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MODEL MAKING
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ETC. ETC.

Hobbies AND PRACTICAL WIRELESS

2D
February 13th, 1932.
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INSIDE:
HOW TO MAKE THIS ALL-WAVE THREE-VALVE STATION GETTER!

AUTOKOIL REINARTZ THREE

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Prices	**4d.**	**2d.**	**1½d.**	**1d.**	**1d.**	**1d.**	**1d. per pair**

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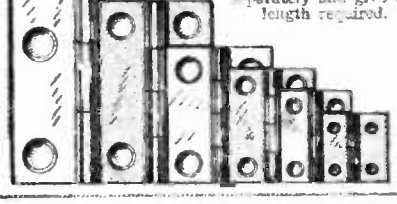

Remember that screws are not supplied with hinges. Order these separately and give the length required.

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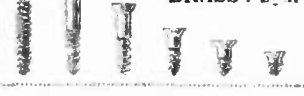
Fretworkers require special thin-shanked screws for their work and these are specially made for them. Made in brass or iron with round or flat heads. In useful sizes—½-in., 5-16in., ¾-in., ⅞-in., or 1-in. State all details when you order.



IRON: 1½d. dozen. 1/2 gross.
BRASS: 2½d. dozen. 2/2 gross.
Postage 1½d.

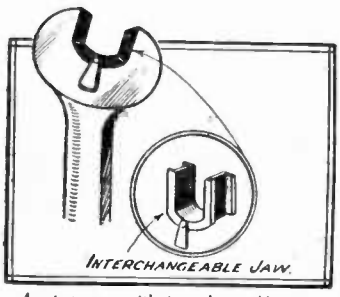
Hobbies

Vol. 73. No. 1,895 Published Every Wednesday FEBRUARY 13th, 1932

THIS WEEK'S CLEVER IDEAS

An Ingenious Spanner.

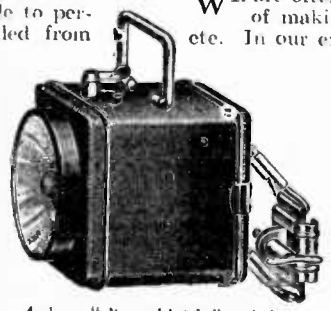
THERE seems to be no end to the number of new spanners produced for the convenience of handymen. Here is the latest. It will be seen that it is of the set spanner variety, and its chief appeal reposes in the fact that only one holder is necessary. The gap in the jaw, it will be seen, takes a number of interchangeable jaws, each of which will suit a particular style of nut. The jaws spring into place and stay there. A slight pressure on the tail-piece removes them.



A set spanner with interchangeable jaws.

A Practical Chemistry Outfit.

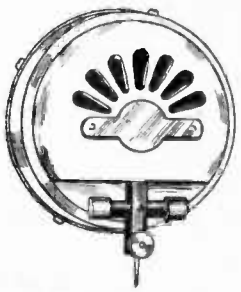
THE correspondence we receive from readers shows that chemistry is a fascinating and popular hobby. The famous firm of Lotts Bricks, Ltd., have recently marketed a number of chemistry boxes at prices varying from 3s. 6d. to 10s. 6d. They have been planned by a practical chemist, and each box contains a generous supply of all those chemicals which can safely be used at home by young and old alike for the performance of a number of fascinating chemical experiments. By means of these chemical outfits the reader will be able to perform all of those experiments detailed from time to time by our Chemistry contributor—experiments such as growing coloured trees, making flares, making big crystals, etc., etc. Box No. 1, at 3s. 6d., contains 18 chemicals, a number of accessories, and an illustrated handbook of 42 experiments. Box No. 2, at 6s., has 22 chemicals, a Bunsen burner, accessories, and a book of 80 experiments. Box No. 3, at 10s. 6d., has 30 chemicals, a Bunsen burner, extra accessories, and a book of 131 experiments. The makers supply spares.



A cheap "dim and bright" cycle lamp.

A New Gramophone Sound-box.

THE gramophone sound-box here illustrated, and known as the "Big Ben," costs 8s. 6d., and is fitted with a stylus bar running in miniature ball bearings. It has a metal diaphragm of aluminium and gives far greater volume than the average sound-box.



A new metal diaphragm gramophone sound-box.

A New Cycle Lamp.

A VERY powerful cycle lamp, having a two-way switch, giving a dim and bright light, is shown at the foot of this page. The case only costs 3s. 6d., or complete with two pocket lamp batteries, 5s. It is strongly made.

Safety-First Armlet.

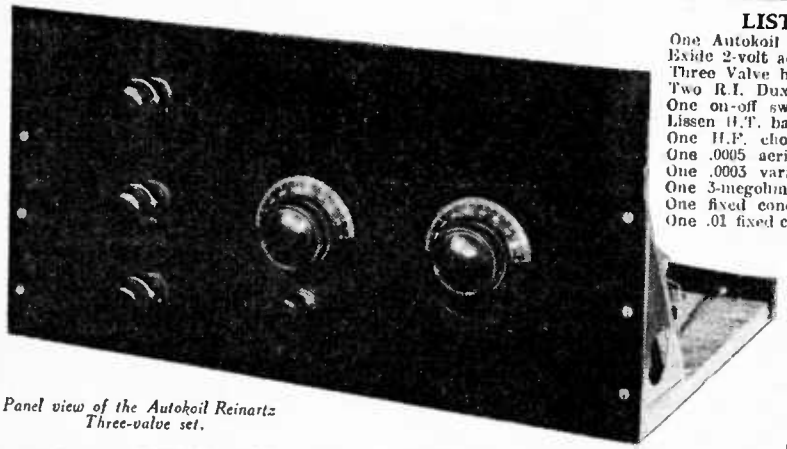
A SIMPLE device, consisting of an elastic armlet, with red reflector at the back and a yellow one in front, has recently been marketed at 6d. (by post 7½d.). It is intended to be used by pedestrians who have to use dark country roads, as well as by hikers and campers. It may easily be carried in the pocket when not in use.

Making Perfect Joints.

WE are often asked which is the most effective means of making satisfactorily stuck joints for models, etc. In our experience the use of an adhesive such as Seccotine gives excellent results, with very little trouble and at little cost.

Seccotine will stick and repair practically everything. It is recommended to the readers of HOBBIES because we have known and used it for nearly forty years. It sets hard as a rock and a neat joint is always made. It can be obtained everywhere in tubes 4½d., 6d., and 9d. An interesting booklet describing the uses of Seccotine can be had from the manufacturers.

The address of the manufacturers of items mentioned on this page can be obtained on application to the Editor.



Panel view of the Autokoil Reinartz Three-valve set.

LIST OF COMPONENTS.

One Autokoil All-Wave Tuner.
Exide 2-volt accumulator
Three Valve holders (Clix or Lotus).
Two R.I. Dux L.F. transformers,
One on-off switch (Lissen).
Lissen H.T. battery
One H.F. choke (Lissen).
One .0005 aerial tuning condenser (Polar).
One .0003 variable condenser (Polar).
One 3-megohm grid leak (Dubilier)
One fixed condenser .0003 (T.C.C.).
One .01 fixed condenser (T.C.C.).
Terminals : aerial, earth, L.T. positive, L.T. negative, H.T. positive 1, H.T. positive 2, H.T. positive 3, H.T. negative, Loud-speaker positive and negative, grid bias positive, grid bias negative 1, grid bias negative 2 (Clix).
One ebonite panel, 14in. by 7in., baseboard 15in. by 7in. (American Hard Rubber Co.)
Two panel support brackets (Camco).
One terminal strip.
Wire for connections.
One Camco cabinet

to correspond with the letter references in the circuit diagram. It will be seen in the photograph that the Autokoil is mounted vertically, with the compensating condenser knob at the top, in which position the reaction knob is the central one and the wave-change knob the lowest of the three. In operating the set, therefore, first adjust the lowest knob to the wavelength band on which it is desired to tune, remembering that with the switch arm in the extreme left position (viewed from the panel) the set will receive on the lower wave band, and in the extreme right position the highest wave band. The Autokoil tunes from 200 to 2,000 metres.

Next, adjust the aerial tuning condenser until a station is received, then adjust the reaction knob, next the compensating condenser knob, and finally the .0003 variable condenser. It will probably be found that this set works best with H.T.1 plugged into about 20 to 30 H.T. volts, and a little experiment with the other tappings will adjust the purity of the reception. Similar adjustments should be carried out with the grid-bias tappings.

The set is simple to operate and if the circuit diagram is carefully followed requires a minimum of adjustment.

ROYAL HOBBIES

WHEN one considers the amount of time members of the Royal Family have to devote to social duties, one wonders that they can find time for hobbies, and still more, that many of them harbour the insatiable spirit of the collector.

The Prince of Wales has probably the largest range of pastimes, which group themselves under the two main headings of sport and music, except for stamp collecting, which taste he has inherited from his father. When the Prince was up at Oxford he played soccer for the Magdalen 2nd XI, but since then he has developed a keen interest in riding and big-game shooting, and has lately taken to speed-boat racing.

A leaning towards music is strongly evinced in the Royal Family, and the Prince is an adept with the saxophone and ukulele, and is learning to play the banjo.

Besides these instruments he plays the bagpipes, and has a large collection of gramophone records kept well up to date, and he never travels without the gramophone given to him by Queen Alexandra.

When Princess Mary is visiting Yorkshire she does not spend all her time hunting. She gives many hours to practice at the piano.

Another royal pianist is Prince George, who confines himself to light music. He has a keen ear and sense of rhythm, and can play most of the popular tunes by ear. At an impromptu dance His Royal Highness played jazz while the gramophone was being mended.

The Duchess of York's love of music takes her to the old world instruments, and she plays the spinet with considerable ability, and is having lessons on the harp.

Possibly the vogue for doing tapestry work is due to the Duchess, who amused herself thus when convalescing after influenza some time ago. The Duke, however, shows more interest in engineering than music, and has the deft hands of a mechanic, which enable him to work at the lathe set up in his study at 145, Piccadilly. He has also begun a collection of model engines and has twenty tiny brass replicas of noted locomotives kept in a cabinet, referred to by Princess Elizabeth as "Daddy's toy cupboard."

In a top room at Buckingham Palace is housed the largest and most perfect collection of British and Colonial stamps in the world. The King is often incorrectly described as a collector of foreign stamps, but in those two hundred volumes there is not one stamp which was not issued in the British Empire.

His Majesty has a special interest in his book of errors and curiosities which are, naturally, more valuable than the perfect specimens owing to their rarity. Errors are not, as might be imagined, presented to the King, for it is the duty of specially-appointed examiners to destroy all stamps which are printed imperfectly, and all the King's stamps are obtained by means of exchange or through sales and agents. Many times stamp enthusiasts have been commanded to the palace.

Another of the King's hobbies is collecting old clocks, and he also adds to the collection of music originated by George III and Queen Charlotte.

Curios and antiques occupy the spare time of the Queen, particularly English and Chinese lacquer. The Chinese room in Buckingham Palace proved such a success that Her Majesty determined to decorate one similarly at Windsor, but Sandringham is her favourite residence, where her apartments are furnished with Chippendale, Hepplewhite, and Sheraton. It is from here that the Queen chooses her exquisite pieces for exhibition, and here also that she has her favourite piano and her collection of miniatures of the Royal Family when they were children.

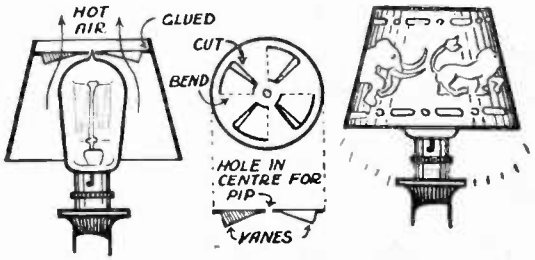


Fig. 4.—A revolving lamp shade worked by hot air.

SCIENTIFIC EXPERIMENTS

By W. Richardson

Previous articles on this subject appeared in "Hobbies" Nos. 1872, 1875 and 1886.

WE stated in the first article of this series that heat is transmitted in three ways, namely, by *conduction*, *convection* and *radiation*. We have given examples of conduction and shown how some substances are better conductors than others. Let us now make some experiments in convection and radiation.

In heating liquids convection plays an important part. For instance, water which is a poor conductor, would take far longer to heat were it not for the fact that as soon as the water at the bottom of the vessel becomes heated it rises to the top and allows some of the colder water to take its place. This cold water in turn becomes heated and rises, and so the cycle goes on until all the water is brought to the same temperature.

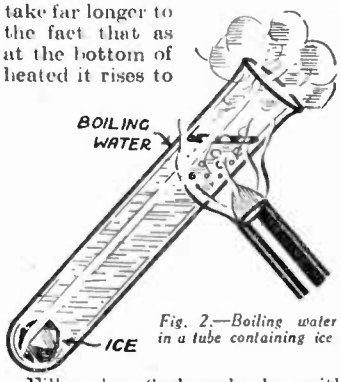


Fig. 2.—Boiling water in a tube containing ice

To Show the Convection Currents in Liquids.

Fill a glass flask or beaker with water and drop in a few crystals of potassium permanganate. Heat the beaker over a small flame. The water above the heated spot becomes warm and ascends, coloured by the permanganate. When it reaches the top it spreads out and then descends on the outside as shown by the arrows in Fig. 1. Now if we can arrange to heat the water in such a manner that convection cannot take place, only that part in contact with the source of heat will become warmed. This is because water, like most liquids, is a very poor conductor.

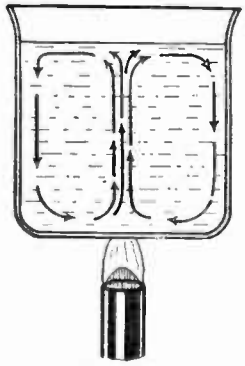


Fig. 1.—Showing the convectio currents in liquid.

To Boil Water in a Tube Containing Ice.

Fill a test tube with water into which has been placed a small piece of ice. If you cannot get ice a piece of candle wax will serve to demonstrate the point. Now heat the bottom *only* of the tube. The ice or wax quickly melts and the water boils. Throw away the contents of the tube and perform the experiment again, but this time heating the tube near the *top* of the water as in Fig. 2. The water will soon boil *at the top* but will remain cold at the bottom, boiling water and ice being present in the tube at the same time. In the first case the whole of the water becomes heated, due to convection. In the second case, however, convection does not take place since the hot water is already at the top and therefore cannot rise any farther. Engineers are careful when designing boilers, radiators, and hot water systems etc., to see that full use is made of convection. For instance, boiler tubes are not made horizontal, but rise slightly from the furnace end so as to set up proper circulation and thus distribute the heat. The hot water from the water jacket of a motor car engine is led to the *top* of the radiator, where it becomes cooled and sinks to the bottom. It is then led back to the bottom of the water jacket to go through the same process again.

Convection occurs in gases in much the same way as in liquids. Here is a simple experiment:

To Show Convection Currents in Air.

Place a lighted candle in a shallow dish and just cover the bottom with water so as to make an air-tight joint with a lamp glass which is now placed over the candle. The candle flame will become smoky and go out (see Fig. 3). Relight the candle and replace the glass but, this time, before the candle goes out, slide a strip of card down the lamp chimney. The candle will immediately brighten up and continue to burn in a normal manner. The reason is that, whereas in the first case the flame is extinguished for the want of air due to the lack of circulation, in the second case the hot air rises up one side of the card division and fresh air descends the other side to take its place. If a piece of smouldering paper is held as shown in the illustration the smoke from it will pass down one side of the card and emerge from the other, clearly showing the path of the air currents. Here is another interesting experiment.

To Make a Revolving Lamp Shade, Worked by Hot Air.

This is a very cute device, sometimes used for advertising and is extremely simple to make. It consists of a light card shade which is supported on the "pip" of an electric bulb fitted to a table lamp. It is constructed as shown in Fig. 4, and depends for its action on the rising currents of hot air from the bulb. These drive the vanes and so revolve the shade. Dainty designs may be cut in the sides of the shade and filled in with coloured tissue

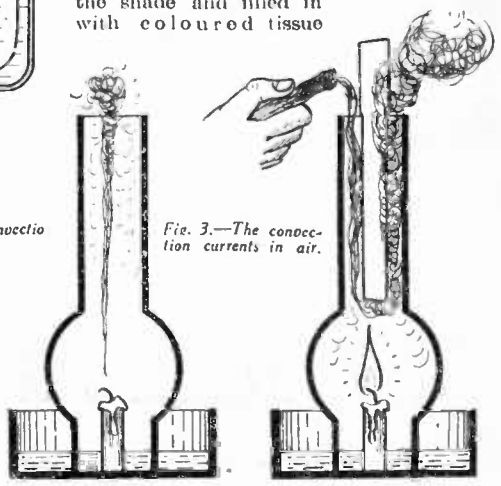


Fig. 3.—The convection currents in air.

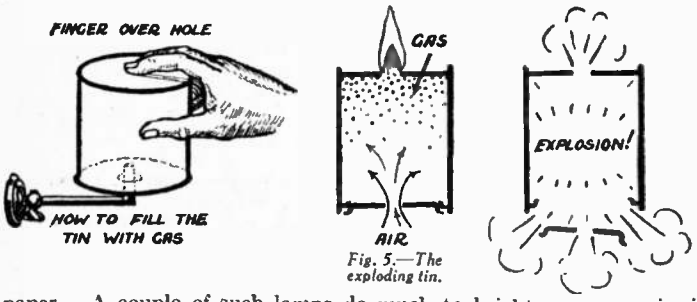


Fig. 5.—The exploding tin.

paper. A couple of such lamps do much to brighten the table at dinner or at a birthday party.

Before turning our attention to radiation we are going to tell you of a rather exciting experiment which is not strictly concerned with convection. It is dependent on the rising of coal gas, due to its lightness rather than to its being heated.

The Exploding Tin.

Pierce a hole about ¼in. in diameter in both the lid and the bottom of a treacle or custard-powder tin. Turn the tin upside down and, placing a finger over the hole in the bottom, fill it completely with coal gas by holding it over a gas jet so that the burner enters the hole in the lid (see Fig. 5). Hold it in position for some seconds to expel all the air. Turn off the gas and remove the tin. Hold it upside down still and apply a match to the hole in the bottom. The gas will light and continue to burn steadily but the flame will gradually get smaller and smaller until at last you will think it is going out. Just as it gets to its lowest, however, there is a loud explosion and the lid of the tin flies off on to the floor! The explanation is this: The gas, owing to its lightness, gradually rises and passes out of the hole in the bottom of the tin where it burns steadily. At the same time air enters through the hole in the lid and takes its place. Presently a state is reached where the tin contains not gas only but a highly explosive mixture of gas and air. It is then that the flame "lights back" and explodes the contents. Just a word of caution: Make certain the tin is properly full of gas as, if there is still air present, it is likely to explode directly you hold the match near the hole, possibly very violently at that. We will now turn our attention to *RADIATION.*

Heat radiations and light are very similar. Both are wave motions in the ether and have the same velocity. The difference lies in the wave length. Light waves are short; violet light having the shortest wave length and red the longest. Longer waves than these are not light but *heat*, and longer still are *wireless waves!*

Apart from the fact that heat can be reflected by mirrors and lenses in the same manner as light, one of the most interesting things about it is the way in which some surfaces absorb it and others reject, or rather reflect it. For instance, a black surface absorbs heat readily, thus a black coat gets very hot and uncomfortable on a hot, sunny day. A light or silvered surface, however, reflects it, hence a white garment is more suitable in summer.

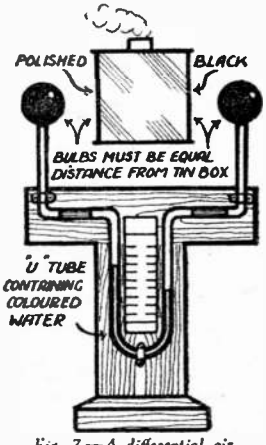


Fig. 7.—A differential air thermometer.

A good experiment to illustrate the distinction can easily be performed as shown in Fig. 6.

The Mysterious Dagger.

On one side of a stout piece of tin-foil or a thin piece of tin-plate draw the shape of a dagger with ordinary students' lamp black as in Fig. 6. The use of candle smoke will serve even better if a clear outline of the dagger is made by masking the tin or by wiping away the unwanted black. Now grind up some mercuric iodide, which is a scarlet powder, with a little gum water and paint the back of the tin-foil with it. Heat a flat piece of iron to redness and hold it about two inches from the front on which you have the outline of the dagger. Gradually you will see a *yellow* dagger appear on the red side of the tin. On removing the hot iron the dagger will disappear, leaving a plain red surface again. What happens is that the black dagger absorbs more heat from the iron than the bright tin, thus the mercuric iodide opposite the dagger also becomes heated and as it turns yellow on heating a yellow outline of the dagger appears.

A surface which absorbs heat readily also forms a good radiator and a surface which reflects it is a poor radiator. This is why a bright polished teapot does not get cold so quickly as a dark one. It does not radiate the heat so readily. To prove this fill a tin box with hot water. One side of the box is covered with lamp black and the opposite side is bright tin (see Fig. 7). Two glass tubes with bulbs at one end are connected as shown with a "U" tube which contains some coloured water. The bulbs, which are previously blacked, are arranged on either side of the tin box so that one is opposite the black side and the other opposite the bright side. The water in the tube which would naturally be the same level in each limb, will be seen to go down one side and up the other. This is due to the fact that the black surface radiates more heat than the polished and therefore heats the bulb opposite to it more than the other one. This causes expansion of the air in the bulb and drives the water down the tube and up the other side. The apparatus with the bulbs and "U" tube is known as a *differential air thermometer* and is well worth making. It will detect very small differences in temperature and is very useful in experiments on radiation. In our next article we shall conclude our experiments on heat and light and describe some dealing with *sound.*

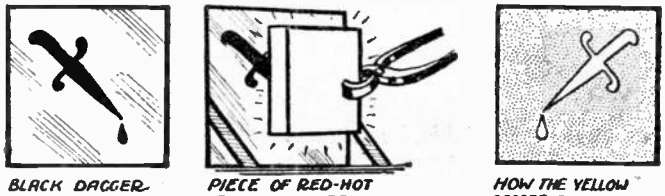
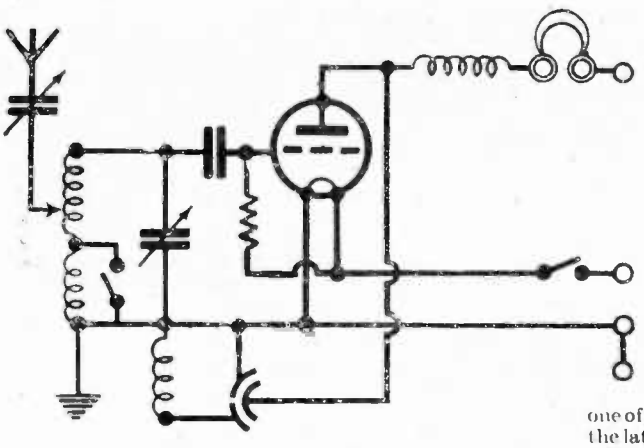


Fig. 6.—The mysterious dagger.

THE "HOBBIES" BRITISH "ONE-VALVER"



THEORETICAL CIRCUIT

You may obtain a blueprint showing the wiring of this set for 1/- post free from the Publisher, Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, W.C.2

I THINK it is no exaggeration to say that a well-designed one-valver used with a good pair of 'phones will give practically the same range and generally far better quality of reproduction than the average loud-speaker "three"; then again, the difference in running costs is another point which cannot be overlooked.

The HOBBIES British One-Valver is a quality set which I am sure will more than uphold its own amongst the many receivers of this class in existence. It is a receiver which will appeal alike to the novice and experimenter, and in order to make its construction as simple as possible we have had prepared a full-size blueprint of the lay-out. With this print, which, by the way, you can obtain from HOBBIES Blueprint Dept. for a shilling, the problem of assembly is practically solved.

How to Use the Blueprint.

You simply lay the print on the baseboard, place each component in its proper position on the print, start the holes for the holding-down screws with an awl, remove the print and screw the parts in place. In the case of the panel, you mark where the holes are to be drilled in just the same way. Quite simple, isn't it?

An All-Purpose Receiver.

I have just stated that this set would appeal both to the novice and experimenter. You may argue that this is rather a rash statement since the average experimenter seems to judge a set by the number of knobs it has, his idea being that the more adjustments that can be made, the better! On the other hand, the novice, or for that matter, the average listener, likes the controls to be as simple as possible. Well now, how have we overcome such a difficulty? Simply like this: on the front of the set there are just the usual two knobs and switches, these being the only controls the average listener need worry about. Inside, however, you will find two means of controlling volume and selectivity, which will be appreciated by the enthusiast desirous of exploring the full possibilities of the set.

The Circuit.

This is quite straightforward. For tuning and reaction I have chosen the best quality plug-in coils in preference to one of the many dual-range coil units on the market because the latter, although excellent in multi-valve sets, are mostly somewhat too sharply tuned for a one-valver, with consequent loss of signal strength. Reaction is obtained by means of one coil only. It is so positioned as to be effective on both the medium and long waves. Smooth action is assured by the use of a differential reaction condenser. Wave changing is accomplished by short circuiting the long wave coil with a simple switch. *No coil changing is necessary!* Incidentally, "shorting" this coil brings it at earth potential and being some distance from the medium wave coil will not cause any "dead end" effect when tuning on the lower band. The aerial, it will be noticed, is connected to a semi-fixed condenser, the other terminal of which is joined to one of the three tappings on the aerial coil, thus providing the two means of adjusting selectivity previously mentioned.

LIST OF COMPONENTS.

One .0005 MFD Polar No. 2 variable condenser.
One .0003 MFD reaction condenser (Polar Compax).
One Clix Type "B" low loss valve holder.
One .0003 Lissen fixed condenser.
One 2 Meg. Lissen grid leak with clips.
Two Lissen "on-off" switches.
One Telsen H.F. choke. One panel 9in. by 6in.
One baseboard 9in. by 7in. Battery cords.
Four Clix Vicegrip terminals. Two terminal mounts.
One semi-fixed "Formodenser" max. .0003 MFD.
Three Lissen baseboard coil holders.
Two Clix fit-all spade terminals.
Two Clix wander plugs. Bylduron cabinet (J. J. Eastick).
One Eta valve No. BY2010 detector.
One Lissen H.T. battery.
One Exide L.T. accumulator.
One pair headphones. Coils: 1 Lewcos 60X, 1 Tunewell 60, and 1 200.
Wire for connections.

Assembly and Wiring.

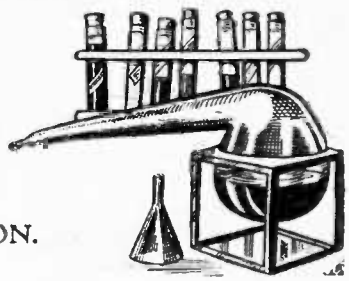
As I stated before, one of HOBBIES blueprints is just the thing to guide you in assembly. However, the wiring diagram herewith shows you how the parts are arranged. A point which should be remembered is to mount the coil sockets exactly as shown, otherwise should you reverse the X coil holder, the connections will be made the wrong way round. Regarding the wiring, it will be noticed that *no soldering is necessary*, all wires being taken direct to the terminals on the various components. The battery leads should be secured to the base by means of a small brass strip as shown, then there will be no chance of accidentally wrenching them off.

Having gone over the connections carefully to see that everything is in order, join up your aerial, earth, 'phones and batteries. Now plug in your coils connecting the lead from the pre-set "Formodenser" to No. 2 tapping on the X coil. The knob on the Formodenser should be screwed down half way. Lastly, insert the "Eta" detector valve and switch on the filament. The wave-change switch should be *out* for the medium waves and *in* for the long waves.

No. 1 tapping gives greatest selectivity, No. 2 gives medium selectivity, and No. 3 gives greatest volume.

Previous articles appeared in Nos. 1854, 1855, 1856, 1858, 1861, 1866, 1868, and 1873.

CHEMISTRY FOR AMATEURS



By H. Welton

THE SIMPLE PROCESS OF DISTILLATION.

A CHEMICAL process of great utility and interest is that of distillation. By its means, highly purified products are obtained from crude substances. For instance, modern lubricating oils are distilled from crude petroleum, while "Scotch Shale," subject to the same process, provides us with paraffin (medicinal), paraffin wax and soft paraffin (white and yellow, known usually as petroleum jelly). And thus we might continue with illustrations, whisky and spirits, raw alcohol, benzene, and a multitude of other commodities—all these manufactured by a distillation process.

The operation is simple—it consists merely of converting a liquid into its vapour and then recovering it by condensing the vapour against a cool surface.

A few moments consideration will make it evident that the distillation process may be employed to separate a liquid from solids dissolved in it, to separate two liquids of differing boiling points—the alcohol may be distilled over from a mixture of water and alcohol, leaving the water in the still, or again we may utilise the distillation process to obtain a liquid the vapour of which is produced by heating some other substance. Of this last application a good example may be seen in the preparation of chloroform, to be described in a later issue of this paper.

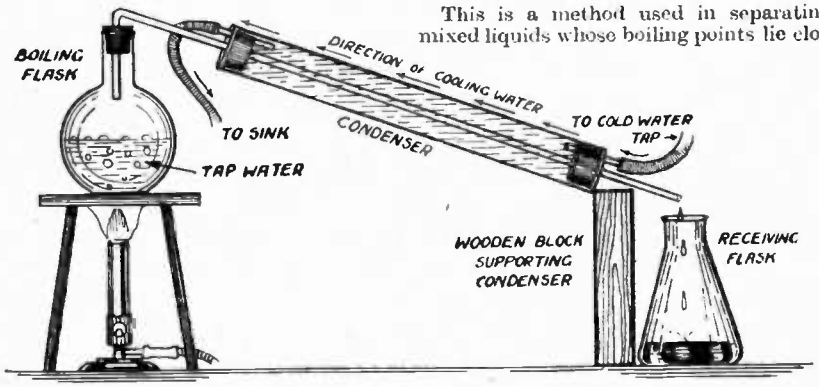


Fig. 1.—A simple distillation apparatus

There are numerous modifications of the distillation process in common use. Perhaps the amateur chemist has already encountered such expressions as "distillation in vacuo," "fractional distillation," and "distillation in steam." A few words on these processes would not be out of place, perhaps.

Distillation under Reduced Pressure (or In Vacuo).

The temperature at which a liquid boils and passes into the gaseous state is dependent on the pressure to which it is subject. Water, for instance, under normal atmospheric pressure (nearly fifteen pounds per square inch) boils at a temperature of 100° Centigrade approximately. Now, if we reduce the pressure below that of the atmosphere, the water boils and passes into vapour before a temperature of 100° is attained This explains why

Eggs Cannot be Boiled on Mountains.

Although the subject of egg boiling seems a far cry from the more technical subject of distillation, it is an admirable illustration of a lowered boiling point caused by a reduction in pressure and is proved without the use of a thermometer. Egg albumen (the "white") is coagulated at the temperature of boiling water under normal pressure. Below 100° it is coagulated only with difficulty. The higher we ascend from the earth, the lower becomes the atmospheric pressure. Coupling these two facts you will realise that on a high mountain boiling water is too low in temperature to successfully boil an egg.

Fractional Distillation.

This is a method used in separating two or more mixed liquids whose boiling points lie close together, and consists of distilling carefully at the boiling point of the more volatile liquid. This portion of the distillate (known as the first fraction) is set aside and a second fraction is collected at a slightly higher temperature. A third and more fractions are collected until the volatile vapours cease to be evolved. The first fractions contain practically all the more volatile liquid and little of the other, whereas the final fractions contain the reverse. Each fraction is very carefully redistilled perhaps several times until complete separation is effected. This is a method used in separating the water from alcohol in the manufacture of the latter. I shall describe shortly in this paper how to make a small quantity of alcohol, and if you have a thermometer you will be able to purify it by fractional distillation.

Distillation in Steam.

Many liquids boil at a lower temperature in contact with water with which they are immiscible. The reason for this is somewhat involved and calls for no explanation here. The operation either consists of heating the liquid and simultaneously passing steam through it, or heating the liquid and water together. In each case the distillate contains both water and the liquid under treat-

(*Continued on page 504.*)

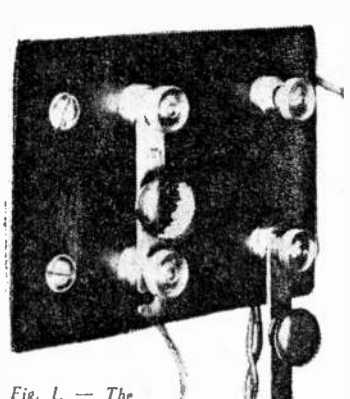


Fig. 1. — The switch in earthed position.

AN EFFICIENT AERIAL EARTHING SWITCH

By A. J. BUDD

A switch which entirely isolates the receiver from the aerial and earth.

A COMMON practice with many amateurs is to use a single-pole switch for earthing the aerial when their wireless set is not in use, the earth terminal of the set being directly connected to earth all the time. A much better arrangement is to use a switch which entirely isolates the receiver from the aerial and earth when placed in the earth position.

A simple switch, which answers the purpose very efficiently, is shown in Figs. 1 to 3. The materials required to make it consist of a piece of $\frac{3}{16}$in. ebonite, 4$\frac{1}{2}$in. long by 3 in. wide, four stout terminals with clamping nuts, a strip of sheet brass, 5$\frac{1}{2}$in. long by $\frac{3}{8}$in. wide and $\frac{1}{16}$in. thick, two brass screws 2in. long, and a wooden bobbin.

Constructional Details.

Mark out the ebonite as indicated in Fig. 4, and drill six holes through, the two to take the fixing screws being countersunk.

To make the switch arms, cut the brass into two pieces of equal length and set out the position of the holes and slots according to the dimensions given in Fig. 5. The slots are made by first drilling holes in the centre lines and then, with a hack-saw, cutting away the metal not required. Clean out the slots and round the ends of the arms with a fine-cut file.

Having screwed the four terminals in position, slip on the two arms and see that the slots engage smoothly with their respective terminal stems. Any tendency to bind can be put right by slightly filing the inside of the tight slot. A small ebonite or erinoid knob can be screwed to the centre of each arm as shown.

The supports for the ebonite base are made from a wooden bobbin of the kind that instrument wire is wound on. Select one that is about 2$\frac{1}{2}$in. long over the ends, and cut it across the centre of the core with a tenon saw. File the sawn ends square, and proceed to screw the base of the switch in position on the side of the window frame, having previously made holes in the latter to receive the fixing screws. After passing the screws through the base-piece, the half-bobbins are slipped on the screws, and on screwing home the latter tightly quite a rigid fixture results.

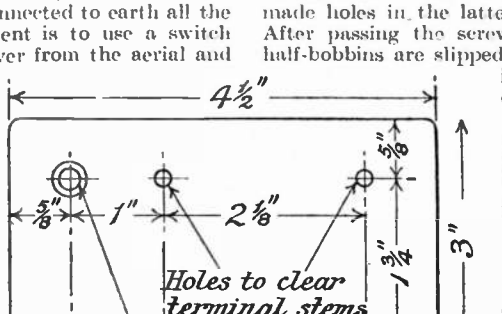


Fig. 4.—How to mark out the ebonite base.

It will readily be seen that the wooden distance-pieces provide ample clearance behind the base for the terminal stems and connections. In making the connections with the various leads, the ends of these can either be placed between washers and clamped by the end nuts, as shown in Figs. 2 and 3, or they can be soldered to the terminal stems before finally screwing the switch in position.

Operation.

As shown in the photograph (Fig. 1), the switch is in the earthed position, the receiver being completely isolated. When the set is to be used, each terminal head

(*Continued on page 506.*)

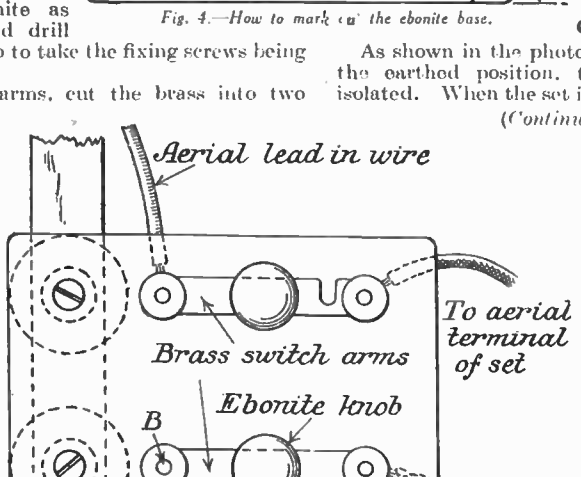


Fig. 3.—A front elevation.

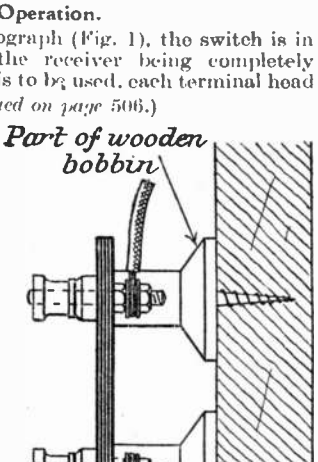
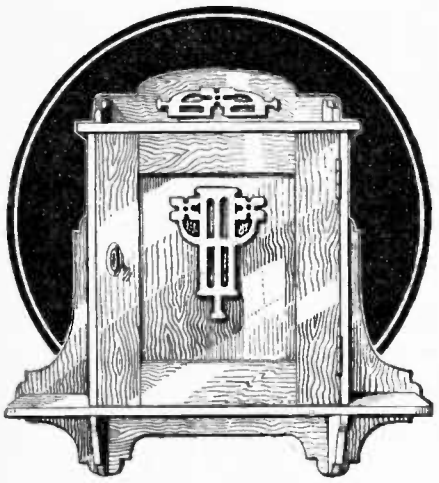


Fig. 2.—A side elevation

A HANGING WALL CABINET



For full size patterns see centre pages.

THE making of a wall cabinet is quite a simple affair for any owner of fretwork tools if he uses the patterns printed in the centre pages of this issue. These patterns are shown full size and make the work straightforward when they are pasted down to actual fretwood ready to cut out with the fretsaw in the ordinary way. They are even more simple because the door is supplied ready made. A piece of work like this looks well in oak, and the parts are all cut from this material, so that they can be stained when it is complete. The framework is cut from ¼in. boards, the two overlays are ⅛in. and the plywood back is $\frac{3}{16}$in.

The Construction.

Actually there is no solid back in the ordinary patterns, but one the same size and shape as the door is glued in to fill up the aperture. The pattern of the sides has to be extended to a complete length of 11¼in., whilst the top and floor have to be drawn out on the wood to the dimensions given. The two sides halve into the floor at the joint marked A, and it is essential that the cutting of this is carried out accurately to make a rigid framework. When these three pieces are put together the top can be added. This piece comes flush with the back edge, but projects ¼in. over the sides and front.

The Outside Frame.

Glue it and screw it in place, taking care that the inside aperture is large enough to hold the door (9in. x 8in.). This rough case is framed up and strengthened with ornamental side pieces and brackets. A recess in the floor allows an upright side piece to be glued and screwed so that it comes flush with the back. The actual position of the back of the shelf is shown by the dotted lines. In addition to glue, a short screw can be added through the narrow neck of wood at the top. Beneath the floor and between the two projecting sides is put the back shaped rail. This comes between the sides and in addition to gluing on to three edges can be screwed like the former part.

The Fancy Top.

Above the top is an ornamental shaped back—the pediment rail—and this stands level with the back edge to set just over ¼in. inwards from each side. A small ornamental overlay is required for this part, and this, like the one on the door, is merely cut from ¼in. piece of wood and glued in the place shown by the dotted lines on the design patterns. In front of this pediment rail, and at right angles to it, is the long thin piece which is glued and screwed in the right angle at the joint shown B. Be careful to get this square, and if necessary drive in a small screw at the front end. The whole framework of the cabinet is complete, but a back of $\frac{3}{16}$in. plywood is cut to fill the aperture and glued in place up to triangular or square blocking fillets glued round the inside of the cabinet. The detail at Fig. 1 illustrates this. The fillet must, of course, be put in $\frac{3}{16}$in. from the edge, level all round, so the plywood rests and is glued close up to it with the back face flush with the rest of the work. The door has a central overlay glued on, is fitted with an ornamental catch on the left-hand stile, whilst two hinges are screwed on to the right-hand edge. The other portion of the screw is fixed on the inner surface of the side so that the door will be set back slightly between the top and floor.

General Hints.

All the parts should, of course, be cut first, cleaned up, and then tested in their proper place. Having obtained a good fit, they are glued strongly together, light markings having been made to show the actual positions. Strengthen up if necessary with blocking pieces inside, and be sure to get the whole cabinet square so the door may hold properly. Glue the overlays carefully so that the adhesive does not squeeze out over the background. If it does, the stain will not "take" and the white surrounding patch will show. The door-knob is fitted with a catch behind, and a small niche must be made in the side to accommodate it when closed.

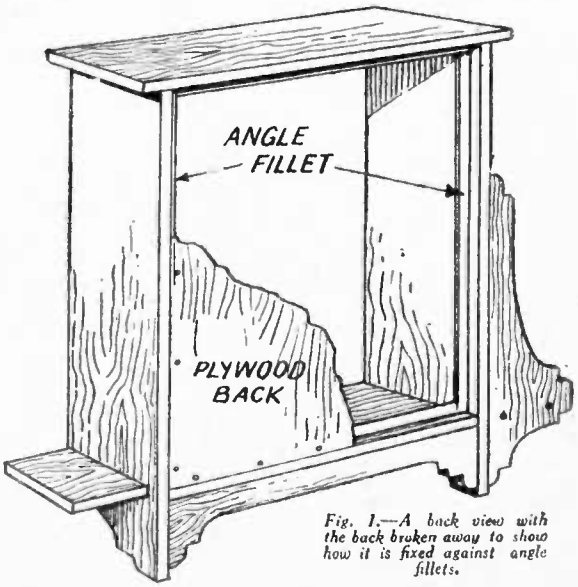


Fig. 1.—A back view with the back broken away to show how it is fixed against angle fillets.

FEB. 13, 1932 — Hobbies DESIGN — No. 1895

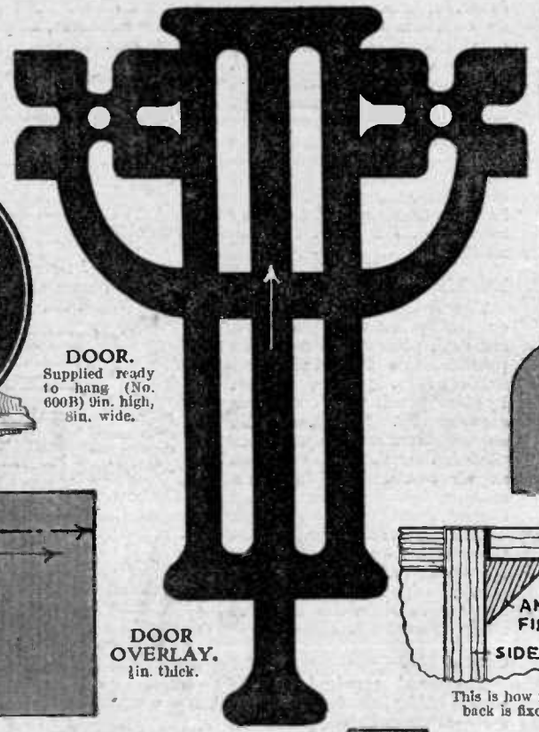
A HANGING CABINET

Instructions for making on page 498.

Suitable for a small first aid cupboard—being 13½in. high, 14½in. wide and 5¼in. deep. Built in oak or mahogany ¼in. thick, with ½in. overlays and 3/16in. plywood back.

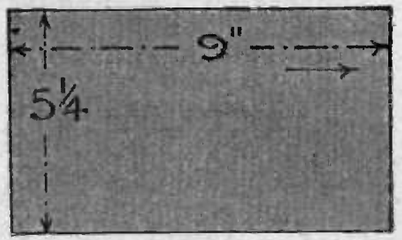
MATERIALS REQUIRED.
Planed oak boards of the required thickness, a door ready to hang (600B) and sufficient angle fillet costs 5/- (postage 9d.). A pair of hinges, catch (No. 5383) and two wall hangers, 10d. The whole lot for 6/7 post free.

OBTAINABLE FROM—
All the necessary parts are obtainable from Hobbies Ltd., Dereham, Norfolk. Branches at 65 New Oxford St., W.C.—83 Newington Butts, S.E.11—147 Bishopsgate, E.C., London—326 Argyle St., Glasgow—10A Piccadilly, Manchester—9A High St., Birmingham—4 St. Paul's Parade, Sheffield—10 Queen Victoria St., Leeds—25 Bernard St., Southampton—68 London Rd., Brighton, 844 Yonge St., Toronto, Canada.

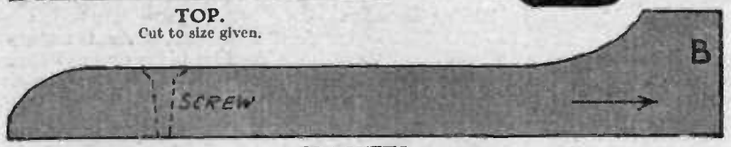


DOOR.
Supplied ready to hang (No. 600B) 9in. high, 8in. wide.

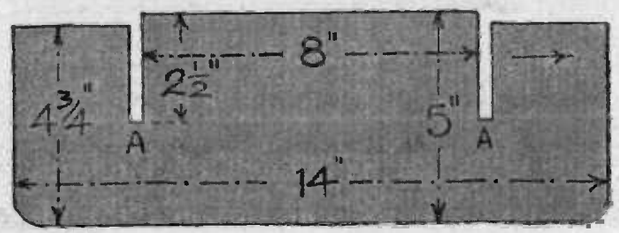
DOOR OVERLAY.
¼in. thick.



TOP.
Cut to size given.



BRACKETS.
Cut two and fix to Top and Pediment rail.

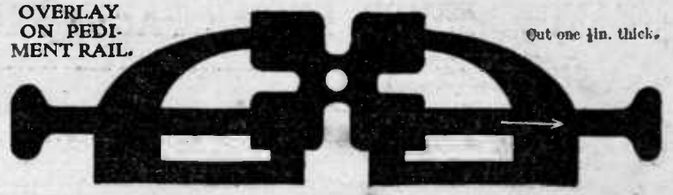


FLOOR.
Cut one to the dimensions given.

This is how the back is fixed.

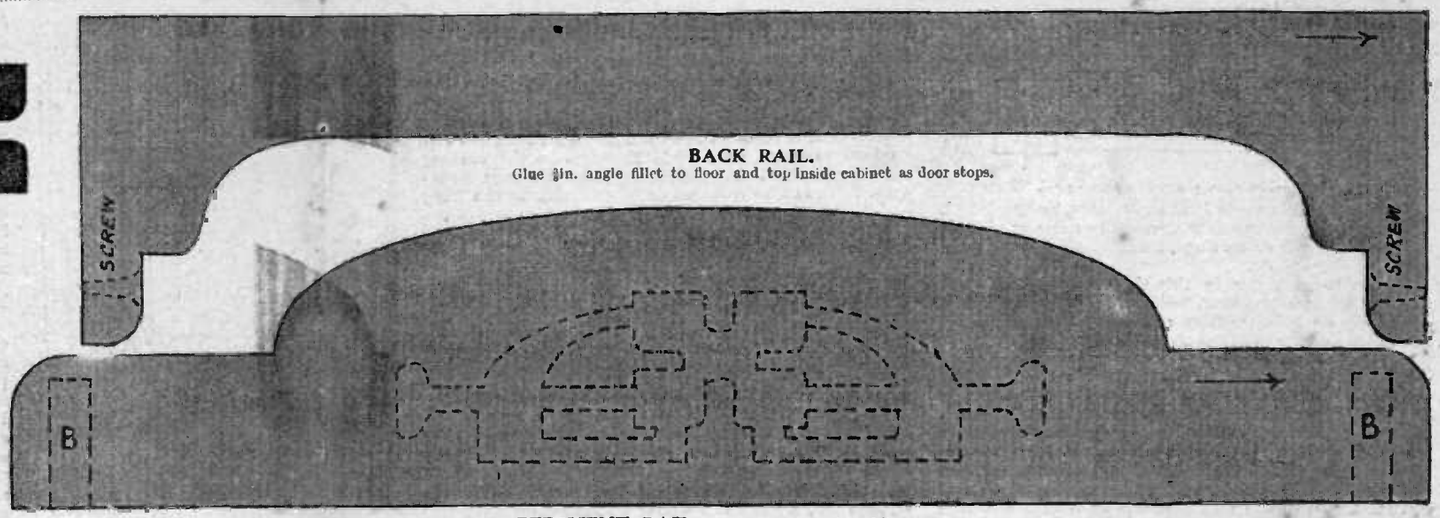
BACK.
This consists of a piece of 3/16in. plywood 9in. by 8in.

OVERLAY ON PEDIMENT RAIL.



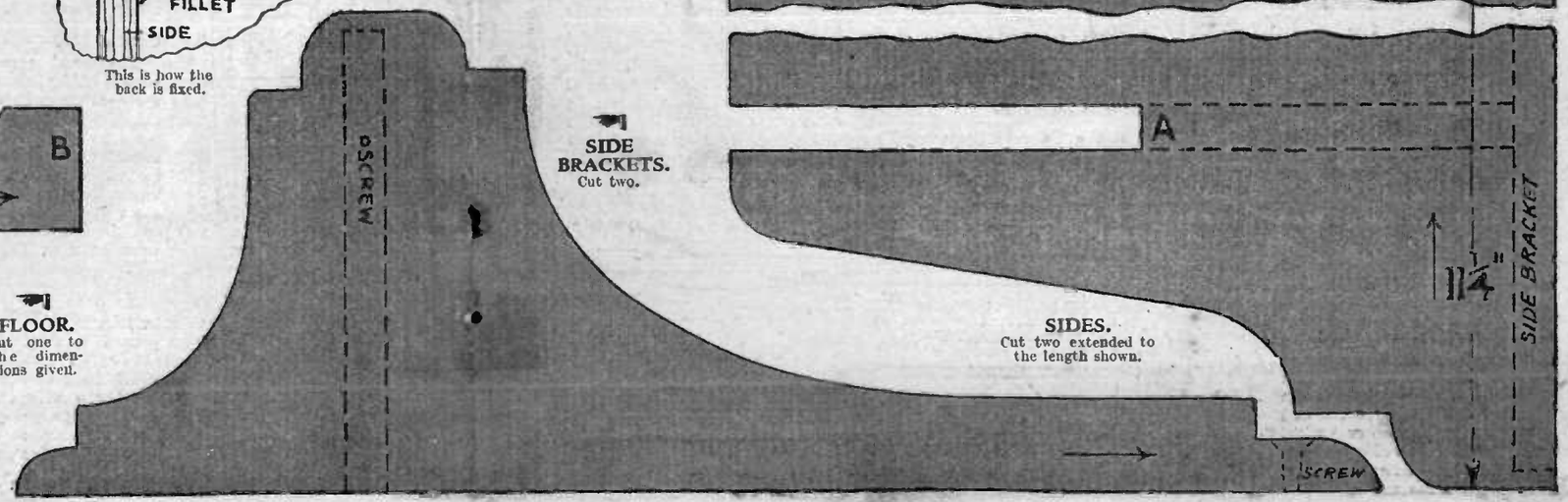
Cut one ¼in. thick.

BACK RAIL.
Glue ¾in. angle fillet to floor and top inside cabinet as door stops.



PEDIMENT RAIL. Glue overlay to dotted lines.

SIDE BRACKETS.
Cut two.



SIDES.
Cut two extended to the length shown.

MAKING MODEL ENGINE PARTS FROM SHEET METAL

By "Home Mechanic"

IN constructing a small model steam engine, the amateur, especially the beginner, often finds that for various reasons he cannot use castings and has to resort to the use of built-up parts as substitutes. With a little care and patience, however, a number of model engine parts can be made from sheet-brass, iron and steel, which, when properly finished, would be quite as serviceable as if made from castings, besides having the advantage of being lighter.

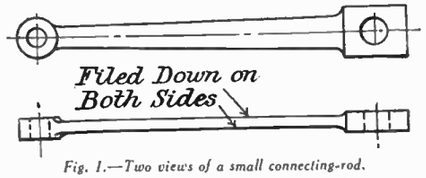


Fig. 1.—Two views of a small connecting-rod.

The writer explains in this short article how such parts as connecting-rods, bearing blocks, and eccentrics can easily be built up from odd pieces of sheet metal, such as are usually to be found in the scrap box.

Small Connecting-Rod.

First of all take the small connecting-rod shown in Fig. 1. This can be fashioned from a strip of sheet brass or gunmetal $\frac{1}{8}$in. thick and $\frac{5}{16}$in wide. A line is scribed down the centre of the strip and the centre of the holes for the gudgeon and crank-pins centre-punched at the required distance apart. After carefully marking out the shape of the rod, hold the strip in a vice and proceed to file away the metal down to the scribed line. The centre part of the rod should be filed down at the sides so that it is made thinner than the ends.

A method of holding the rod while this operation is performed is shown in Fig. 2. The rod is placed on a piece of hard wood, about $\frac{3}{4}$in. thick, and held in position by a number of small brads driven into the wood and touching the rod all round, so that the tops of the brads come just below the level it is desired to file down to. Old gramophone needles answer the purpose quite well. The block of wood can now be held in the vice, and the filing down of one side of the rod proceeded with. After finishing one side, reverse the rod and file down the other side in the same manner. The edges should be filed quite square with the sides and finished with a fine-cut file, the file marks being afterwards removed by means of a piece of fine emery cloth stuck on the end of a narrow flat strip of wood. If two rods are required, they can be marked out at the same time on a strip of sheet brass of sufficient length.

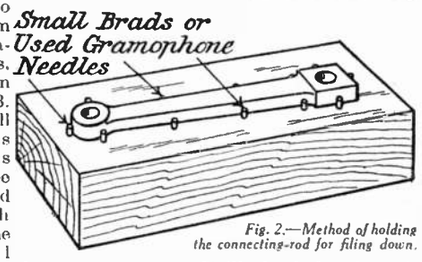


Fig. 2.—Method of holding the connecting-rod for filing down.

Locomotive Type Connecting-rod.

Assuming that two of these are to be made, the outlines can be carefully marked out side by side on a piece of sheet brass or iron of suitable width and thickness, and after separating with a hacksaw, each one can be filed to shape all round the edges in the manner before described. Rectangular pieces of brass about $\frac{1}{16}$in. thick can be soldered on to each side of the "big end" to form thickening pieces, as shown in Fig. 3, and small brass washers should be soldered on each side of the "small end" for the same purpose. Drill the holes through for the gudgeon and crank pins, file round both ends to remove any superfluous solder and finish off with fine emery paper.

Forked Connecting-Rod.

Strong and serviceable connecting-rods of this type can be made from strips of sheet metal in the manner illustrated in Fig. 4. Having decided the length of rod, mark out the two side plates to the shape shown at A, and after filing to the outline, bend each piece, as at B. The parts of the strips between C and D, which are shown in contact, can now be tinned. Clamp them together with a small screw clamp so that they register correctly, and then sweat them together.

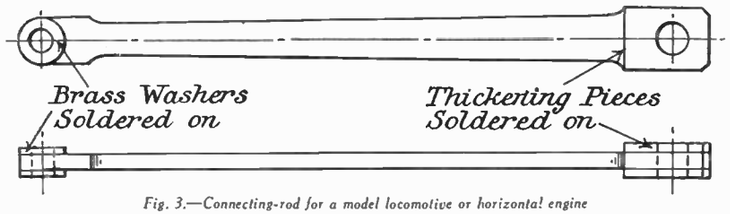


Fig. 3.—Connecting-rod for a model locomotive or horizontal engine

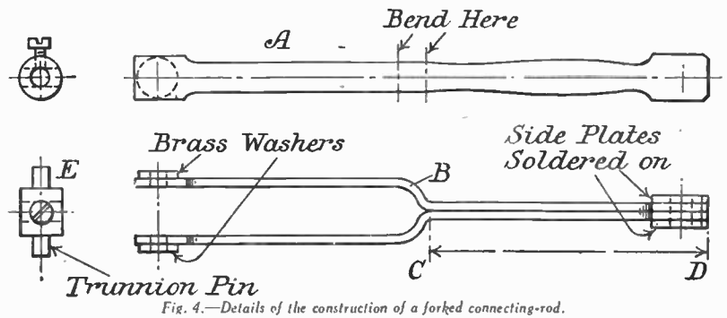
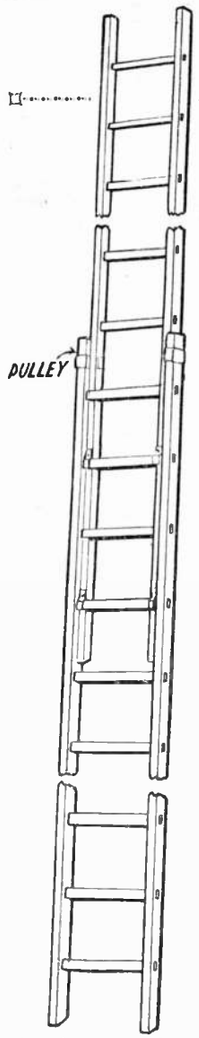


Fig. 4.—Details of the construction of a forked connecting-rod.

(To be concluded next week.—ED.)



AN EXTENDING LADDER

WHERE it is difficult to store a long ladder, a place can usually be found for an extension ladder in an outhouse or shed. If it be of fairly simple construction and can easily be taken apart, each part can be used separately, thereby serving a number of purposes. The extension ladder described consists of two separate ladders, one of which slides inside the other, the inner one being $\frac{3}{8}$in. narrower than the inside measurement of the outer ladder to allow for free sliding movement.

The Material.

The ladder sides should be cut from prime straight-grained red deal, planed as straight as possible, free from twist and finished $2\frac{7}{8}$in. by $1\frac{1}{4}$in. A 7in. by 3in. plank will cut these economically. Should there be any camber when the pieces are planed, they should be set out in pairs and arranged in such a manner that the sides, when framed, should tend to pull each other straight; if the edge should be convex, set out the sides and the position of the rungs so the convex edge faces the user, thereby causing the sides to straighten when in use.

Cutting List.

The wood required for the *outside ladder* is as follows: Two red deal sides, $15\frac{1}{2}$ft., planed as straight as possible and free from twist to $2\frac{7}{8}$in. by $1\frac{1}{4}$in., seventeen oak or ash staves, 16in. long, $1\frac{1}{2}$in. wide, and $\frac{7}{8}$in. or $\frac{3}{4}$in. thick. For the *inside ladder*, two sides of red deal are required, planed as straight as possible, free from twist, to $2\frac{5}{8}$in. by $1\frac{1}{2}$in., fourteen oak or ash staves, 13in. long, $1\frac{1}{2}$in. wide, and $\frac{7}{8}$in. or $\frac{3}{4}$in. thick.

Setting Out.

Place the ladder sides together in pairs, as shown in the sketch (Fig. 1) and set out rungs for a 10-in. tread or rise. The outer ladder should be 15ft. long and the inner 12ft. 6in. Set the mortise gauge to a $\frac{7}{16}$in. mortise chisel and gauge the mortises on the upper and convex side of the centre line. The idea of this being to cut the mortises on the compression side of the timber, thereby gaining strength and substance to carry the weight when in use. If desired, the mortise may be set out $\frac{1}{4}$in. above the centre-line; this would improve the balance of the ladders. Set out the rungs for the wider and narrower ladders, as per sketch (Fig. 2), and gauge for the tenons.

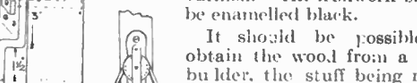


Fig. 1.—Marking out the two long sides of the ladder.

Construction.

Cut the mortises in the ladder sides and the tenons of the rungs. In cutting the mortises allow for hardwood wedges. Fit the tenons in the mortises and round off the corners of the rungs. Clean up the rungs and inner sides, glue, cramp, test for squareness, and wedge the rungs. When the glue is set, clean up and round such of the corners as are shown in the plan for the iron clip-bands. Chamfer or round off the ends of the ladder sides.

Fig. 2.—The dimensions of the two sets of runs.

The Clips.

Sketches are shown at Fig. 3 of the side and stave clips. They may be made from wrought iron or mild steel. The side clips are made out of $1\frac{1}{4}$in. by $\frac{5}{16}$in. material, and the stave clips out of $1\frac{1}{4}$in. by $\frac{5}{16}$in., both are drilled for screws and a bolt which precludes the possibility of an accident which might be caused by the strain withdrawing the screws.

Putting Together.

The ladders are fixed by threading the top of the inside ladder through the iron clips of the outside ladder, sliding the inner one to the desired height and dropping the shouldered irons on to their respective staves. Should it be desired to raise the upper ladder with a rope over a pulley, fix a small side pulley near the top (see Fig. 4), and at the back of the lower ladder, tie the rope to the bottom rung of the shorter ladder and raise as desired.

The ladders should be finished with a coat of size and two coats of varnish. All ironwork should be enamelled black.

It should be possible to obtain the wood from a local builder, the stuff being rough sawn to the required dimensions. A blacksmith or tinsmith will make the support clips for you quite cheaply.

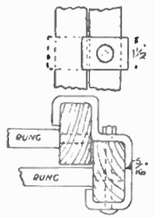


Fig. 3.—Elevation and plan of side clips for extending the ladder.

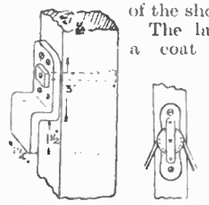


Fig. 4.—The pulley.

Putting Music in a Groove!

MOST people no doubt think that a record is just a black disc which will talk, sing, or play whenever it is placed on the gramophone. But how *do* they put the music in the grooves? The organization and equipment required is just as complicated as that needed for the manufacture of much more imposing-looking things—motor-cars for instance.

The original recording is the most spectacular but not by any means the most difficult part of the business. It is carried out on a large wax blank, about 14in. in diameter and 2in. thick. To make a single blank takes twenty hours or so, for the wax used has to go through many refining processes before it is moulded into shape and the surface highly finished by a sapphire cutter on a special machine. There must not be the tiniest blemish.

In the recording-room this wax blank is set on a turntable that is rotated at exactly seventy-eight revolutions per minute by means of a weight—the only form of driving power that will remain absolutely constant. A tiny sapphire cutter, attached to a kind of glorified telephone receiver, is lowered until it cuts a little groove in the revolving blank.

By means of gearing, the turntable is arranged in such a way that besides rotating it gradually moves along bodily under the cutter. So the cutter is a shade nearer the centre at the end of each revolution, and forms a spiral of grooves. On a full-time record—a 12in. playing for 4 minutes 40 seconds and a 10in. for 3 minutes 30 seconds—there will be no less than ninety-nine grooves to the inch, but there is no need to set them so closely together in every case.

Recording the Artiste's Voice.

Directly the cutter is started on its journey the operator in the recording-room gives the "commence" signal to the artistes, who occupy an adjoining studio. The sounds from there are picked up by a microphone, which is connected through suitable amplifiers and controls to the "telephone receiver" above the turntable.

The sapphire cutter is thus made to vibrate sideways in sympathy with these sounds, and in doing so it cuts an irregular groove in the wax blank. Tiny waves are made, the number varying according to the note recorded. For a high note there may be as many as 500 of these waves made over an inch of track; for a low note, only one wave over 2in. The track is cut at a speed of two miles per hour, and 840ft. of it is needed for a full 12in. record.

Tests Made on Wax Blanks.

Before the final recordings are taken one or two tests are made on wax blanks, and played back so that any faulty rendering can be corrected. The principle involved in playing back is exactly the same as with the finished record. A steel needle, fitted in this case to an electrical pick-up, is run along the track, whose waves set up in it identical vibrations to those caused by the original sounds. These vibrations are amplified, as they would be by an ordinary gramophone, and reproduced through a loud speaker.

The actual master record—a duplicate is always taken in case of accidents—cannot be played back, for a steel needle run over the soft wax surface is bound to damage it to a certain extent. So directly they are completed and the machine has cut the final quick spiral into the centre—the one that works the automatic stop on a gramophone—they are packed off in carefully-padded boxes to the works.

Turning Out Duplicates.

Having made two records that mustn't be played, the gramophone people have before them the task of turning out any number like them that can. It is no simple problem, for the surface impressions of the duplicates must be identical with one of the originals in every respect. Even a variation of a thousandth of an inch, which is considered a fairly fine limit in engineering practice, would be fatal in this case.

There is plenty of room for trouble, because the original wax master has to be copied through five stages before the final record is obtained. First it is hung inside an immense safe, fitted with massive chains and padlocks. Inside it, tiny particles of pure gold are hurled against the face of the wax by electrical forces. In time they form a thin layer of gold which, when peeled away, gives a faithful negative copy. The wax is afterwards useless, but it has done its bit.

The gold master, as it is called, is next dropped into an electroplating vat, and covered with a deposit of silver. On separating the two metals, the silver has a positive face—it exactly matches the original wax. Several silver "mothers" are generally made.

(*To be concluded next week.*)

TWENTY-FIVE YEARS AGO

Issue dated January 26th, 1907.

IT was in this issue twenty-five years ago that one of the most popular designs ever produced appeared. This is the Home, Sweet Home Design, No. 589. This is still available to readers, is still mightily popular with a large number of workers, and has had to be reprinted more than half a dozen times since its original appearance. The same issue gives an interesting chapter on the arms of Church dioceses, and the early stages of electricity of those days are well shown by the construction of a small Wimhurst machine. The usual features also appeared.

What a remarkable difference is evidenced when we compare these early issues with the latest copy!

CHEMISTRY FOR AMATEURS (*continued from page* 496).

ment, and as they are immiscible they are readily separated. Many essential oils used in medicine are obtained in this way, the leaves of the plant, which contain the oil, are treated by either of the above methods. The oil passes over with the steam and finally is separated in the distillate from the water upon which it floats.

And now to the amateur chemist's laboratory, where, having grasped the theory of distillation, he will no doubt wish to satisfy himself of its truth.

The apparatus required for distillation consists of the still boiler, the condenser and the receiver.

The Still Boiler.—This consists of a glass flask. The capacity is immaterial; if much distillation is to be done, then a larger flask is necessary to avoid constant refilling. A bored cork closes the mouth of the vessel.

The Condenser.—For this you will require about a foot of glass tubing about an inch in diameter. Any good chemist will obtain this for you if he does not actually stock it. You will also need a yard of ordinary thin glass tubing and two bungs which will fit the ends of the wide tubing. It is unnecessary to describe in any detail the construction of the condenser, as it will be quite evident from Fig 2. The glass tubing is cut with a three-cornered file as described in the first article of this series. Two holes are bored in each bung. These must accurately fit the narrow tubing which they house, otherwise the contraption will not be water-tight. In use, the condenser is connected to the tap, the overflow pipe returning the water to the sink after it has traversed the water jacket. The inner tube of the jacket enters the bung or stopper to the boiling flask.

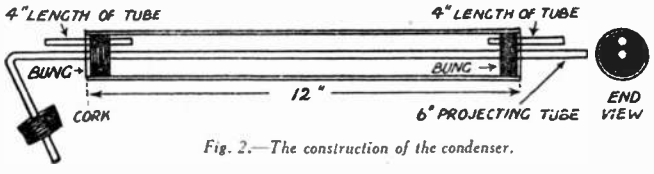


Fig. 2.—The construction of the condenser.

Three-quarters fill the boiling flask with tap water and arrange the apparatus as shown in Fig. 1. The boiling flask or still rests over the bunsen on a wire gauze and tripod and is connected to the condenser. The outlet end of the latter passes into the receiving flask. Turn on the heat until the water in the still is boiling vigorously, then turn down the flame, keeping the water steadily boiling. The liberated steam will be seen condensing in the condenser inner tube.

The first portion of the distillate is used to rinse the receiver and is then thrown away. It is not pure distilled water as it contains the more volatile impurities and dissolved gases always present in tap water. This precaution having been observed, proceed to collect the distillate now coming over until about two ounces of water only remain in the still boiler. At this point cease to collect the water now coming over as it will contain the less volatile impurities.

The simple type of still employing a Liebig type condenser such as I have described, is not capable of delivering large volumes of distillate in a few minutes, but, nevertheless, is quite adequate in output for most small laboratory purposes. On the larger scale, continuous forms of still are employed in which the cooling water in the jacket, becoming warmed by contact with the condenser pipe or "worm," is passed on to the boiler which is automatically kept at a constant level. Some saving in heat is thereby effected, and there is no risk of the still running dry.

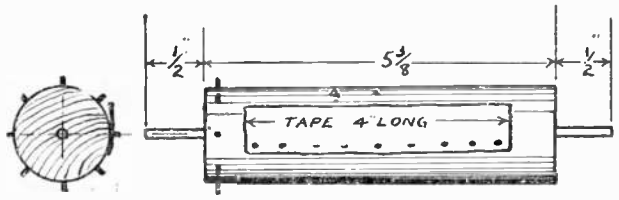


Fig. 11.—Details of the "beams."

A WORKING MODEL HAND LOOM

(*Continued from page 468, February 6th issue.*)

NEXT cut the wires at the back, thus leaving 65 single wires, all parallel and stretched across the frame. Screw the frame on to its wooden support and fix the hinges on to the baseboard halfway between the main frame and the supports for the cloth beam. The screw eyes are for use as handles.

The "beams" are made from four pieces of broomstick 1⅛in. diameter, as shown in Fig. 11. The spindles are made from nails with the heads cut off. You will find it very difficult to get the wood true on the spindle if you drive the nail in without special precautions. A good method is to mark off the centre carefully and drill a hole of the same diameter as the nail about 1in. deep. Ask an assistant to watch the drill to make sure you are holding it upright. The drilled hole then forms an effective guide for the nail which should be driven in about ½in. further to fix it firmly.

For the cloth beam drive in eight small brads and cut off the heads leaving ⅛in. projecting, as shown in Fig. 11. This provides a simple form of ratchet arrangement, the brads engaging a hole in a flat brass spring which can be seen in Fig. 1. There is no need to give a drawing of this spring, for the photograph shows all that is required. A small block of wood holds the bottom end of this spring.

A piece of strong tape ¾in. wide is tacked along one edge only to the round wood, as shown in Fig. 11.

The warp beam is the same as the cloth beam except that the tape is tacked along the other edge, and, instead of the eight brads, a single round-head screw is fitted.

A rubber band is hooked over the screw on the warp beam, wrapped once round the beam and hooked on to a screw eye in the baseboard to provide tension on the threads; this rubber band can be seen near the left of Fig. 2.

The only item now to be made is the shuttle which is illustrated in Fig. 12. This is best cut out of a piece of bone about $\frac{1}{16}$in. thick, though ⅛in. fretwood will do quite well; all the edges and corners should be well rounded, smoothed off and polished, so that the shuttle shows no tendency to catch any of the warp threads.

Ordinary darning wool is good material to weave on this loom. The warp beam is fixed, temporarily, about a yard behind the machine and the wool is stitched on to the piece of tape of the cloth beam, threaded through the reed, then through the central eye in one of the twisted wires of the front heald and stitched on to the tape of the warp beam. The second thread passes through the next space in the reed, but is threaded through an eye in the back heald instead of the front one. Alternate threads go through an eye on the front heald and the threads between go through an eye on the back heald. The warp threads are then all rolled on to the beam at once and the beam fitted in to its supports, a small nail being pushed into the $\frac{1}{16}$in. hole in each support to hold it in place.

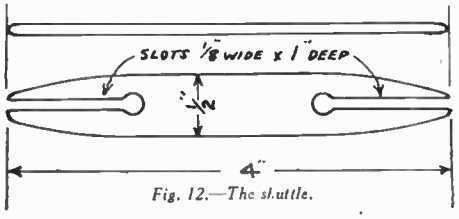


Fig. 12.—The shuttle.

The shuttle is wound in the slots with as much wool as it will carry easily. Press one of the heald levers to raise and lower the warp and pass the shuttle through the resulting "shed," then pull the reed towards the front to push the weft into position. Now depress the other lever to reverse the position of the healds and pass the shuttle through the shed again in the opposite direction, press the weft up close to the previous thread with the reed, and you will find the cloth grow as these operations are repeated.

AERIAL EARTHING SWITCH (*continued from page 497*).

is given a slight turn and the top switch arm moved round, until the end slot engages with terminal stem (Fig. 3). The lower switch-arm is moved upwards until the slot near the end engages with terminal stem B, after which the terminal heads are screwed down.

One advantage of this type of switch is that a positive contact is maintained, not only when the receiver is in use, but also when the aerial is earthed.

It will be noticed, with reference to Fig. 3, that different kinds of wire are indicated leading to the switch terminals. The aerial lead-in wire and the lead to the aerial terminal of the receiver are of heavy rubber-covered stranded wire. The earth wire to the switch is 7/22 copper wire, and the earth lead from the switch to the receiver is ordinary twin flex. This arrangement has been found to work very well in practice, reception being much better than when smaller gauge wire was used.

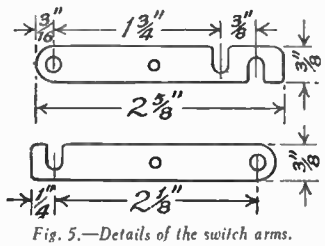


Fig. 5.—Details of the switch arms.

REALISTIC TOY LOCOMOTIVES AND HOW TO MAKE THEM—3

By E. W. Twining

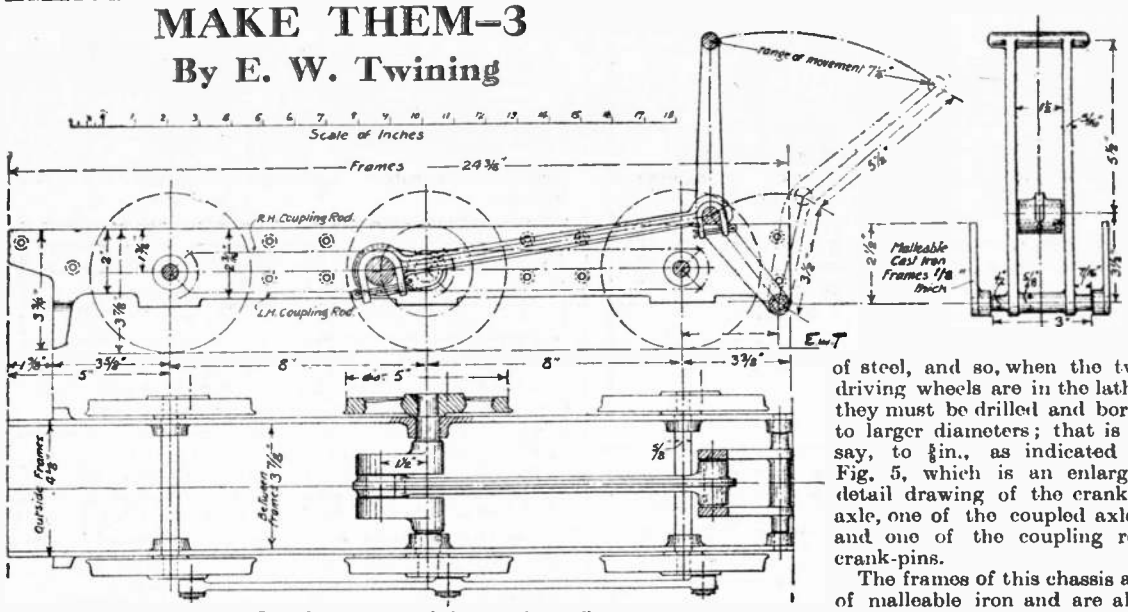


Fig. 4.—General arrangement of chassis with propelling gear.

FIG. 4 is a general arrangement of the chassis of the propelled model, the motive power being the muscular action of the juvenile driver. From the drawing it will be seen that the centre axle is cranked like a full-size locomotive, except that one large-throw crank is provided instead of two. A connecting rod from this is carried back to the cab, where the little end is attached to a double lever, which is operated by hand, a pushing and pulling motion being applied, thus revolving the crank and with it the driving and coupled wheels of the engine. Nothing could be much more simple than this, either in operation or in construction, for, with regard to the latter, there are only three parts (seven with the frames and coupling rods), and these are all cast in malleable iron, including the crank axle.

This axle is bigger all over than those for the coupled wheels, because malleable cast iron does not possess the stiffness of steel, and so, when the two driving wheels are in the lathe, they must be drilled and bored to larger diameters; that is to say, to ⅜in., as indicated in Fig. 5, which is an enlarged detail drawing of the cranked axle, one of the coupled axles, and one of the coupling rod crank-pins.

The frames of this chassis are of malleable iron and are also heavier than in the simple engine. They are cast with hosses to form bearings for the axles. In this driven engine larger bearings will obviously be necessary than in the undriven model, in order to reduce wear, especially on the journals (the parts of the axle which run in the bearings).

The Crank Axle.

This will need to be turned in the lathe on the wheel seats and journals, but it should not be necessary to turn the crank-pin on which the connecting rod will work. This can quite well be finished by filing, testing with callipers from time to time for roundness.

The crank webs need not be touched unless there happens to be any abnormal lumps and roughness projecting which might foul or interfere with the free working of the connectin rod.

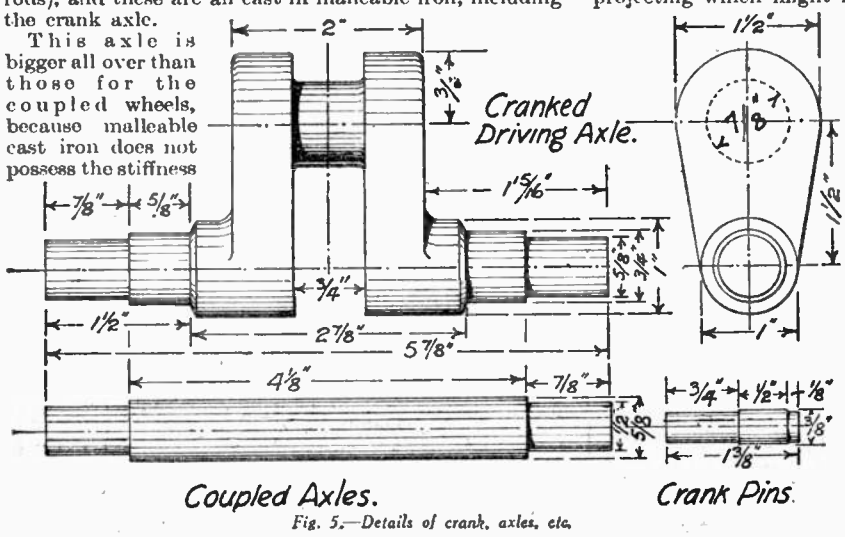


Fig. 5.—Details of crank, axles, etc.

From Fig. 4 it will be seen that I have shown the main inside crank dividing the right-angle between the outside or coupling rod crank-pins. That is to say, the outside crank-pins will each make an angle of 135 degrees with the main crank, one leading, or in front of, and the other behind, the main crank.

The axles of the other pair of wheels and all the coupling rod crank-pins are of steel; they are to be made to details shown in Fig. 5, and exactly as in the simple chassis except for the differences in lengths, i.e., the measurement over all and that over the shoulders between the wheel seats.

(To be continued.)

Turkey, and the notorious misrule of the unspeakable one resulted in such disorders that the great European Powers decided to act the part of policeman. The Turks were expelled, and Crete was granted a measure of independence which was only slightly affected by a nominal Turkish suzerainty (without payment of tribute) and the watchful eye of the Powers. Prince George of Greece was appointed High Commissioner, and the island entered, in 1900, upon a period of peace which it had not known for centuries.

Cretan Culture.

It happened that the more stable government gave particular satisfaction to one of our own countrymen, the celebrated archæologist Arthur Evans, who had been engaged, since 1894, in unearthing the relics of pre-historic Cretan culture. The throw light on the manners and habits

The Cretan King Minos on his throne.

fearful creature, which had the body of a man and the head of a bull, lived at Knossos, and devoured, once every year, six young men and six maidens who were sent from Athens as a sacrifice.

When real history began Crete was a place of little importance—a mere province of the Athenians, who had small respect for its inhabitants. Was it not a Greek poet who was responsible for the well-known line which described all Cretans as liars? Was it not, also, a Greek who, at a later date (tenth century), wrote of "the three accursed K's: the Cretans, the Cappadocians and the Cilicians"?

Correct Solution.

"HOBBIES" CROSSWORDS No. 19 RESULT

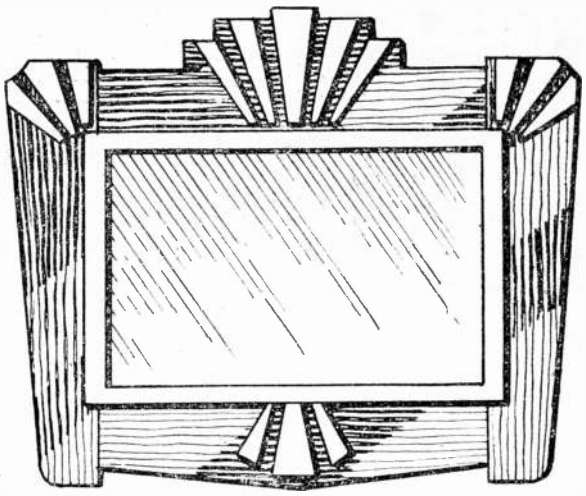
Only one correct coupon was submitted and the Cash Prize of £5 has been awarded to the following reader :—

E. Draper, 56, Regents Place, Swindon, Wilts.

Payment will be sent in due course.

Another Easy Puzzle appears on page 504.

A MODERN PICTURE FRAME



ALTHOUGH the new-art style does not appeal to everybody, it nevertheless must be said for it that furniture and hangings designed and carried out in this style always present a very striking appearance, and are generally very attractive. The sketch shows clearly the character of the frame, which is made, from ½in. wood, of two side rails of simple outline, a lower shaped rail, and a wide, decorated pediment rail. The whole is decorated with tapering overlays of thin wood. In commencing to make the frame, mark out the two side rails first.

The Principal Dimensions.

On the right-hand half of the diagram (Fig. 1) are the dimensions for marking out the rails, which measure 20½in. long, tapering in width from 4in. at the top to 2½in. at the bottom. Cut out one side rail and then use this as a templet for marking round for the other side rail. When both rails are cut, smooth up the edges and round off the outer corners.

The bottom rail measures 17in. long and 4½in. wide in the centre. Square up the piece to these dimensions and then set down 3½in. from one long edge and connect up these points with the centre point. Take care to get the ends of this rail perfectly square, so close joints result after the side rails are fitted. The top rail is set out from the dimensions given, the length being 17in. and the width in the centre 6½in.

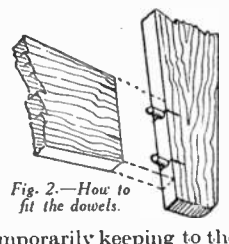


Fig. 2.—How to fit the dowels.

Form the step-like outline by following the measurements at this point, and square up the lines before cutting with the fretsaw. Clean up all the rails, and then place them together, temporarily keeping to the interior measurements of 17in. and 12in. Mark across where the dowels will be put (see Fig. 1).

Take the frame apart and run the lines of the dowels down across the thickness of the rails (see Fig. 2) and bore the holes ⅜in. diameter down to a depth of ½in.

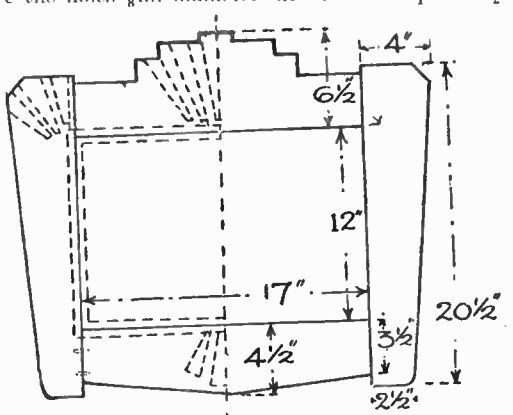


Fig. 1.—Dimensions and details for marking out.

Pieces of hardwood rod 1in. in length are next prepared and driven in the side rails, the ends of the dowels being previously dipped into hot glue. Care must be exercised to keep the dowels perfectly square and true, so that when the other rails are driven in the whole frame will lie flat and even. Bring the joints well together and cramp them up until the glue has hardened.

If proper metal cramps are not available an improvised one can be formed by stout cord and a wood or metal winder for twisting it. Pass the cord twice round the top and bottom of the frame and insert the winders just within the opening of the frame.

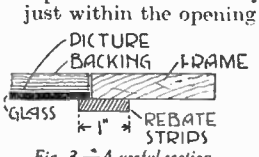


Fig. 3.—A useful section of the frame.

The strips which are glued on form the rebate for the glass, etc. Two strips 18½in. long by 1in. wide, and two strips 13½in. long by 1in. wide are required, and they should be planed up from ¼in. thick stuff. The ends are mitred to 45 degrees so they fit accurately and allow a margin of ¼in. for the support of the glass, etc. In Fig. 3 is shown a section through the frame and the strip with glass and backing board complete.

The Decorative Overlays.

These are very simple in outline and may be drawn from the 1in. squared diagrams (Fig. 4). Wood ¼in. thick would be preferable for the overlays, but there is no reason why ⅛in. wood should not be used.

A piece of 21oz. sheet glass (17in. by 12in.) is held in place by a thin plywood backing board of the same size. It is held in place to the frame by picture-framer's sprigs or fine headless nails. Cover the whole back finally with stout brown paper, and screw in a pair of screw-eyes with rings for hanging.

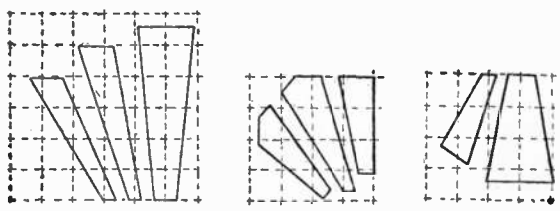
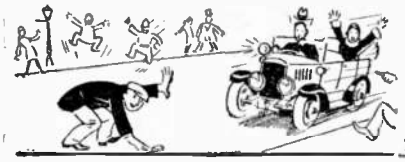


Fig. 4.—Squares to enable the worker to mark out the overlays.

Odds & Ends

WHAT a strange assortment of Hobbies there must be in the world. Cigarette cards, stamps, fretworking, etc., are just everyday ones, but what about the odds and ends of pastimes in which some fellows glory. There's the man we know who collects door knobs—goodness knows why. There is the London accountant who has spent twenty years visiting the forty-nine cathedrals in England and Wales. This meant a deal of happy travelling—even to the cathedral city of St. David's in Wales, where the nearest main line



The hold-up!

is sixteen miles away. Quite a number collect covers off matchboxes, and a firm of match makers have thousands of varieties from all parts of the world.

* * *

MAY we say "Thank you" for the greetings we had from readers at Christmas and the New Year? Our desk was littered with cards of all kinds, little gifts of calendars, boxes, etc., as well as a number of interesting picture annuals from friends overseas. It is nice to have these kindly greetings from unknown readers who think in such practical terms of the work and effort of their Editor. Thank you very much!

* * *

THERE is little nowadays to remind us of valentines except the date. A few shops make a "splash" of gifts for suitable females, and George, the office boy, has been found writing some stuff which he calls poetry. But years ago, of course, Valentine's Day was a great event, and although it did not carry enough weight to close the schools, it meant great fun. The idea was to put the present on a doorstep, knock, and run away, so the recipient was unaware who had left the present.

Our correspondence.

But then, some of the naughty lads of those days used to knock and run away without leaving a present. Too bad altogether. That is one of the things you must *not* make a hobby of on February 14th.

* * *

WE are wondering who is saying unkind things because he didn't get his competition model back. Really, it's his own fault, because although he sent stamps for its return he altogether forgot to add his own name and address. By the way, those who did not want their jigsaw competition pictures back may like to know what happened to them. They were despatched to a Children's Home in time to arrive with Santa Claus and so provide a little amusement for Christmas Day.

* * *

HOW many of you can turn? No, not like Dick Whittington, but turn wood and metal on a lathe. Legs, spindles, rails, all sorts of things are done this way by the amateur, and those who are expert at turning should get particulars of a competition being held by the Worshipful Company of Turners of London in April. There are special sections for amateurs, apprentices, scholars and technical students, with money prizes of several pounds each. If you are keen and capable, write for particulars to The Clerk, The Worshipful Company of Turners, Broad Street House, Old Broad Street, London, E.C.2.

* * *

HAS any reader got a design of the Giant Bracket, No. 38 Special? That is the one nearly 3ft. high with Father Time on guard over rabbits, birds, etc., and the months of the year cut out in different parts. Mr. J. Fox, of Upper Fennor, Oldcastle, County Meath, wants

The giant.

one rather badly, so perhaps some reader who can spare his copy will sell it to this reader. Thank you.

* * *

READERS in the Wolverhampton District should make a note of a Hobbies Exhibition to be run at the Boys' Club, Mander Street, Wolverhampton, on March 19th. Competitions and exhibitions will cover games, toys, models, philately, sketches, etc., so some of you will undoubtedly be interested. Write to the address given for further particulars.

* * *

WHO says fretwork designs don't sell? Listen. A gentleman strolled into the Hobbies Store in Manchester, and bought different designs to the value of £1. 1. 9. He had, he said, received a list of these from a Scoutmaster friend of his in Australia who lived near the bush and could not obtain them there. Can you not imagine the delight on the arrival of the designs—the eager anticipation of the hours of enjoyment such designs would bring to a lonely fellow way down under? More power to his elbow, say we. It is astounding how many readers keep in touch with the home country through the medium of Hobbies.

Let Your Editor Help You. Address your letters and queries to The Editor, "Hobbies," Geo. Newnes, Ltd., 8-11, Southampton Street, Strand, London, W.C.2, enclosing a stamped addressed envelope. All letters and queries must bear the full name and address of the sender.

New Imperial Competition Result Next Week.

I HAVE almost completed the judging of the model New Imperial competition, and the full results, with the names and addresses of the prize-winners, will be given next week. Your newsagent, of course, has your standing order. I know!

Another Special Wireless Number.

OUR issue dated February 27th (the week after next) will be another special wireless feature number. Our last wireless number (January 23rd issue) was such a success, particularly as it contained details of our "Baby Grand," together with a free gift wiring diagram of it, that readers have urged me to produce this second radio number. Make a note of the date! February 27th issue.

"Mental Nut" Prize-winners.

THE first correct solution to be opened in connection with the Mental Nut contest appearing in our January 23rd issue was sent in by B. Waite, 10, Newell's Villas, Misterton, Doncaster, to whom a book has been sent.

Congratulatory Letters.

I CONTINUE to receive from all parts of the world letters of praise and letters containing constructive criticism. The change in the style and format which we instituted with October 4th, 1930, issue evidently met with universal approval, for we have multiplied our circulation rather more than five times since that event. This is a remarkable achievement, and it is a glowing testimony to the happy reader co-operation which the paper has earned for itself. HOBBIES to-day is the only paper of its type; it has no competitors. In spite, however, of this cloistered position, the paper is produced at a competitive price which all can afford, and it gives full value for money. There is also the valuable Free Advice Bureau of which hundreds of readers each week avail themselves. Our free gift schemes have exceeded in value and number anything which has ever been done before. Each week the paper is eagerly snapped up. Perhaps that is why so many thousands of readers have taken my advice and placed a regular order with their newsagent.

NEXT WEEK.

Free Design Sheet for
MODERN HALL MIRROR

PRACTICAL AERIAL ERECTION

WEAVING ON OUR MODEL LOOM

SHARPENING SAWS

PRINTING FROM LINOLEUM BLOCKS

EXPERIMENTS WITH SPARK COILS

A SIMPLE STEAM TURBINE

Stamps, Electrics, Model Aeroplane Topics, Model Railways, Coins, Etc., Etc.

1932 "Tit-Bits" Year Book.

THAT handy compendium of reference, the 1932 "Tit-Bits" Year Book, again makes its welcome appearance. It is impossible to find a more comprehensive digest of all those facts and figures regarding sports, holidays, education, banks, fishing, dogs, death duties, the law about children, income tax, flying, motor records, etc., etc., which when wanted are hard to find. These are but a few of the subjects mentioned in this Year Book, and we cannot find better value, with its 192 pages at 1/-. It is a book which everyone should have at hand, for a maximum amount of information has been packed into it.

QUERIES AND REPLIES.

Exchange Wanted.

Mr. F. Cunningham, 44, McLellan Street, Plantation, Glasgow, has a box of Carpenter's Tools which he would like to exchange for a pair of Prismatic Binoculars.

Book on Model Engine Building.

Full instructions on making a powerful steam engine appear in "25 Simple Working Models," obtainable from this office for 1s. 2d. This is in reply to W. Tracey, 10, Haslips Op., Norwich.

Weight of Ebonite.

Ebonite weighs 77lb. per cubic foot, W. T. (Brighton). We are not quite clear as to what you mean by silver cord. Perhaps you will let us have further details. Sheet ebonite ¼in. thick weighs 13oz.

Grid Condenser and Leak Values.

The grid condenser should have a value between .0001 mfd. and .0003 mfd. The grid leak usually has a resistance of from 1 to 5 megohms. J. C. (Cork).

Stamped Envelopes Required.

John L. McArdle, Park Cottage, Colt Terrace, Coatbridge, N.B., wishes to collect covers bearing stamps of more than one country.

Stripping a Film by Heat.

A well-known method of stripping the film from a glass negative, L. H. (Bristol), consists in impregnating the film with an alkaline hardening solution, drying and then immersing in an acid solution: the separation of the gelatine film then follows as the result of the formation of carbon dioxide under the film. The negative is hardened in the following bath: Formaline 300 c.c.s., Glycerine 40 c.c.s., and water to make 1,000 c.c.s. If the negative is treated before drying, 60-90 seconds' immersion will be sufficient; if it is dry, 20 minutes is advisable.

The Gauge of Wire for Aerial and Lead-in.

Stranded 7/22 enamel copper wire is recommended for aerial and lead-in. H. K. (Darlington). Where the lead-in is liable to touch earthed bodies H.T. cable is recommended. H.F. current travels on the surface of wires, not through them. The earth lead should also be stranded wire.

Fixing Crystals.

A cup with a screw cap is best for mounting crystals. J. O. J. (East Ham). The crystal being packed in lead foil. We do not advise the use of solder, but if you prefer this method use Wood's metal.

Book on Making Fireworks.

I recommend you to obtain a copy of "The Complete Art of Making Fireworks," published by Chatto and Windus, at 5s. Probably Messrs. W. and G. Foyle will let you have a second-hand copy. J. T. (Coatbridge).

Lubricant for Prints.

This lubricant is used when burnishing prints with a steel roller. M. B. (Manchester): Powdered Castile soap 20 grs. (5 gms.) and Alcohol 10oz. (1,000 c.c.s.).

Repairing Cracks in Ebonite.

Cracks in ebonite or black composition accumulators, F. D. (Kilkenny), can be repaired by melting into the cracks a mixture composed of 2 parts resin and 1 part of finely shredded gutta percha. This compound will set hard again after the source of heat, preferably a piece of heated steel rod, is removed.

Preventing Developer Stain.

As a means of preventing staining of the fingers with developer, K. S. (Greenock), rub "Vanguard" Boracthol ene into the finger tips and over the nails before putting the fingers into the developer. The preparation in no way harms any sensitive surface.

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Make yourself a Ukelele

H.J.M., of Anfield, made one and wrote:—"I have made ukelele and it is a great success. In fact, I have taken it to the Liverpool Examiner for the Banjo, Mandolin and Guitar, and he said the tone was as good as any uke he has heard."

Why pay a pound for a ukelele when you can make one for yourself for 4/-? Everything is supplied ready for the handyman to complete, and anyone with a few fretwork tools can do it. The design sheet has full-size patterns and cutting instructions, the wood is supplied planed and cut in the boards required, pegs and strings are included in the parcel. Hundreds of these full-size playing instruments have already been made by delighted readers.

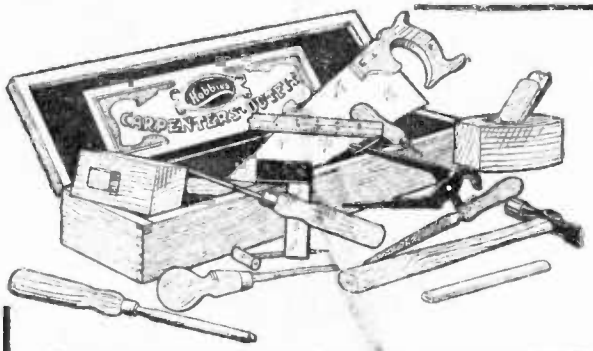
Ukelele Banjo No. 1825. Design 4d. Parcel of wood 2/9 (postage 6d.). pegs and string 1/6 (post 1½d.).

Ukelele No. 156 Special, Design 6d. Parcel of wood 2/- (post 6d.), string and pegs 1/6 (post 1½d.).

If you prefer, a neck already shaped is supplied for 1/9. An instruction handbook on how to play, price 1/-. Complete illustrated construction details for either, price 2d. (postage 1d.).

No. 1825. *No. 156 Special.*

All the parts, designs, etc., are obtainable from Hobbies branches in London, Glasgow, Manchester, Birmingham, Sheffield, Leeds, Southampton, Brighton. Or from your usual ironmongery store. Sent by post direct from Hobbies Ltd., Dereham, Norfolk.



CARPENTRY OUTFITS

Hobbies

No. 1. This useful little set contains a number of serviceable tools of general utility. There is a handsaw, hammer, screwdriver, ¼in. chisel, 2ft. folding boxwood rule, bradawl, gimlet, and a carpenter's pencil. **7/6** Post 9d.

No. 2. Contains a wider range of tools of equally good quality—each one reliable and useful. Included is a 16in. handsaw, hammer, screwdriver, bradawl, ¼in. chisel, gimlet, pincers, 2ft. boxwood rule, file, mallet, and a carpenter's pencil. **11/6** Post 9d.

No. 3. A comprehensive set of tools for any amateur carpenter. The outfit includes a handsaw, mallet, smoothing plane, hammer, ¼in. chisel, file, gouge, screwdriver, pincers, 2ft. folding rule, gimlet, bradawl, carpenter's pencil and square. **27/6** Post 1/-.

BRITISH MADE AND RELIABLE

Those who are fond of woodwork will welcome these splendid tool sets. Most Outfits contain cheap inferior tools which are of no practical use. These, however, are splendid value, because every tool is well made, strong and a real serviceable article. Each set contains a useful range of tools to meet everyday woodworking requirements.

London: 65 New Oxford St., W.C.; 147 Bishopsgate, E.C.; 83 Newington Butts, S.E.11. Glasgow: 326 Argyle St. Manchester: 10a Piccadilly. Birmingham: 9a High St. Leeds: 10 Queen Victoria St. Southampton: 25 Bernard St. Brighton: 68 London Road. Sheffield: 214 West St.; or by post from Hobbies Ltd., Dereham, Norfolk. Canadian Depot: 844 Yonge St., Toronto, Ontario.

HOBBIES NEW 1932 CATALOGUE

300 PAGES

This Book puts Pounds into your pocket

There are over 300 pages to interest you showing over a thousand things any fellow can make. Five free designs are given with every copy, and it is a better book of hobbies than anything ever published. Every reader of Hobbies should have a copy. Its pages have been entirely re-written and heaps of new lines added for the handyman.

It shows you how to turn your spare time into pocket money. Every page is packed with useful information, and the editorial section has articles on over 20 different pastimes. Clock-making, a model aeroplane, wireless sets and cabinets, puzzles, model making, woodwork and fretwork are all dealt with for the amateur. You can turn 1/- into £1 with little trouble.

Value for Money

With each copy there are two large free designs for making a modern All-In Wireless Cabinet and a novel Xylophone type of musical instrument. A quaint new Calendar Picture in colours, a working model toy and a pipe rack pattern are also given free. They alone are worth 2/6.

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