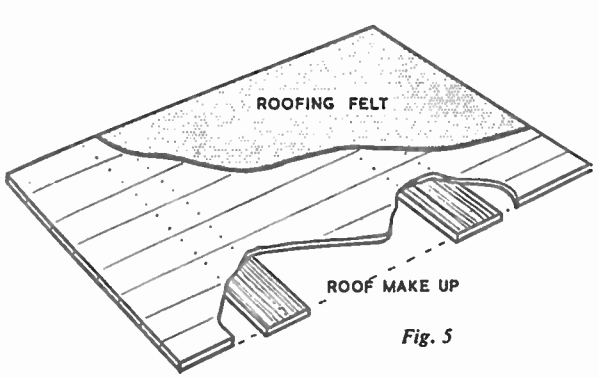
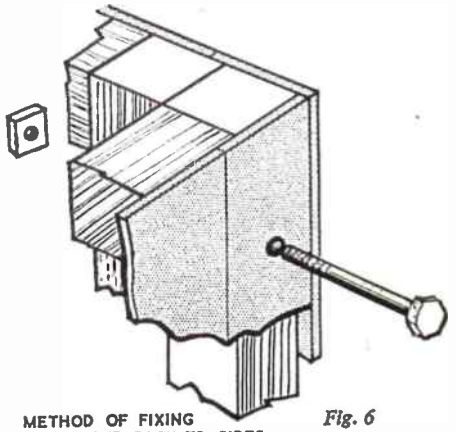
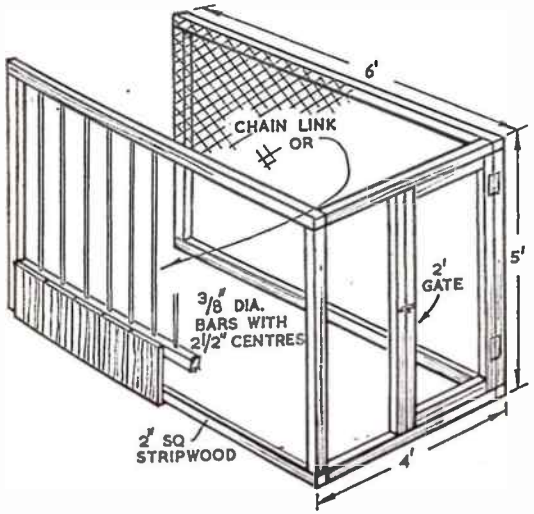


Fig. 5



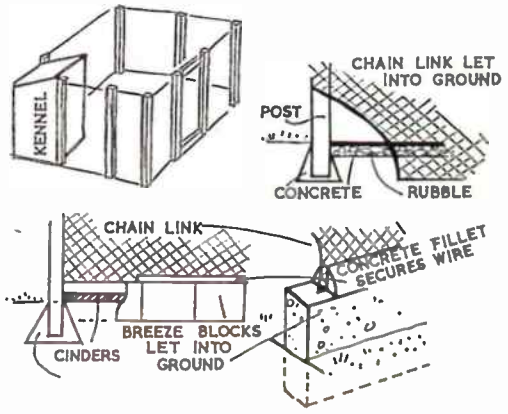
METHOD OF FIXING FRONT AND BACK TO SIDES BOLT TOP AND BOTTOM

Fig. 6



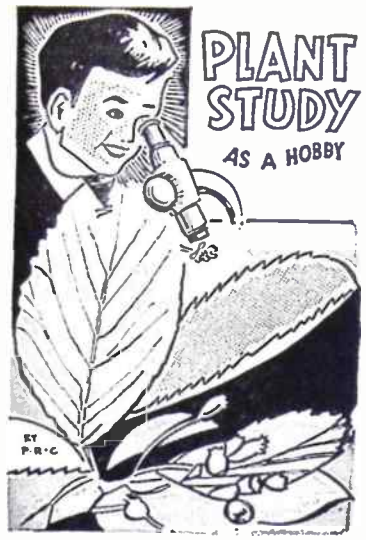
RUN FOR FIXING TO FRONT OF KENNEL

Fig. 7



SUGGESTED FOOTINGS FOR LARGER RUNS

Fig. 8



FERNS AND THEIR RELATIONS

By P. R. Chapman

WITH the ferns we come to the highest group of the non-flowering plants, and of course many of these are familiar to most people.

Although the ferns native to this country are comparatively small plants (but much larger than the mosses), tropical ones reach tree-like proportions, as a visitor to most large botanical gardens can prove for himself. There are excellent specimens of these gigantic ferns in the greenhouses of the Royal Botanic Gardens, Kew, Any amateur botanist within visiting distance of this collection would be well advised to go there, for not only are these giant ferns to be seen in the Temperate and Tropical Housos, but in addition there is an excellent Fern House where numerous smaller species can be seen.

The ferns, or to give them their correct name, the Pteridophytes, have the same type of life cycle as we saw in the case of the mosses and liverworts, but in this case it is the spore bearing generation or sporophyte plants which we see and know as ferns.

In the case of the mosses it will be remembered that it is the gametophyte generation that we mostly see, that is the plants producing male and female cells which by combination give rise to the minute inconspicuous sporophyte plant. In the case of the ferns, the sporophyte plants are large and conspicuous; the spores from these on germination produce minute gametophyte plants.

Since it is this generation which needs very moist conditions to reproduce, it can succeed by remaining close to the ground, where the soil is damp, whilst the gametophyte generation, less dependent on films of moisture, can reach greater proportions. Ferns therefore can grow much larger than mosses, and, as we have already mentioned, can reach tree-like dimensions.

This increase in size of the sporophyte plant over the gametophyte is an evolutionary step, and applies to all plants higher in complexity than the Bryophytes. As we shall see later, this is carried further in the case of the remaining two great groups of plants, the Conifers and the true flowering plants, where the gametophyte generation is reduced to a few cells.

The Prothallus

The tiny flat gametophyte plant, known as a prothallus, is about a quarter of an inch long, and is roughly heart-shaped. These prothalli can sometimes be found by careful searching on the soil beneath and around groups of ferns. Fertilization takes place on the surface of the prothallus, upon which the new plant starts to grow, but it soon becomes independent, the prothallus withers and the new sporophyte grows to its full size.

The latter is far more like an 'ordinary' plant than a moss, having stems, roots and leaves, the latter being called fronds As they develop they uncurl in a characteristic way. If a common fern, such as bracken, is examined, the underside of some of the fronds will be found to be covered with rows of small brown scale-like structures. These are the sori inside which the spores develop.

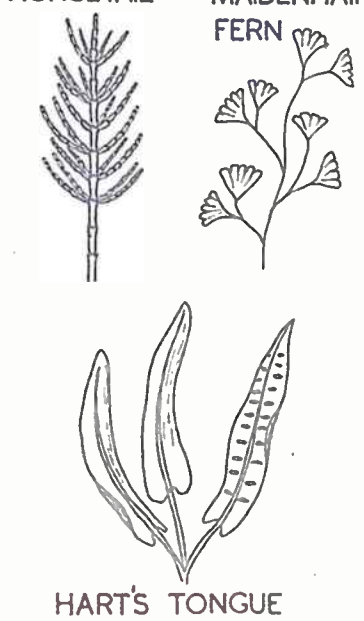
The minute prothallus of a fern may be difficult to discover amongst the undergrowth of a wood, but it is quite possible to grow some for yourself. Obtain two flower pots, one larger than the other, and soak them in water. Put some wet peat or sphagnum moss (usually obtainable from a florists or sometimes Woolworths) inside the larger pot, put the smaller pot on this and pack the space between with the peat or moss, as shown in the diagram.

A ripe sorous-bearing frond trom a fern is allowed to dry on a piece of paper, and the spores scattered on the inside of the smaller pot. The pots are then stood in about an inch of water in a pan, and covered with a piece of glass. You should soon see prothalli appearing on the inside of the pot, and their development can be studied.

Another method is to sprinkle the spores on to a piece of wet peat, standing in water in a saucer and covered with a jar. Minute fern plants will eventually be seen growing from the prothalli. When they are large enough they can be pricked out into a soil mixture of equal parts of leaf mould and sand. The pan should be covered with glass at first, which should be gradually lifted to harden off the plants.

A collection of native ferns can be made in this way. It is merely necessary to remove a small piece of a spore-bearing fern frond found on a country walk, and placing it in an envelope, labelled with locality. This can then be treated as above. This is far better and more instructive than the pulling up of our native fern plants.

Although all ferns reproduce in the rather complicated manner we have described, they are mostly perennials and can also multiply by means of runners or underground roots, which accounts for the rapidity of the spread of species such as bracken.



Our Ferns

The commonest of our ferns is probably the Bracken, *Pteridium aquilinum*, familiar to most people. It is usually considered as a rapidly spreading weed, and difficult to eradicate, but in shady woods it grows quite large and can be most attractive, particularly in autumn, when it turns golden brown. It is best not to try planting this fern in the garden!

Another very common fern is the Male Fern, *Dryopteris filix-mas* (nothing to do with the gender of the plant!) to be found in woods, lanes and heaths in the summer. It is also a large fern, the frond segments are narrower and more delicate than those of the bracken.

Passing from the common to the rather rare, we must just mention one of our most beautiful ferns, the Maidenhair Fern, *Adianum capillus veneris*, often grown as a pot plant. It is usually to be found near the sea, particularly the coasts of the West Country and Ireland.

The Hart's Tongue is a fern quite different in appearance from the typical ferns, and although widely distributed in this country, is only locally common. The long, lance-like fronds are undivided.

On leaving the true ferns, we should mention that, once again, there is a most useful little book on this subject in the Observer Series.

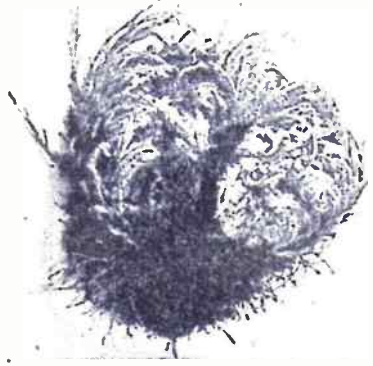
Relations of Ferns

The Pteridophytes also include a number of other plants, less obvious to the casual observer. The common horsetail (*Equisetum arvense*) however must be familiar in appearance to many people. It can be seen growing profusely by the sides of streams in spring. The shoots are erect and jointed, with whorls of thin jointed branches. The whole plant is rough to the touch, due to the presence of silica. Horsetails have the same type of life cycle as the ferns, but the prothallus is irregular, not heart-shaped.

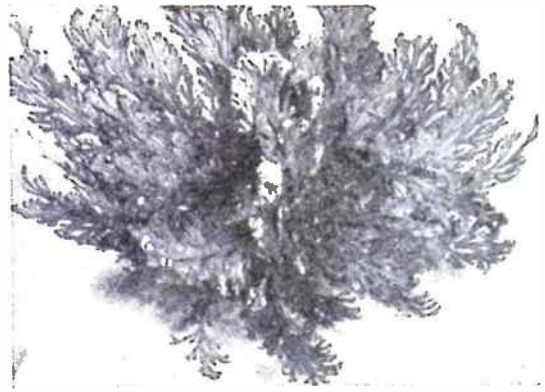
The club mosses are comparatively scarce in this country, there being only five native species. The Common Club Moss (*Lycopodium clavatum*) can sometimes be found on heather moors, mostly in the North of the country. It is almost moss-like in appearance, having long, creeping stems, with erect shoots, bearing cone-like spore producing organs.

Although small, rather inconspicuous plants today, the horsetails and club mosses played a most important part in the distant past, for the ancestors of out present plants reached gigantic proportions, and were mainly responsible for the formation of the coal forests in the Carboniferous era, about 250 million years ago. Flowering plants did not then exist.

Finally we must mention the Selaginellas, only one species of which occurs in this country and so is unlikely to be of much interest to the collector. In tropical regions however, these plants are more numerous, several hundred species being known. One, often sold as a plant curiosity, is the 'Resurrection Plant', *Selaginella lepidophylla*, occurring from Texas to Peru. When dry, it curls up into a ball, but on soaking in water, the plant opens out and presents a fern-like appearance. This can be repeated time after time.



'Resurrection Plant' dry



'Resurrection Plant' moist

Next The Gymnosperms, Conifers

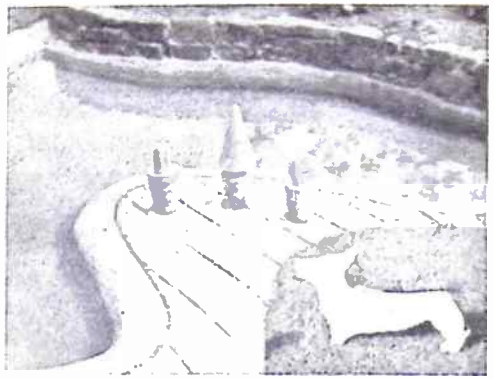
Note. In the article on Lichens, the author stated that there was no popular book on identification. This was true at the time of writing, but yet another Observer book has just been published on this at the usual price of five shillings and can be recommended.

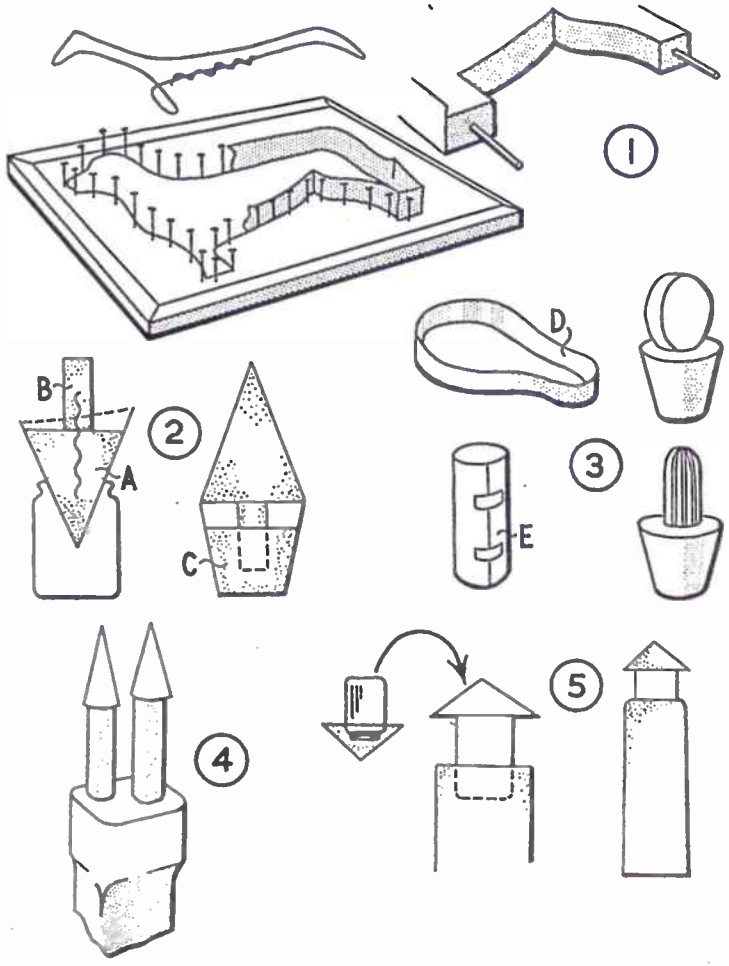
"OIL PAINTINGS?—STRAIGHT THROUGH THERE, SIR!"

ORNAMENTS FOR GARDENS IN CONCRETE

By A. Liston

GARDEN ornaments made of concrete are easy to make, and can be used to add an unusual touch to rockeries, paved courtyards and the edges of paths. They can be of any size, and thus kept in scale with the rest of the garden. Their simple outlines blend well with both modern and long-established surroundings.





The concrete used is a 2 : 1 sand and cement mixture, or bags of ready-mixed fine cement (Marleymix), needing only the addition of a little water.

One of the attractions of these ornaments is that their design can be of personal or family interest. A photograph of a pet dog, for example, supplies the shape for a pair of concrete animals to set on gateposts flanking a gateway, the method of construction giving them an attractive heraldic appearance.

Forming the mould

The method of construction for this type of ornament is shown in Fig. 1. The outline of the chosen object is first copied from a photograph on to a piece of hardboard of the appropriate size, the piece used here was 18 in. by 12 in. Some minor alterations to the shape as first drawn may be necessary, to ensure that no part is too slender to cast easily. On a dog, for example, the legs and tail should not be too long and thin, and may be thickened slightly for strength. The hardboard is then placed on a thick board backing to prevent buckling after the cement has been poured. Panel pins are then driven in at 1 in. intervals round the outside of the drawn shape.

The sides of the mould are made from 3 in. wide strips of thick cardboard — an old shoe-box proved perfectly satisfactory for this. The strips are bent round inside the panel pin outline to the desired shape, and held in strategic places by pieces of adhesive tape on the outside. Tinplate strips, cut from empty food tins, can also be used, and are to be preferred when two or more identical shapes are required.

The cement is poured in to the depth of just over an inch, and a skeleton of reinforcing wire, made from a length of scrap stiff wire, is laid in place. More cement is added until it is at least 2½ in. deep, and the surface is gently smoothed over with a knife blade. The concrete should be left undisturbed for 48 hours, after which time the pins are carefully eased out with pliers and the sides of the mould stripped off. When the hardboard is stood upright, the casting should come away easily. If it does not, it is best to leave it for another 24 hours before lifting it off. In any case, the shape should be left to harden off for several days before it is placed in position.

Any rough edges can be trimmed by gently stroking them with an old file blade. If the ornament is to be set permanently in position, lengths of ½ in. diameter reinforcing rod should be allowed to project through the sides of the mould, at the feet, for 3 in., to be cemented into holes prepared for them on the chosen site.

Trees and cacti

The smaller 'tree in a tub' piece is made as shown in Fig. 2. A cone made of stiff paper (A) is held together with adhesive tape and set in a jar. Cement is poured in, and a reinforcing wire inserted so that it projects for a few inches. When the cement is dry, a cylinder of stiff paper (B) is slipped over the wire and filled with cement. After 48 hours, the paper moulds are removed, and the concrete 'tree' set in a plastic or paper cup which is three-quarters filled with cement, (C) the rim of the cup supporting the base of the cone. After 48 hours the mould is removed.

Plastic containers retard the hardening of the concrete, so this removal must be done carefully. Here, a razor blade was used to slit the sides of the expanded polystyrene cup.

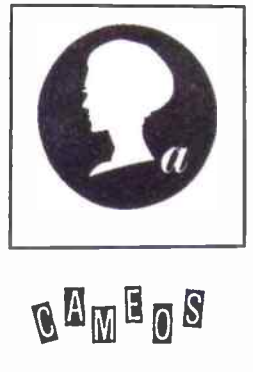
Cacti in pots (Fig. 3) are made by first moulding the cactus in a pear-shaped strip mould (D) or in a paper cylinder (E) then setting them in cartons filled with concrete, ridges and a rounded top being carved on the pillar-like cactus with a file-blade after the cement is dry.

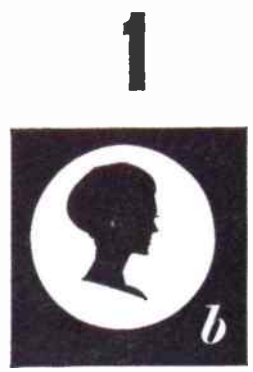
Using these methods, there are many possible design variations. Fairy-tale castles, for example, (Fig. 4), use towers made as before, set in a square base with rounded corners, while a lighthouse is made by placing the neck of an inverted glass jar into a shallow cone of concrete, then inserting the whole top, when dry, in the top of a column of concrete, cast in one of the larger plastic detergent containers. (Fig. 5). With these examples as a starting-point, no doubt many other novel ideas will spring to mind.

Seeing isn't Believing

HERE are two optical tricks proving that seeing is not necessarily believing. In other words, even when your eyesight and intelligence are good, your eyes and brain can be confused when you view or compare certain objects in unusual circumstances.

Firstly, study the two round cameo brooches shown in Fig. 1. The elegant lady depicted upon them might, indeed, have been your grandmother when she was young. But here we have a pretty optical illusion . . . which brooch is larger, A or B? Or, to put the question another way: do you think you could completely cover the white brooch with the black one?





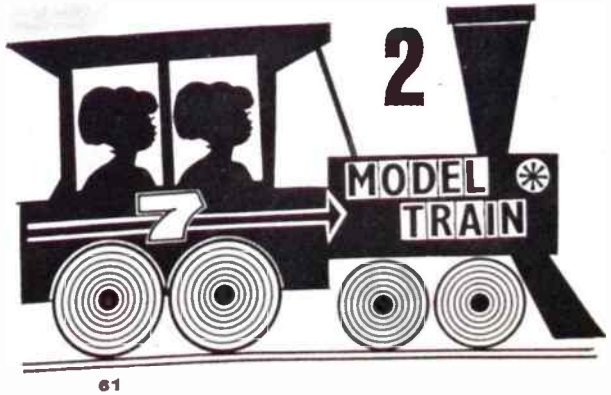
Actually the brooch sizes are identical, so A could cover B completely. Brooch B looks bigger than A because light reflected from the white area makes strong impressions upon your eyes' sensitive retinas. These impressions apparently 'overlap' the less active parts of your retinas, which register the black areas of the diagrams. For the same reason, the white 'frame' surrounding A makes that brooch look smaller than it really is.

The model train

But now look at an optical trick of a different sort. Here is a mere diagram (Fig. 2) that can produce an illusion of movement.

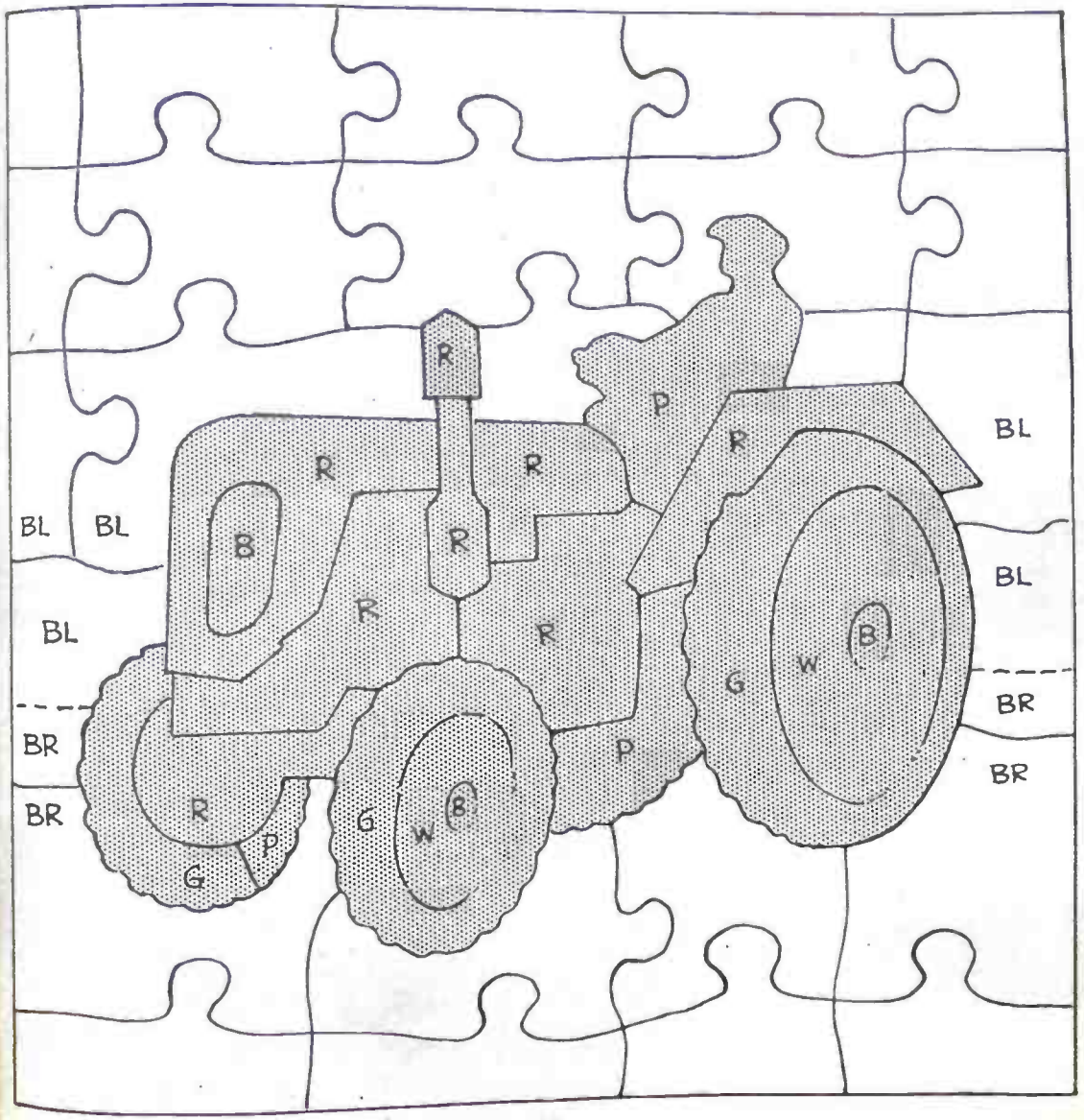
Hold this page between both your hands, and give the paper a series of rapid clockwise jerks, to 'rotate' the picture of the 'Model Train'. Do this in a good light, while you stare at the wheels. The wheels will seem to be turning fast!

Your eyes and brain compare the physical and mental stimuli produced by the diagram, with memories of real wheels spinning fast — where structural details and dirty marks upon the wheels are viewed as series of blurred concentric circles. (A.E.W.)



A JIGSAW FOR JUNIOR

TRACE this pattern and transfer to ¼ in. plywood by means of carbon paper. Cut out with a Hobbies fretsaw. Paint the pieces in the appropriate colours. Above the dotted line will be blue (BL) and beneath the dotted line brown (BR). Other parts are coloured red (R), purple (P), black (B), white (W) and grey (G). The two wheels in the foreground are cut as one piece and the colours G, W and B painted on. (M.p.)



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READER'S REPLY HW OCT. 1963

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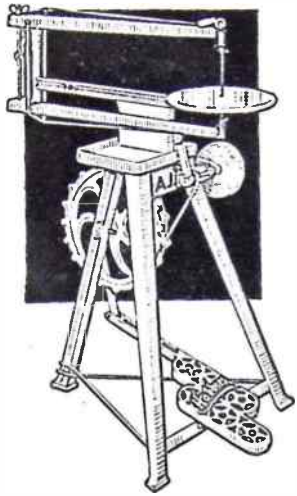

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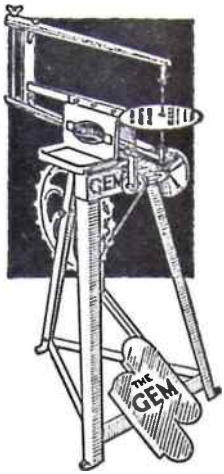

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