A Sailing Model of the 'Golden Hind'

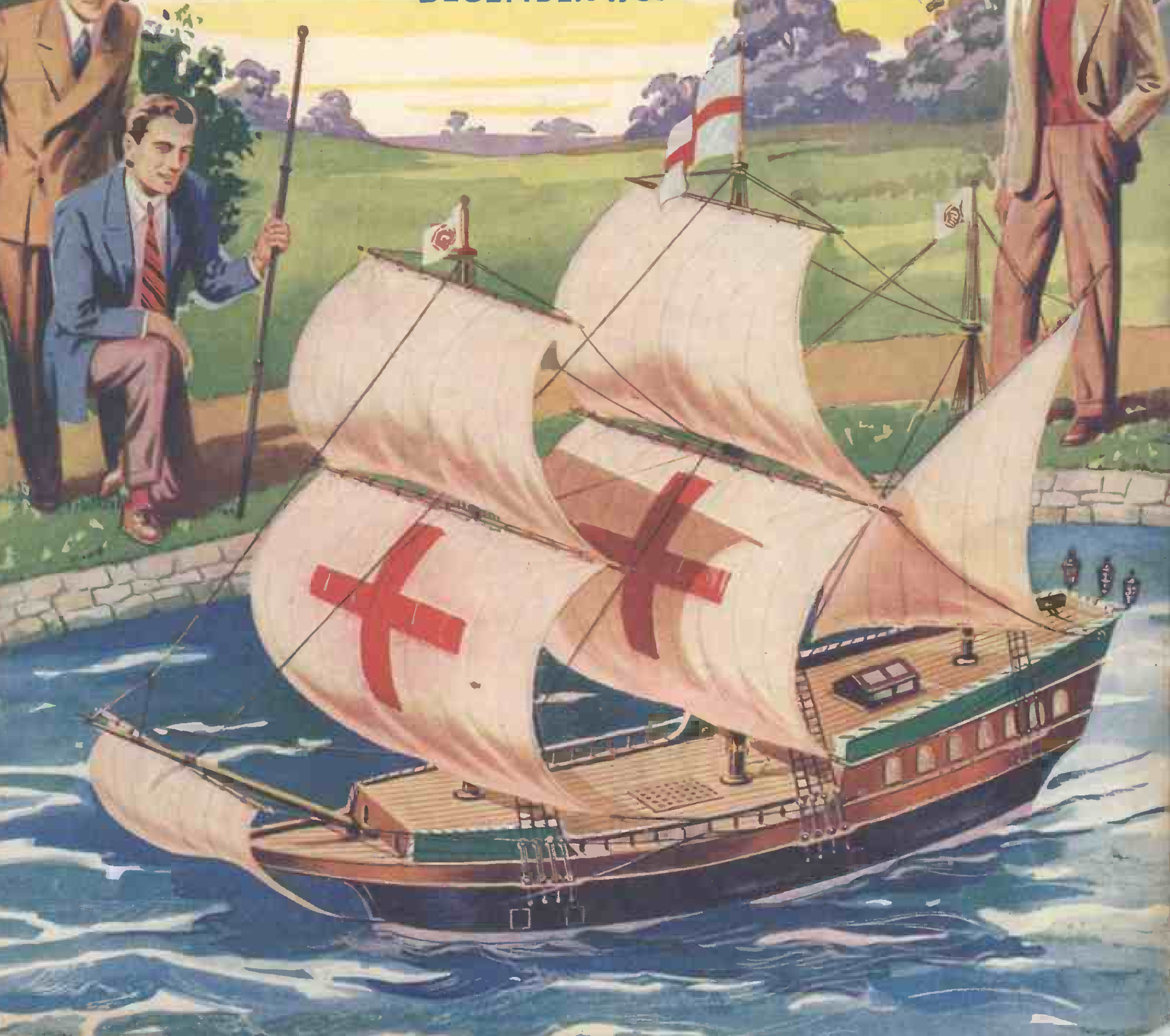
NEWNES

PRACTICAL MECHANICS

1/-

EDITOR : F. J. CAMM

DECEMBER 1955



PRACTICAL MECHANICS
The "Cyclist" and "Home Movies" are temporarily incorporated
VOL. XXIII. No. 264
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FAIR COMMENT
By
The Editor

Some Fallacies Exploded

IN the course of the year I receive a large number of letters which start off: "in order to settle an argument, will you tell me . . ." and some of the questions asked are like recurring decimals —they crop up regularly. Every editor, of course, is flattered by this belief in editorial omniscience, and it is true that editors of technical publications, in the course of time, become something approaching walking encyclopædias. In assisting their readers, quite often they have to find out things for themselves. I should like, therefore, this month, to deal with a few of these recurring decimal questions and I take as the first example the belief commonly held that there are some people on whom watches will not go, particularly wrist watches. Let me say at once that if the movement is in good order and properly adjusted it will go on anybody, and there is no such person on whom such a watch will not function satisfactorily. When a watch fails to go some jewellers offer this as an excuse for having sold an unsatisfactory article and ascribe it to the physical characteristics of the wearer. It is not true. I have made a hobby of horology for many years, and have obtained very high awards for watch rating for the very rigid Kew A tests at the National Physical Laboratory, Teddington (now the Craftsman's test). When I have been asked to examine watches which would not go on a particular person, in every case I have found that it has been due to defective mechanism or adjustment.

Do not, therefore, accept such an excuse from your jeweller. Very few jewellers to-day are skilled watchmakers and I fear that, having sold a watch, they are not vitally interested in complaints.

Another question which frequently crops up relates to the distance covered in one hour on a bicycle. So can I set it on record in order to "settle arguments" that the record for one hour's cycling behind motor pace is 76 miles, 504 yards, ridden in 60 minutes on a bicycle by Leon Vanderstuyft, the Belgian, at the Montelhery Track, Paris, on September 30th, 1928. He beat the record of Paul Guinard, of 63 miles, made at the Munich track in 1909.

Newcomers to the pastime of cycling hear this fact expressed and flatly refuse to believe it. It is, however, true and was an officially witnessed and recognised record. The highest speed ever attained on a bicycle was attained on May 17th, 1941, by Alfred Letournier, a former six-day racer, who pedalled one mile in 33.05 seconds, equivalent to a speed of 108.92 miles per hour. The record was made at Bakersfield, California, and he rode behind a shield attached to the rear of a racing car. His bicycle was equipped with the highest gear ever fitted to a bicycle. The chain wheel had 57 teeth and the rear sprocket six, giving a gear of 252. The first English cyclist to cover 20 miles in an hour unpaced was H. L. Cortis, and the first to cover 60 miles in an hour paced was A. E. Wills.

Another hoary old problem asks whether the top of a wheel really does travel faster than the bottom. In the case of a wheel travelling along a road it certainly does, for taking any particular point as the top of a wheel it will, when travelling along a road, describe a curved path, the length of which is in excess of the horizontal distance travelled. In point of fact, a flanged wheel as used on locomotives is actually travelling in a direction opposite to that of the train, so that if a train is travelling from London to Liverpool, part of the wheel is travelling from Liverpool to London at the same time! You might like to work that one out! Of course, some questions require scientific knowledge before an answer could be comprehended and now and again I receive some sticky ones such as: "why is water wet."

Then there is the dispute concerning how a rocket or a jet engine derives its power. There are still those who believe that the power is obtained by "pushing on the air behind." Indeed, a well-known aeronautical authority even stated this over the air. The fact is that a rocket or a jet engine derives its power from the reaction of the escaping gases on the body from which they are escaping. They would thus be more efficient in a vacuum. I receive in the course of every year a fair crop of letters from readers who have discovered the solution to perpetual motion, or a means of squaring a circle. It is not difficult, however, to convince them where they are wrong. Since no one has ever discovered the value of Pi, I fail to see how anyone can find a method of squaring a circle exactly, and not approximately. There are plenty of approximations. As far as perpetual motion is concerned anyone who feels that he has discovered this age-old problem, and can *demonstrate it*, will have had made an immediate fortune.

Another question asked: who invented the pneumatic tyre? The answer is that it was invented by Thomson, many years before Dunlop re-invented it. Dunlop lived within a mile of Thomson, in Ayrshire (Air-shire !). Thomson actually marketed his tyre under the title of elastic bands for carriages. There seems, however, no room for doubt that Dunlop re-invented it without prior knowledge. It was this clash of two inventions which caused a change in patent procedure leading to examination for novelty and anticipation before the patent was granted. There are many who think that Baird invented the disc television receiver. He did not. It was invented by Paul Nipkow, a German in the 1880s, and he successfully demonstrated that it was possible to transmit a picture from one room to another by means of a scanning disc. Television, as we know it to-day, owes nothing to Baird. Similarly, Marconi did not invent radio. He was the first successfully to demonstrate the theories of Hertz and others. Watts, by the way, did not invent the steam engine and neither did Stevenson. The Rocket was not the first locomotive, the first being Locomotion No. 1, built in 1804.—F. J. C.

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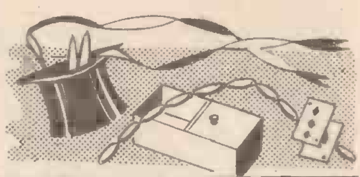
CHRISTMAS MAGIC



Some Simple Conjuring Tricks for the Party

THE art of escaping is a special branch of the conjuring profession and often special equipment is necessary. There are, however, some tricks which can be attempted by the amateur.

Escape from Chains

What happens in the first trick is shown in Fig. 1. A length of chain, furnished with two rings, is handed for examination, together with a padlock. The performer then asks a member of the audience to bind his wrists tightly together with the chain and padlock it. The chain is drawn so tightly that the links can be seen pressing into the flesh, yet in a couple of seconds the conjurer can free himself, and instantly hand out the chain and padlock for inspection.

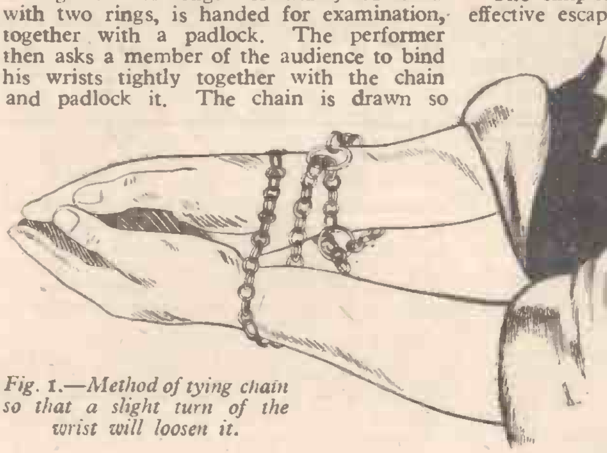


Fig. 1.—Method of tying chain so that a slight turn of the wrist will loosen it.

The secret lies partly in the way in which the chain is used and partly in the way it is made. There is a ring at one end of the chain and a second ring a few inches along the chain, as shown in Fig. 2. We will call these rings A and B. To begin with the performer passes the plain end of the chain through ring A. He then passes the loop so formed over his right wrist, holding the hand with the thumb uppermost. The ring A must be on top of the wrist, that is, on the thumb side, and the chain must pass up through the ring on the palm side of the hand. Having drawn the chain tight the conjurer then places his left hand alongside the right, the free end of the chain hanging between his wrists, and asks a member of the audience to take the hanging end of the chain, pass it round his left wrist and on round his right wrist. The end of the chain is then passed through ring B, which will be found just under the right hand, drawn very tight, and padlocked at a convenient point. Fig. 1 will make clear the way in which the chain must be bound. The movements should be carried out with the chain in the hands and no difficulty whatever will be experienced in getting the fastening right.

The performer's hands are now, to all intents and purposes, firmly bound together. He can, however, release himself in a few moments by simply turning his right wrist to the left, when the chain will loosen and can be drawn off, although still remaining padlocked. The reason for this is that the first loop of chain is really a slip-knot, and once this is loosened the whole fastening is automatically released.

The Mail Bag Escape

For this escape the performer is fastened inside a large sack, a screen is placed round him, and in a few moments he walks out from behind the screen with the sack, still securely fastened, over his arm.

The simplest method of performing this effective escape is by means of a prepared sack. The preparation is so slight that it is extremely unlikely that it will be discovered, even by the closest examination, and even if it is discovered it is improbable that it will mean anything to the spectator who finds it. The construction of the sack is shown in Fig. 3. It is simply a large bag, roomy enough to contain the performer comfortably and fitted with a draw cord run through a hem at the top of the bag. Any kind of strong fabric will do for making the bag. The draw cord must be of good length. The preparation consists of leaving the lower part of the hem unsewn for a few inches at the part opposite to the opening where the draw cords emerge. (See Fig. 3.) The bag can safely be handed for examination without fear of this slight preparation giving any clue to the escape afterwards performed.

Fig. 2 (left).—Chain for manacle release.
Fig. 3 (Above).—An escape sack.

The performer steps into the bag and draws it up over his head, instructing his volunteer assistants to draw the cord tight, tie it securely, and seal the knots in any manner they please, so that they may be able to identify the seal later. In helping the assistants to gather the mouth of the sack the performer secretly pulls the through the unsewn part of the hem about 18in. of the draw cord and holds on to it (Fig. 4). The assistants now tie up the sack as firmly as they please, and the performer waits till he is told that the screen is round him. He had better have an assistant of his own to give him this cue in case a spectator remains behind the screen or does not conceal him properly, which would give away the secret. All he has to do then is release the piece of cord he is holding, when he can open the sack sufficiently to get out. Having escaped, the conjurer then cuts the cord where he was holding it, draws it tight, ties the ends together and tucks them under the part of the hem from which he took them. This leaves the sack securely fastened and the original seals intact.

Fig. 4.—How the performer pulls the cord inside the sack while it is being fastened.

With these two trick escapes ready to perform the conjurer can make a very effective escape by first having himself manacled with the chain and padlock and afterwards tied and sealed in the sack. While the sack is being fastened he escapes from the chain, leaving him only the sack escape to make when the screen is placed round him.

A Trick with Paper Money

Now for one of those exciting tricks in which paper money is recklessly burned to ashes, but in due course reappears whole again. The point of this type of trick is that the note should be borrowed.

A borrowed ten shilling or pound note is folded and placed in an envelope. The envelope is then laid on top of a tumbler while a small parcel is fetched from behind a screen. This parcel is given to the owner with the promise that if anything happens to his money he may have the contents of the packet. This he is assured is worth quite as much as his note. Needless to say nobody believes it.

The conjurer then holds up the envelope in front of a candle flame and the shadow of the note inside is clearly apparent. The next moment consternation reigns; or at least it ought to, for the performer has carelessly allowed a corner of the envelope to

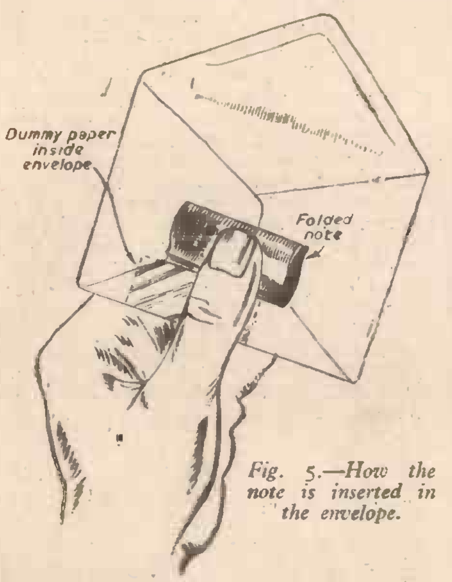


Fig. 5.—How the note is inserted in the envelope.

stray into the flame. It catches fire and soon envelope and note are reduced to ashes. After as much fun as possible has been extracted from the situation the owner of the note is asked to open the parcel. It contains a penny bun. The conjurer assures the gentleman that the bun is worth quite as much as his vanished banknote and asks him to break it open. Inside the bun is found the missing note and the number on being read out is found to tally correctly with the number of the original note, which was taken down by a member of the audience at the beginning of the trick.

For such an effective result the means are ridiculously simple. The envelope has inside it a piece of paper the size and shape of a ten shilling or pound note. This is folded and put in the bottom of the envelope before the show begins. A note having been borrowed and the number taken down, it is folded into a packet similar to the concealed paper. The performer then holds the envelope with the address side towards the audience, opens the flap and apparently tucks the folded note inside. Actually he simply slides it down at the back of the envelope and holds it there, as shown in Fig. 5. He then seals the flap of the envelope and lays it on top of a glass, retaining the folded note concealed in his hand.

The parcel containing the bun has the paper opened a little at the place where it is folded over. This opening comes at the side of the bun and a slit is cut in the bun at this point. When the conjurer goes to fetch the parcel it is the work of a moment to force the folded note into the bun and to press the paper together. If a new bun is used the slightly sticky nature of its texture will cause it to close up round the note leaving hardly any trace of the way in which it was introduced.

The rest of the trick is simply a matter of playing up the situation and getting as much comedy out of it as you can.

The Watch Trick

One of the most popular tricks in the whole range of conjuring is that in which the performer borrows a watch from some member of the audience and proceeds apparently to smash it up, after which the pieces are caused to disappear in some way and eventually the watch, completely restored and none the worse for its adventures, is reproduced from some unexpected place.

There are many versions of this trick but the procedure is always divided into three sections. First, the watch must be secretly enchanged for a dummy, then the pieces must be disposed of and finally the original watch must be produced again.

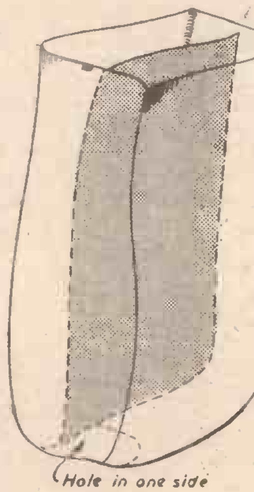


Fig. 7.—The double bag.

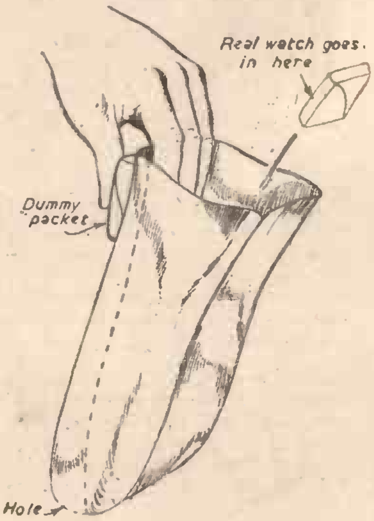


Fig. 8.—How the watch is changed.

Exchanging the Watch

This *must* be managed without arousing suspicion in the minds of the audience. Anyone who gives the matter a moment's thought will know that it is not the borrowed watch which is smashed. But spectators of a conjuring performance are not normally in a position to give any logical consideration to what is happening. Their minds are so fully occupied watching what is apparently being done that they have no opportunity during the performance to reason things out.

Fig. 6.—Changing the watch—the view the audience does not see.

In Fig. 6 is illustrated a simple means of exchanging a borrowed watch which at the same time leads naturally on to the smashing-up episode. To begin with the performer asks for the loan of a *pocket* watch. He asks some other member of the audience to collect the watch for him and place it in an envelope for safe keeping. This done the assistant is requested to drop the watch into a small cloth bag, the performer reminding the audience that he has not touched the watch at all.

The watch is dropped into the bag and instantly, to the apparent horror of the conjurer, goes through the bottom of the bag and lands with a crash on the floor. The conjurer anxiously turns the bag inside out and discovers a large hole in the bottom, and then turning to the owner of the watch to apologise, he accidently treads on the fallen watch, with noisily disasterous results. No doubt the performer can, with further clowning, complete the destruction of the watch.

Most of the method is clearly demonstrated in Fig. 6. When the conjurer picks up the bag he holds behind it a similar envelope to that in which the watch is to be placed. This envelope contains some odds and ends of cog wheels, bits of spring and other portions of retired watches together with either a couple of lumps of sugar or some nut shells. The bag is held as shown and as the real watch is dropped into the bag the dummy parcel is allowed to fall from behind. The illusion of the watch going through the bag is perfect and the subsequent treading on the packet produces a realistic touch, thanks to the nut shells or sugar.

A Divided Bag

The bag itself is double, a vertical partition dividing it into two halves as shown in Fig. 7. One half of the bag has a hole or rather a slit in the bottom. The conjurer takes care when holding the bag that the real watch is dropped into the sound side by holding the partition against the opposite side as in Fig. 8. When he later shows the hole in the bag he grips the borrowed watch through the cloth and turns the bag inside out via the damaged side. The bag is then laid aside and an assistant carries it off to extract the watch behind the scenes. If the performer is working on his own, he lays the bag behind his screen and during subsequent visits to that spot for the purpose of

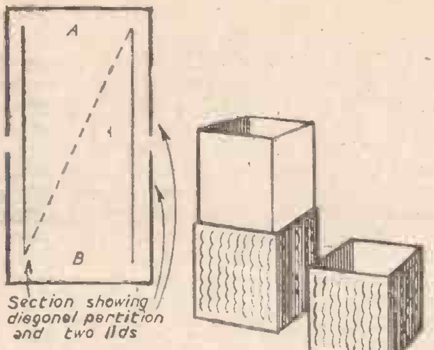


Fig. 9.—The changing canister.

the trick extracts the watch himself.

"Vanishing" the Pieces

There are many ways of doing this, but one of the easiest is to use a changing canister such as that shown in Fig. 9. The canister is a square tube measuring about 3in. wide by 6 in. high. It has neither bottom nor top, but is fitted with a partition running diagonally and dividing the interior into two parts, A and B in the diagram. There are two push-over lids which push on at opposite ends and meet in the centre. The pieces of watch are placed in end A, that lid being removed for the purpose and lid B doing duty as the body of the canister. Lid A is then put on and the canister turned upside down in carrying it to another table, after which lid B is removed and the pieces of watch have seemingly changed to a handful of confetti, or anything else the performer likes to have inside the "B" end of the canister.

Reproducing the Watch

This, too, can be managed in several ways, but one of the most popular is finding the watch in the smallest of a nest of boxes as shown in Fig. 10. All the cardboard boxes have hinged lids and the trick is prepared by opening them all and placing them one within the other so that all the lids open the same way. The nest, so arranged, is placed behind a screen or in a hat out of sight of the audience. The first opportunity the conjurer has he takes the watch from the bag, where it still reposes, and when going to fetch the boxes he places the watch into the innermost and closes the lot by closing the outside lid in one movement.

Any reasonable number of boxes may be used, but six or eight is usually sufficient. The time taken to open this number of boxes is, of course, out of all proportion to the mere second or so needed to put the watch in and close them.

The borrowed watch is nearly always secured soon after the exchange by the conjurer or his assistant and immediately placed in the nest of boxes from which it is to be ultimately produced. The boxes may be given to someone to hold while the dummy watch is still on view. When this is eventually made to vanish and the real watch made to appear in the boxes the effect is completely baffling because the audience imagine that the nest of boxes was given to the spectator to hold before the borrowed watch had left their sight.

A Real Mystery

For this trick the conjurer first borrows a cigarette and puts it on the table in full view. Then taking a pack of cards he asks a spectator to choose one. The chooser then tears the card into pieces and one of the pieces is given to him to hold. The conjurer burns the remainder of the pieces and sprinkles the ashes over the cigarette. He then tears open the cigarette, and inside it, rolled up, is found the card completely restored except for one small piece. When the spectator applies the piece it fits exactly.

First of all you have to decide what card is going to be chosen. This means you will have to "force" the card when you have the selection made. This will be explained later.

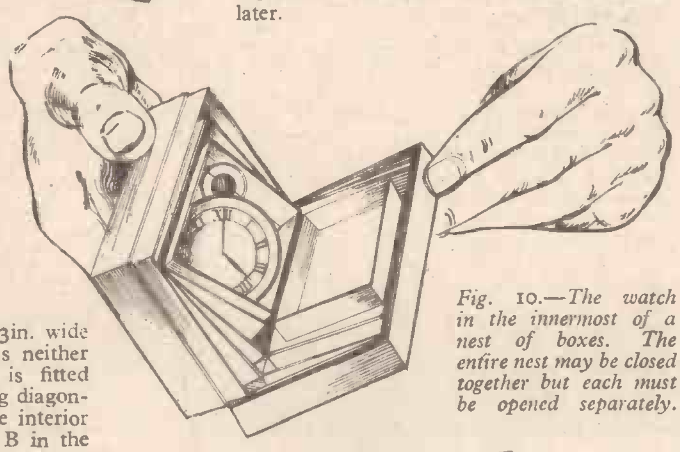


Fig. 10.—The watch in the innermost of a nest of boxes. The entire nest may be closed together but each must be opened separately.

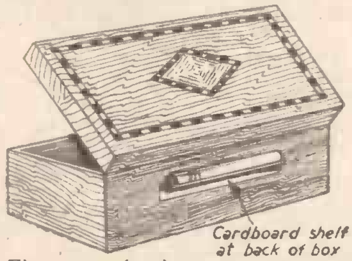


Fig. 11.—A cigarette concealed on a shelf on the back of the box.

In the meantime suppose we take the ten of diamonds as the card. Tear a piece from one corner and put it in your waistcoat pocket. Roll the remainder of the card into a neat roll and, with a cigarette paper, make an imitation cigarette of it. Stuff a little tobacco taken from a real cigarette into the ends and the result should be a very convincing imitation.

The Card Box

The box containing your pack of cards should be of the kind shown in Fig. 11, i.e., larger than a pack and having a hinged lid. To the back of the box fix with drawing pins a piece of postcard bent along the centre to form a sort of shelf (Fig. 11). This box, with the pack inside, stands on the table, the cardboard shelf being at the back. Just under the shelf, on the table, place your dummy cigarette. Make sure that you have a duplicate ten of diamonds on top of the pack, and you are ready.

Begin by borrowing a cigarette. Take it in your right hand and apparently put it down behind the box, picking up the box with the left hand. What you really do is shown in Fig. 12. You drop the genuine cigarette on to the little shelf and allow your fingers to rest on the dummy cigarette as the other hand takes the box away. To the audience the illusion is perfect and nobody will have the least idea that you have changed the cigarette, particularly as nobody knows what you are going to do. Open the box and take out the cards then put the box aside taking care not to expose the back of it.

"Forcing" the Card

Now for the "force" of the ten of diamonds. An experienced conjurer would bring the card to the middle of the pack, spread the cards fanwise and move the card along so that the person choosing a card has the ten of diamonds very subtly insinuated into his hand. This method, however, needs a good deal of practice and experience. Here is an easier one. Hold the pack in the left hand and ask someone to stick a paper knife, or a finger into the pack somewhere. Open the pack at the point indicated and lift off the upper part. As you do this, press with the fingers of your left hand on the top card, which is the ten of diamonds, so that it is held back and slips down on to the lower half as you take the top half away. Apparently you have cut the pack as the chosen point and offer the card cut at to be taken.

Ask the chooser of the card to tear it into small pieces. While this is being done put down the pack and pick up an ashtray, at the same time getting hold of the corner from the card that is in the dummy cigarette, which you will remember is in your waistcoat pocket. Conceal this corner in your hand and receive the torn pieces on the ashtray. Now apparently pick up one of the pieces and hand it to the person who chose the card. What you really do is to put your fingers on the pieces and bring the concealed piece to your fingertips. Thus you pick up and give your assistant the actual corner torn from the card in the cigarette.

The rest of the trick is simple. Burn the pieces and sprinkle the ashes over the cigarette. Tear open the cigarette and offer the apparently restored card to have the missing piece tried. As it is the piece originally torn from that card it is, of course, bound to fit.

Fig. 12.—Exchanging a cigarette. The real cigarette is being placed on the shelf, while the prepared dummy is ready to be revealed on the table.

ISSUES REQUIRED

The Editorial Department of PRACTICAL MECHANICS urgently requires sound copies of the following issues:—

October, 1934; August, September, October and December, 1935; January, June, July, September and October, 1936; October and November, 1937.

If any reader has copies of these old issues of P.M. we shall be pleased to receive details. Only issues in a sound state of preservation are required.

RADIO CONTROLLED MODELS

By Members of I.R.C.M.S.

5.—Obtaining a Second Channel Using the Mark/Space System

IN this article will be given some ideas on how to achieve engine speed and other controls using the mark/space system as the basis.

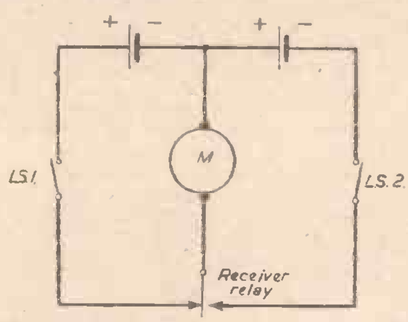


Fig. 1.—Basic two-battery mark/space steering circuit with limit switches (L.S.).

To sum up the present system we are using a continuous transmission (mark) to steer the boat one way, an absence of signal (space) to steer it the other and a pulsed signal (50/50 mark/space) at a frequency of about 5 per second to hold the rudder in any intermediate position between extremes of steering. To control the engine speed it is necessary to transmit a type of signal which will not alter the rudder setting, but which can be easily separated by the equipment in the boat. For the purpose of this article we assume that the model is electrically propelled, but there is no reason why the principles involved should not be modified to control the speed of vessels powered by steam or diesel.

Fig. 1 shows the basic mark/space steering circuit using alternately batteries A and B. When the 50/50 mark/space pulses are being received, an alternating (square wave) voltage is applied to the steering motor. From Fig. 2 it will be seen that a transformer has been connected across the motor terminals. A transformer is a device which responds only to alternating current and, so long as the pulsing on the motor continues, a current is induced in the secondary winding which is rectified by the meter rectifier unit, stored in the 25 μF electrolytic condenser, and then applied to the relay B. On slow speed, pulsing at the rate we have used so far, insufficient current is generated to operate the relay but (and here lies the key to the system) if the pulse rate is increased to about 20 per second the current produced also increases and the relay then closes. The closing of this relay can be used to operate a sequence switch which can in turn give stop, half speed, full speed and astern control (or any more positions desired). The second control relay could also be used to operate a Mighty Midget motor which by suitable gearing could open and close by a reciprocating motion a steam or throttle valve. It will be obvious that increasing the pulse rate will not affect the steering control (providing that the mark/space ratio is not disturbed) yet the vessel can now distinguish between normal steering signals and an engine-speed-change signal.

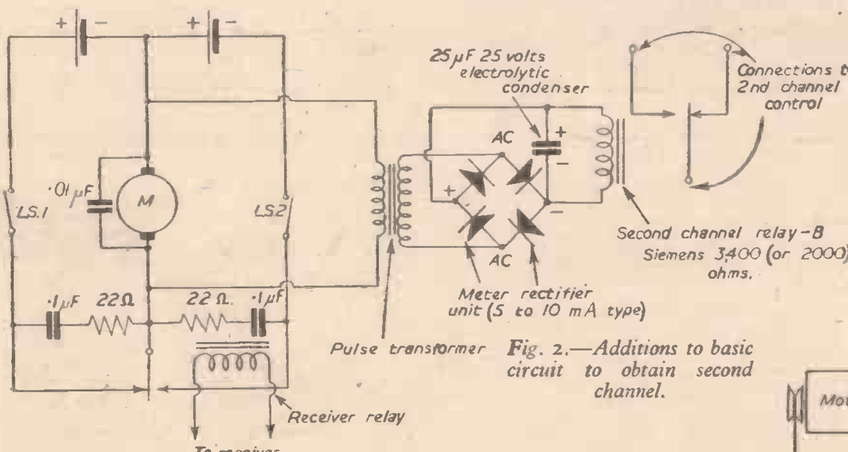


Fig. 2.—Additions to basic circuit to obtain second channel.

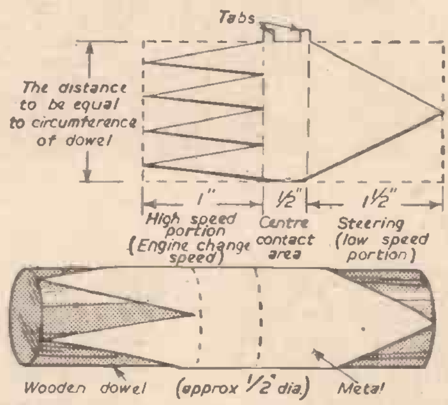


Fig. 3.—Method of rolling soft brass or copper shim round dowel rod to make up dual purpose pulse drum.

The Modified Control Box

To provide the extra control the control box must be altered so as to generate, when necessary, high speed pulsing to operate the engine-speed-change relay. It can be done very simply by increasing the battery voltage used for driving the pulse drum motor and normally keeping it slowed down by using a series resistance (a rheostat) in the circuit. When it is desired to change speed a button is pressed which shorts out the resistance

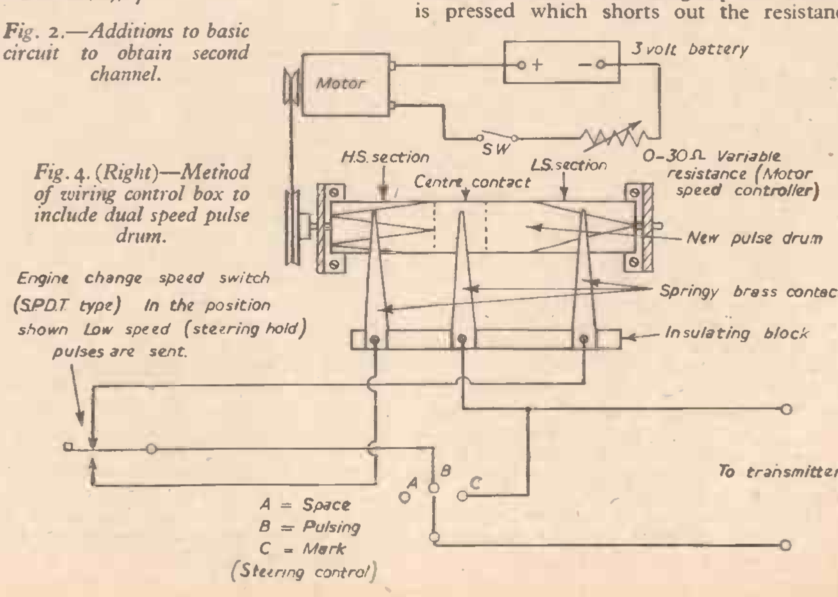


Fig. 4. (Right)—Method of wiring control box to include dual speed pulse drum.

and, therefore, speeds up the motor. This method suffers from the mechanical inertia of the pulse drum and motor which take time to speed up and slow down. A better method is to make a new pulse drum as illustrated in Fig. 3 which consists really of two drums in one. The right-hand portion is the normal steering drum with its two contacts, one of which can be slid along to alter the mark/space ratio and therefore avoid "creep" in the steering motor in the boat. The left-hand part is the high speed pulse section with a separate contact; it gives four pulses per revolution compared with one per rev. from the main drum and is equipped with its own sliding contact. The double drum can be made as before from thin brass or copper shim cut to shape as shown and rolled round a wooden dowel rod, then the tabs are soldered to hold in position. A better job is made from a thin gauge piece of brass tubing filed to shape and mounted

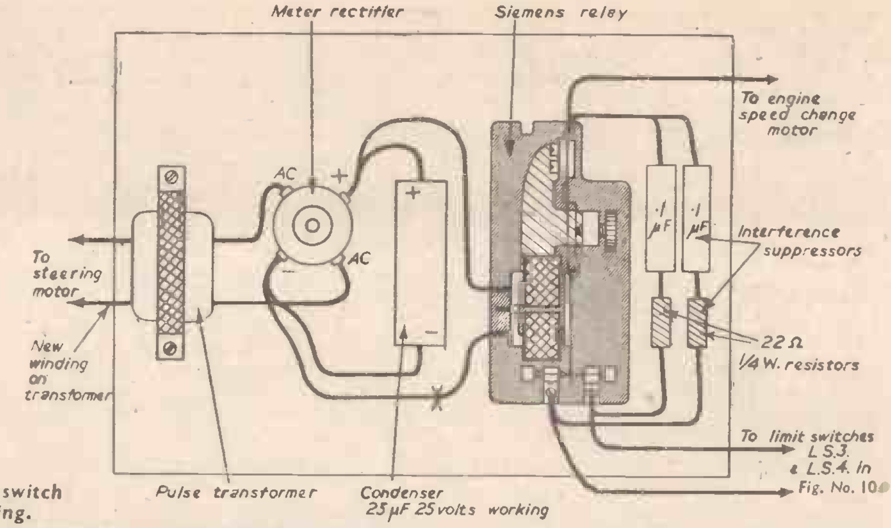


Fig. 5.—Extra components to operate engine control gear—practical wiring diagram. Insert meter at X for testing.

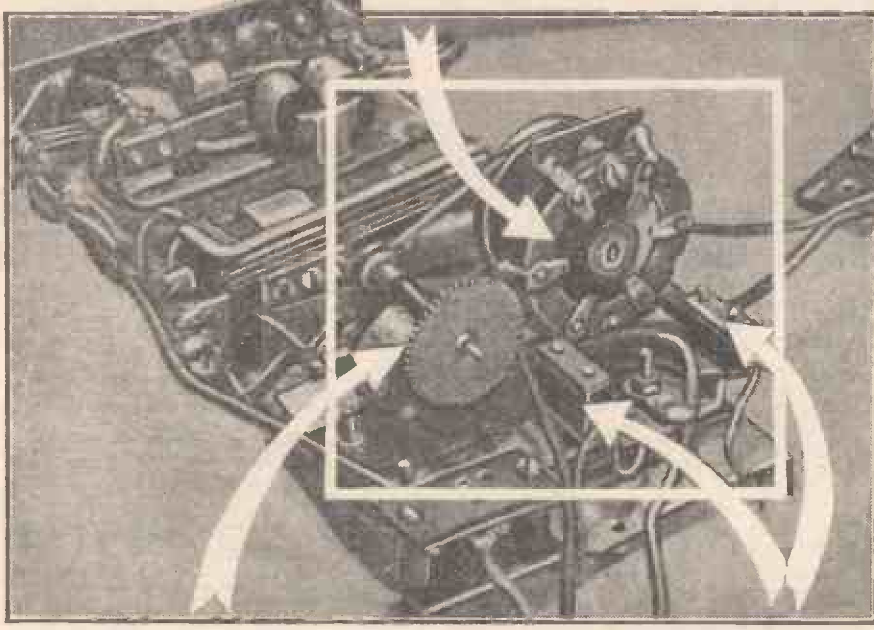
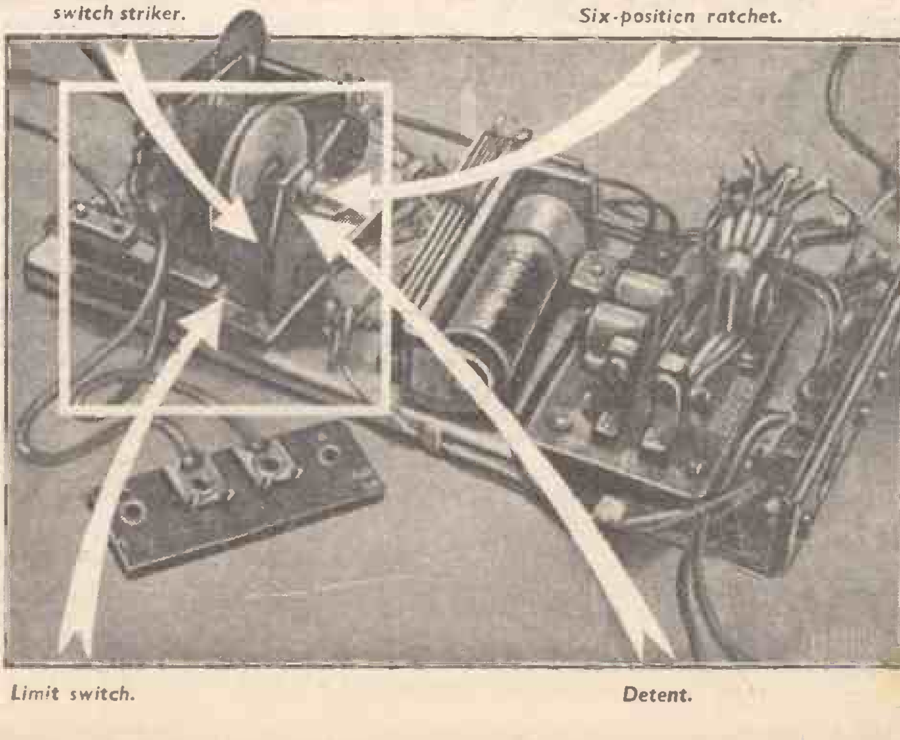


Fig. 6 (Above).—A six-position motor-driven sequence switch suitable for engine speed control in electrically propelled boats. Made by Mr. L. Thompson. In this system the motor drives one way to change to the next contact in the sequence, then drives back again to reset for the next position (i.e., a spring return is not used which is a considerable advantage.)

Fig. 7 (Right).—Another view of the six-position motor-driven sequence switch.



on the wooden dowel as described last month. The three contact fingers should be of springy brass or copper shim which rest lightly but firmly on the drum. The control box should be rewired as shown in Fig. 4 and an S.P.D.T. type push button (a Micro switch is suitable) incorporated to bring in the high speed pulse unit when necessary, for changing engine speed. This system is very reliable and instantaneous in action.

Extra Equipment in the Boat

To separate the high speed pulsing from the normal steering pulsing in the model it is necessary to incorporate the pulse transformer, the meter rectifier, the 25 µF 25 volts D.C. working bias electrolytic condenser and the second relay which can be a Siemens 3,400 ohm. or a 2,000 ohm. high-speed type, together with a suitable sequence switch for operating the main driving motor.

It will be found very convenient to mount all of this "intergear" equipment, as it is called, on a suitable base, which can be a small piece of 3-ply wood, and then screw this into the model when tests have been satisfactorily concluded. This is a lot easier than trying to wire up the equipment and then adjust it *in situ*.

This extra equipment is shown in Fig. 5.

Pulse Transformer

The pulse transformer is converted from a midget output transformer of the 1.S.4 type. The laminations should be removed and the original secondary (the outer layer of thick wire) removed. It should be replaced with as many turns of 32 s.w.g. enamelled copper wire as will go into the space and this winding now forms the primary of the pulse transformer (i.e., the winding connected to the terminals of the Mighty Midget steering motor. Readers may find that they have to experiment with this component to obtain the best results, as output transformers of different manufacturers vary.

It may be found that a winding of 30 s.w.g. or 34 s.w.g. will give better results. Obviously the thinnest wire that will work satisfactorily is the best, as current is saved from the energising batteries.

Meter Rectifier

The output from the secondary of the pulse transformer is connected to a meter rectifier of 5 or 10 mA rating (the higher rating is to be preferred). The leads should be joined to the two A.C. connections sometimes marked ∿ on the rectifier and the two other terminals marked + and — should be connected to the second relay and to the electrolytic condenser.

Electrolytic Condenser

The output from the rectifier consists of a series of pulses and the function of the $25\ \mu F$ condenser is to store the energy during a pulse and release it in the off period until the next pulse arrives. It therefore smoothes the output and prevents the relay from chattering. In common with all electrolytic condensers it is important that it should be correctly connected in the circuit and the positive from the meter rectifier should be connected to the positive terminal of the condenser. Likewise the negative of the rectifier should be connected to the negative of the condenser.

The relay which, as previously mentioned, should be of a high-resistance type, should now be connected across the electrolyic condenser to complete this part of the installation. For testing, a milliammeter should be connected in series with one of the leads to the relay so that the current generated in the circuit can be checked.

Testing

It is now desirable to test the unit, and this is best done via the radio link, i.e., using the transmitter and receiver as if working at a distance although it is possible to connect the control box directly to the coils of the receiver relay (using a 30-volt battery in series to energise the circuit). Note that, to prevent interference radiation and possible sticking of the relay contacts, suppression circuits have been included between the armatures of the relays and each contact point. They consist, in each case, of a 22Ω $\frac{1}{4}$-watt resistor and a .1 F condenser. This is standard practice and suppressors of this type should always be used across make-and-break contacts otherwise trouble may be experienced due to the receiver operating from radiation in the boat.

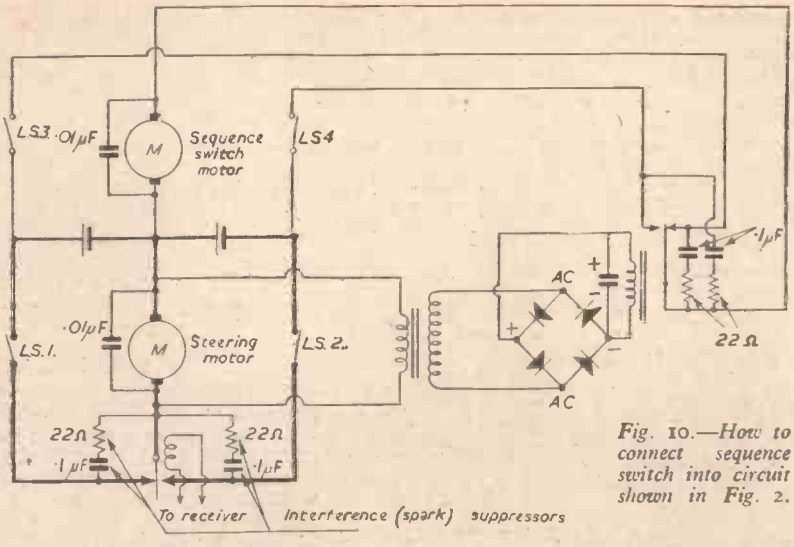


Fig. 10.—How to connect sequence switch into circuit shown in Fig. 2.

The unit should be used first with the normal steering 50/50 pulse and the steering motor should work in the normal way. A reading should be obtained on the milliammeter connected in the relay circuit, but it should only be about 1 or 2 mA., and the second channel relay should be adjusted so as not to close on this current. The Siemens' relay is very handy in this respect as the armature tension can be so easily adjusted. Mark and space will, of course, provide the normal steering operation. Now press the engine change-speed button on the control box. The current shown on the milliammeter should at once rise to a value of 4mA. approx. (the actual amount depends upon the battery voltage used and the transformer windings). The second channel relay should at once close and should open again when the button is released. If difficulty is obtained in making the current low enough on the normal steering 50/50 pulses it may be necessary to slow down the pulse rate by reducing the speed of the pulse drum. A variable resistance (0-30Ω) to control its speed is therefore a useful auxiliary on the side of the control box.

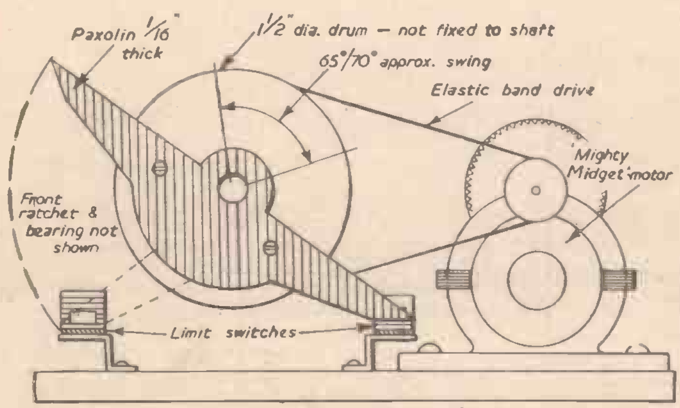


Fig. 8.—Six-position motor-driven sequence switch. N.B. Drum is driven approximately 65 to 70 deg. between limit switches, but the six-position ratchet (behind) only moves the shaft in 60 deg. steps.

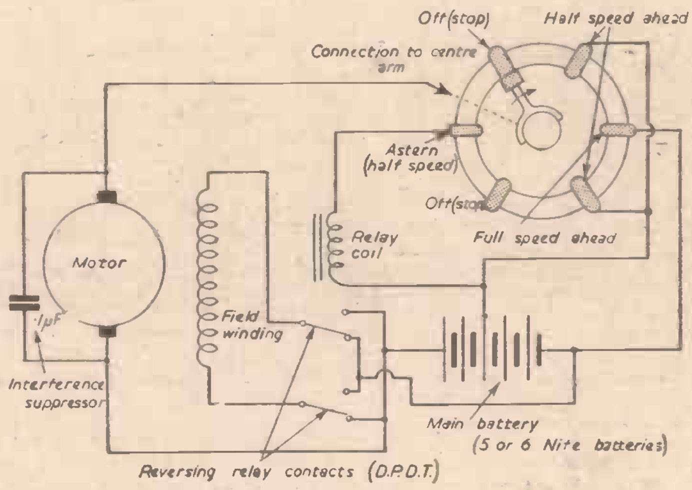


Fig. 11.—Method of wiring up six-position sequence switch to driving motor.

Having proceeded this far it is now quite a simple matter to use the second channel relay to operate a further Mighty Midget type of motor which will, by suitable gearing, switch on or off or reverse the main motor or else open and close a throttle valve in sequence. Readers will probably wish to use their own inventiveness for devising systems to control the model's movements, but here is one very good method of controlling electrically-propelled models.

The system is based on a six-position sequence as follows:—Off, half-speed ahead, full-speed ahead, half-speed ahead, off, astern, and is incorporated in the air-sea rescue launch built by Mr. L. Thompson.

A—driving ratchet. B—the ratchet to prevent the shaft turning during back motion.

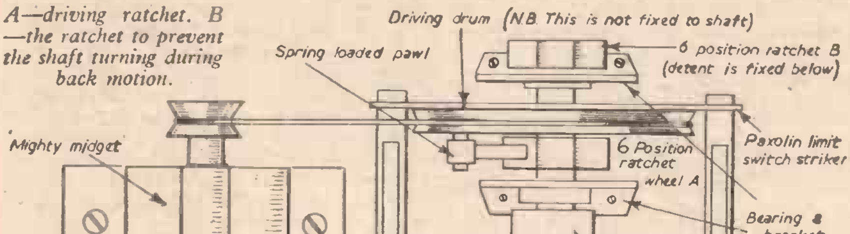


Fig. 9.—Six-position motor-driven sequence switch.

(Continued on page 136)

Fig. 1.—The completed wall light.

A Scroll WALL LIGHT

A Decorative Wall Lamp Made from Odd Scraps of Metal

By J. A. HELYAR

IN the original model, shown in the heading sketch, Fig. 1, brass was used but mild steel or a combination of the two metals will be equally successful.

The mains dimensions of the various parts are clearly shown in Fig. 2. The wall plate is fashioned from 16 s.w.g. or 1/16in. thick sheet. After shaping, all rough edges should be removed with a smooth file. The top end is now formed into a scroll by bending the plate round a piece of 1in. diameter pipe. This may require the use of a vice, in which case any teeth marks left on the metal should be removed with a file. A better method is to protect the jaws of the vice before bending with pieces of bent tinplate.

The Scroll

This is made from 1/16in. thick material, 5/8in. wide, cut to the length shown in Fig. 2. Each end should be hammered out as shown, and all rough edges removed. Form into a "S" shaped scroll to approximately the dimensions given. The tight curves at each end should be bent first, taking care that they go in opposite directions. The rest of the bending can be done by hand and the shape adjusted accordingly.

Forming the Dish

This is hammered out of a 3¼in. diameter disc of soft brass or aluminium. It is only necessary to form a shallow lip, ¼in. high at the most. In the centre make a ⅜in. diameter hole to fit over the brass lamp-holder adaptor.

The candle clip is cut from stout tin plate or very thin sheet brass to the dimensions given in Fig. 2. Bend up the arms as shown and remove sharp edges.

Making the Arm

The arm is now constructed from a 9in. length of square brass tube or, if this material is not obtainable, prefabricated from 1/32in. sheet.

The end of the arm to be fitted to the wall plate is filed carefully so that it is at right angles on all four faces. The other end is cut to a point on each face, bent in and soldered. A 5/16in. diameter hole is now drilled in the centre of one face 2in. from the point. All sharp edges and surplus beads of solder are now removed with a file. The small brass threaded adaptor is now fitted to the arm by a fillet of solder on each side, under the flange. At this point care must be taken to ensure that the hole in the adaptor is in line with the one in the arm.

The completed arm is now soldered securely to the wall plate, making sure it is at right angles and that it does not project at the back. Any slight projection, however, can be removed with the file, so that when it comes to installing the bracket it will be flush against the wall.

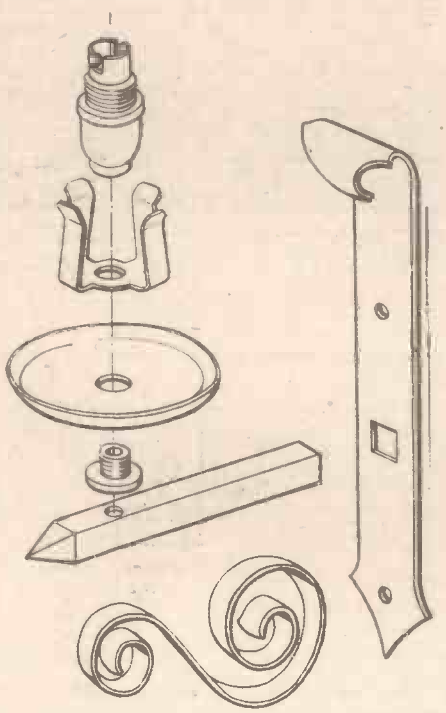


Fig. 3.—The order of assembly.

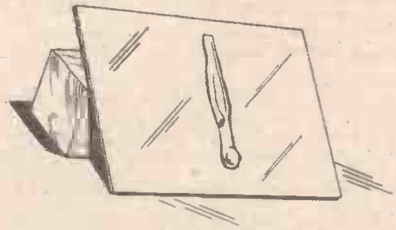
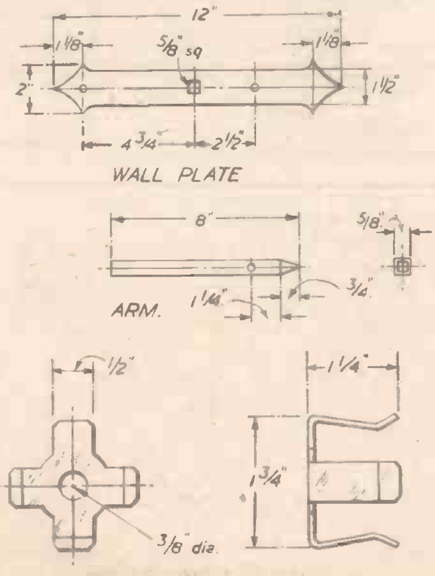


Fig. 4.—Making a solder "drip."



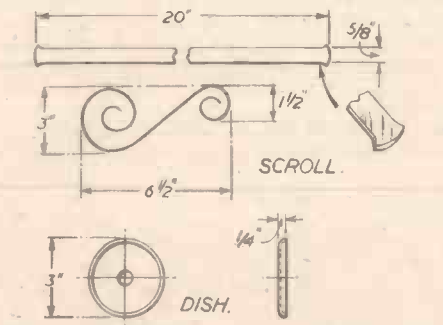


Fig. 2.—Dimensioned views of all the parts.

Attaching the Scroll

This is done by soldering it at the three points of contact with the arm and wall plate. Before soldering, joints must, of course, be thoroughly cleaned with emery cloth and tinned. Again remove any surplus solder with a file.

Now that all the parts are made they should be cleaned and painted matt black. This will give a realistic wrought-iron appearance. When dry the complete bracket can be assembled by placing the dish, followed by the clip on the adaptor, and screwing up the lamp-holder.

Assembly will be facilitated by reference to Fig. 3

The Candle and Drips

The candle is made from 1½in. diameter cardboard tube, 3in. long. Solder is used to make the imitation wax drips in the following way. Melt a small quantity of solder in an old tin lid, then pour a large drop on to a sheet of aluminium set at about 45 deg. (Fig. 4). The molten solder will run down the sheet, cooling very quickly and in so doing will form a realistic "drip," which can then be easily picked off the aluminium. Several attempts may have to be made before satisfactory "drips" are produced.

After trimming the tops of the "drips," three or four being required, they are then attached around the periphery of the cardboard tube with a suitable adhesive.

The whole assembly should then be painted off-white, giving two or three successive coats.

Metal tubes can, of course, be used for the candle, but it will be necessary to attach each "drip" with two small rivets. This latter method was used on the original model.

The choice of lampshade is left to the constructor, so that it may blend with furnishings. It should, of course, be one of the "clip on" types as the screw ring on the lampholder is shrouded by the candle.

A LIGHT DIMMER FOR THE AMATEUR STAGE

Add This Professional Touch to Your Amateur Production This Winter

By H. A. ROBINSON

STAGE lighting for amateur dramatics or concerts is never really complete without some arrangement for dimming and intensifying the illumination slowly. Certain effects are entirely dependent on a protracted "fade out," and even the putting on of the lights to start with and cutting out at intervals, etc., is improved by "rheostat" action.

There are several methods by which a progressive increase or decrease in the flow of an electric current can be produced, but for the amateur stage electrician the "liquid resistance" as described here and shown in Fig. 1 is without doubt the simplest.

The principle is that when a current is passed through a vessel containing water to which common salt or soda has been added varying resistances come about in proportion to the distance through the solution the current has to make its way to close the circuit.

upper corners, also contact the sides of the pail. This is simply a matter of cutting the triangle to suit the particular size and shape of pail being used.

The spindle "2" may be made from a piece of discarded broom handle. The two recesses for it are taken out from opposite top edges of the box. To prevent the spindle slipping sideways and so out of the hollows two wooden washers ("3" in Fig. 2) are fitted. They are made as shown in Fig. 3, located just inside the box, and are fastened to the rod by a nail or screw carefully inserted and revolving with it. Cut the washers first as a square and then trim the

Fig. 1.—The completed light dimmer.

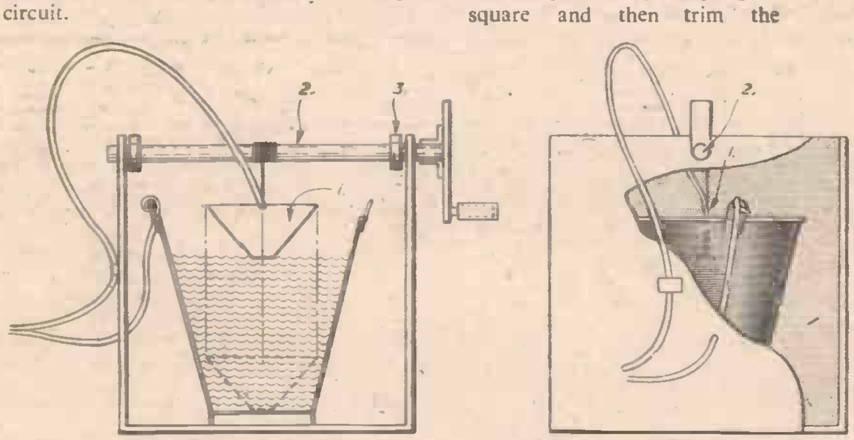


Fig. 2.—Two views showing the general arrangement of the dimmer.

The cross-sectional diagram (Fig. 2) shows the general arrangement of the "dimmer"—the official name for this apparatus, though it is also used for entirely opposite action. As laid out it is capable of dealing with currents up to 5 amps.

An ordinary domestic metal pail, if possible of fairly steep sides, is used. The triangle of fairly thick tinplate, marked "1" in Fig. 2, is made by folding a diamond shape across its smaller axis and with its lower points ("a" in Fig. 3) turned outwards. The box used is about the size of a tea-chest and this is to keep everyone away from anything "live" including, of course, the metal pail itself.

Item "2" is a spindle by means of which the triangle is raised and lowered in the pail, which latter holds the resistance-varying solution. The spindle runs in the recesses cut out of the upper edge of the box.

When the foot of the triangle is on the bottom of the pail the current is running straight through. The best results here are obtained when the triangle is cut so that when the lower point is on the bottom the

corners as shown.

At one end of the rod is the simple cross-bar and handle (held by small angles) to facilitate easy and smooth turning.

Assembly

Place the pail in the box. Break one of the electric leads to the footlights or whatever lamps are to be controlled and take the loose end of one side of the break through a hole in the side of the box. Attach this cable firmly to one of the handle loops on the top edge of the pail. Strip the cable end for a few inches and wind the bare wire round the metal loop, tightening up with pliers. A bolt through the metal would make a better terminal.

If dealing with D.C. electric supply the negative line should be broken for the dimmer.

Now set the spindle in the hollows, see that it rotates easily, and from it suspend, with thin cord, the triangle of tinplate.

Next take the other end of the cable and attach this firmly to the top of the triangle, as shown in Figs. 1 and 2.

The cord must be fixed securely to the spindle with a few tacks at its end and wrapped round several times so that the raising and lowering of the tinplate is positive in action.

The cable attached to the triangle must come down easily with it and should stand in an easy curve above the edge of the box, as shown in Fig. 2. This is effected by fastening the cable to the side of the box with a leather strip (a piece of old strap will do). The leather holds the cable, which should be of the heavy type (not untwisted flex) in a light friction grip, and it can be pulled up and down till the right amount of slack in the loop is secured and held. There must be no dragging of the lead over the edge of the box.

Finally, fill the pail with a saline or soda solution. First nearly fill with clear water and lower the triangle to the bottom. Switch on, and if all is in order the lights in the circuit will burn to their full intensity. Rotate the spindle, so drawing up the triangle, and the lights will go out. Raise till the point of the tinplate is just in the liquid, as shown in Fig. 2.

Now slowly add a concentrated solution

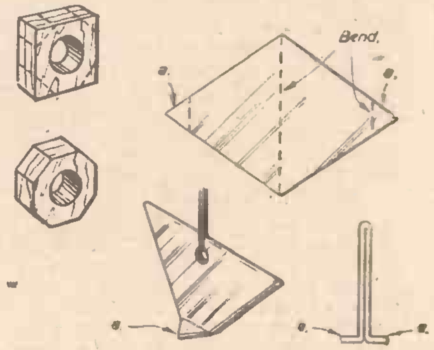


Fig. 3.—Construction of the tinplate triangle and the wooden washers.

of salt or soda, switching off as it is stirred in, and then switching on to see the result.

The salt or soda solution has the effect of reducing the resistance of the water, and must be added till it is found by trial that, with the triangle still at the top position, and with its point just immersed, the lamps start to glow very faintly. This is the degree of concentration needed.

Lowering the triangle, it will now be found, causes the bulbs to burn more brightly in proportion to the area immersed and the distance it is from the pail. When the metal is at last contacted, the lamps burn again at their full intensity.

NOVEL Underwater Apparatus

Some New Devices for the Aquarist Which are to be Produced in America

SHOWN in use in Fig. 1, the "AquaPed" is somewhat like an underwater unicycle. It is designed to propel an underwater swimmer more efficiently than is possible by the use of swim fins. The essential feature of the device is the application of scientifically designed 27in. diameter propellers to swimmer propulsion.

Fig. 1.—The AquaPed in use.

The AquaPed is so arranged that the swimmer applies power to pedals in a manner similar to pedalling a bicycle. The pedals are geared to two lightweight alloy counter-rotating propellers mounted on concentric shafts, as shown in Fig. 2. The counter-rotating propellers are necessary to eliminate torque.

The operator sits on a bicycle-like seat and the AquaPed is held to his body by suspender-like straps. The device is manœuvred by simply bending the body and steering with the hands. The AquaPed provides speeds from two to three times faster than those obtained by swim fins. The weight of the complete unit is 19 pounds. It has a slight buoyancy, permitting operation on or under the surface of the water.

Fig. 2.—The AquaPed.

The "MiniSub"

This is a small submarine which is designed for two men, or one with cargo. Motive power is supplied by foot pedals that drive propellers or by batteries and a 1 h.p. electric motor. The craft is freely flooded and the operators wear Aqualungs. Fig. 3 is a photograph.

The MiniSub is 14ft. 4in. long, 22in. wide and 42in. high. Pedal operated, it weighs 375 pounds; with batteries and electric motor, 425 pounds. The craft is manœuvred by means of a control wheel, like an aircraft. It can loop, roll, and climb or dive vertically. The operators sit erect, back to back, with their heads in transparent domes like those on fighter aircraft. See Fig. 4.

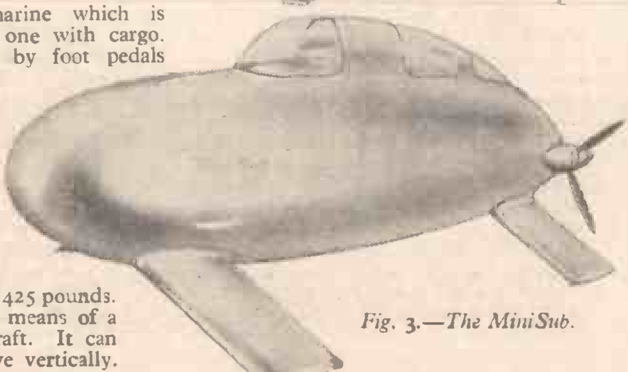


Fig. 3.—The MiniSub.

Using foot power only, one man can attain a top speed of 4 m.p.h., or he can cruise comfortably at 3 m.p.h. for as long as his air supply permits. If two men pedal the top speed is 5 m.p.h., the cruising speed 3.8 m.p.h. With the electric motor, two speeds are possible, 7.3 and 3.8 m.p.h.

The MiniSub is equipped with control vanes that provide excellent manœuvrability. The hull and control vanes are made of plastic-impregnated laminated glass cloth. The hull is three layers thick, with additional layers at points of stress and wear and on the control vanes. The vanes are swept back 30 deg. to prevent them from catching seaweed. A large plastic canopy provides good visibility and also serves as the access hatch.

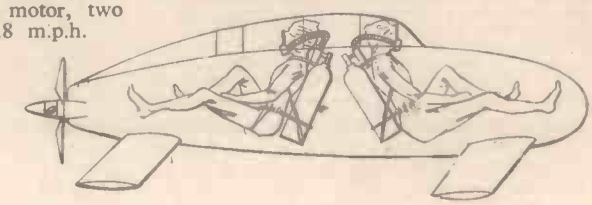


Fig. 4.—The crew sit back to back in the MiniSub.

Development of these craft started as a hobby with the inventors, but as commercial applications became evident the projects were taken over by the Aerojet-General Corporation, which intends to put both craft on the commercial market.

It is expected that the MiniSub will appeal to sportsmen, construction and salvage companies, scientific oceanographic agencies, including fisheries, etc., and offshore prospectors such as those searching for oil and uranium.

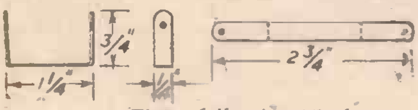
The two devices have been invented by C. A. Gongwer, manager, and G. M. McRoberts, chief engineer, of the Underwater Engine Division of the Aerojet-General Corporation, Azusa, California.

A Remote Controlled Model Car

A Method of Converting a Toy Clockwork Car to Electric Drive and Remote Control

By A. B. ORR

AS an alternative to the Bowden cable method of steering, which tends to limit the model car's manœuvrability, I decided to use a servo motor. This eliminates the restricting Bowden cable and



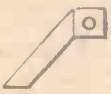


Fig. 1 (Above).—The bracket. Actual dimensions will depend on the size of the car.
Fig. 2 (Left).—The arm soldered to a 1/16in. nut.

the model needs only to trail a light plastic flex. I was not keen on spending a lot of time on the body work, and this problem was overcome by converting a clockwork car to electric drive and fitting power steering.

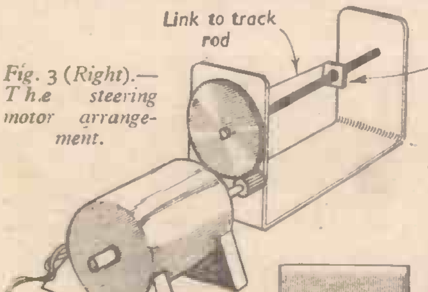


Fig. 3 (Right).—The steering motor arrangement.

There are many toy cars on the market, mainly of foreign origin, that have all the requirements necessary for conversion. These requirements are not exacting and are: (a) The model should be at least 7in. in length and have a bonnet height of not less than 1½in., and (b) it must have steering fitted. A visit to the nearest toy shop should afford a range of models from which a suitable one can be selected. Many of the larger toy shops have toys which were broken either in transit or demonstration which they are only too glad to get rid of at reduced prices. One of these would suit the job perfectly.

Having chosen the car, the first operation is to convert the drive from clockwork to electric motor.

Drive Conversion

A Mighty Midget was chosen as the power unit, as it is really small and has ample power for the job if suitably geared down. Gearing down can be done by mounting the motor so that its shaft bears on the tyre, but this is not always successful as it depends on the wheel being completely true and steady on its bearings. Another method is to use a countershaft to reduce the speed. In the original, however, the existing gears on the

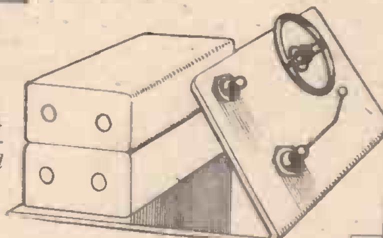
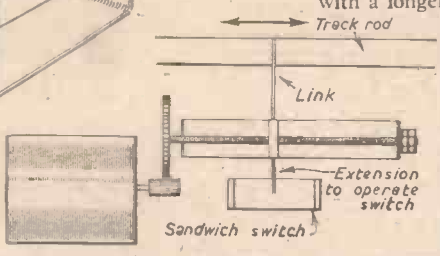


Fig. 4 (Right).—The control panel.

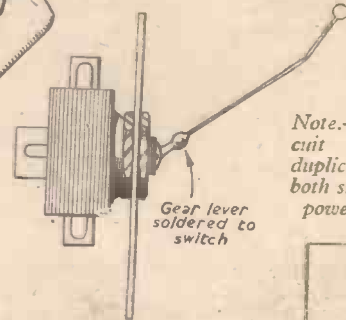
clockwork motor were utilised. To do this remove the spring from the motor and run the car along a table. The wheels are now driving the gears and it should not be difficult to select a gear that, when driven by the electric motor, will give the necessary reduction. Bear in mind that the car should travel quite slowly, as it is a tricky job negotiating table legs and chairs if the car is travelling at any speed. Having selected a train of gears eliminate any unwanted ones and put them to one side for possible use later. Remove the shaft from the gear it has been elected to drive and replace it with a longer one that will protrude about ½in. from the side. On to the projecting shaft solder a ½in. pulley. As the Mighty Midget is supplied with a pulley on the shaft it only remains to mount the electric motor with the pulleys in line and couple with a rubber band to act as the driving belt.

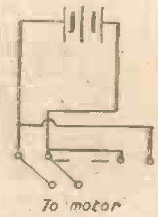


Power Steering

Make the bracket shown in Fig. 1 from light metal strip. Cut the head off a 1½in. x 1/16in. bolt and to one end solder the largest of the gears that were left over from the clockwork motor. Mount the screwed rod in the bracket, screwing on a 1/16in. nut in between the supports. Put lock nuts on the free end.

To the existing track rod solder an arm at right angles made





Note.—The circuit below is duplicated for both steering and power drive.

Fig. 6.—The toggle switch gear lever.
Fig. 7 (Right).—The control panel circuit.

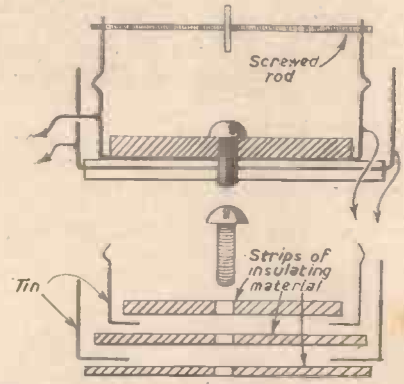


Fig. 8.—Details of the sandwich switch used for the flasher unit.

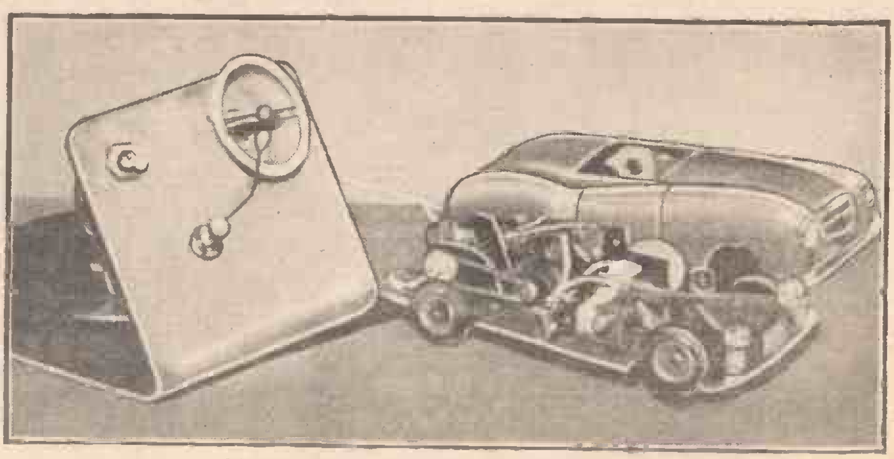


Fig. 5.—The control panel and interior of car.

as in Fig. 2. Now mount the bracket and screwed rod assembly in such a position that the arm on the track rod can travel along the threaded rod without obstruction, from lock to lock. Solder the track rod arm to the nut on the threaded rod and check that there is complete freedom of movement.

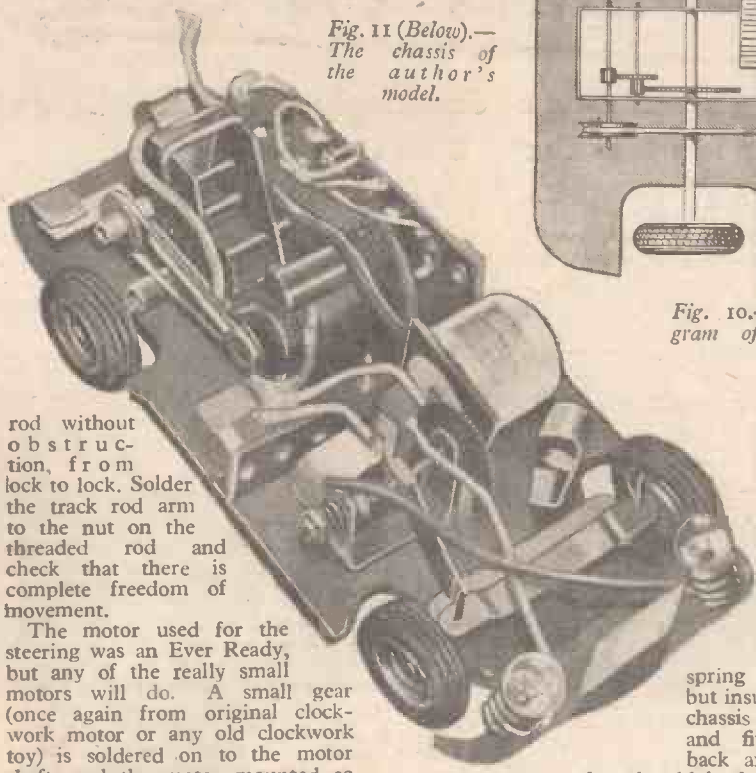


Fig. 11 (Below).—The chassis of the author's model.

The motor used for the steering was an Ever Ready, but any of the really small motors will do. A small gear (once again from original clockwork motor or any old clockwork toy) is soldered on to the motor shaft, and the motor mounted so that the gears are in mesh, see Fig. 3. For testing purposes, connect up the motor and run it first one way and then the other to ensure that there is freedom of travel from lock to lock. A difficulty arose here due to the nut on the threaded rod jamming at the end of its travel, but this was remedied by fixing stops to the chassis as near the track rod as possible.

Control Unit

This can be as elaborate as the reader wishes, the essentials being two double-pole, double-throw switches to reverse the current to the two motors. One is a rotary switch while the other is of the toggle variety.

The "dashboard" is made from aluminium bent to the shape shown in Figs. 4 and 5. The steering wheel is made up from heavy gauge bull wire and is soldered on to the rotary switch shaft. The toggle switch, which is used as a gear level, should have an extension solder on in the shape of a gear lever, with a knob of solder at the top, as shown in Figs. 4, 5 and 6.

Wiring

The leads from the two motors should be taken to a small terminal strip secured to the chassis. The control flex should then be connected to this strip and tied to a secure part of the chassis to protect the connections in case the car should get out of control and jerk at the flex. About 6ft. of connecting flex is taken from the car and is likewise secured at the control panel end. The circuit for the control panel wiring is shown in Fig. 7. A third switch can be incorporated to switch the batteries on and off.

The car is now ready for the road in its "standard" works form. However, there are optional extras. Flashing indicators can be fitted that really add to the realism. A switch is made up from light strip tinplate (see Fig. 8) and mounted behind the bracket supporting the threaded rod. An extension (shown diagrammatically in Fig. 3) is soldered on to the nut traveller that closes the switch at each lock. The flasher unit is simply a contact made from a short length of clock-spring anchored to, but insulated from, the chassis at one end and fitted over the back axle. Where it passes over the axle a blob of solder is formed to make a small cam. The free end of the strip is bent to make contact with the chassis when the cam is on the flat, the circuit being broken when the strip is forced up by the hump on the rear axle. The strip should be insulated where the cam on the axle bears on it. The circuit for the flasher is shown in Fig. 9. The flasher bulbs can be fitted in the front or the rear, depending on the space available. The bulbs are soldered to the chassis by their bottom contact. Holes can then be drilled in the body and coloured cellophane stuck on the inside. The batteries for the flasher are of the pen type and can be accommodated in any spare space available on the car. Figs. 10 and 11 show the layout of the author's model and give some idea of component sizes.

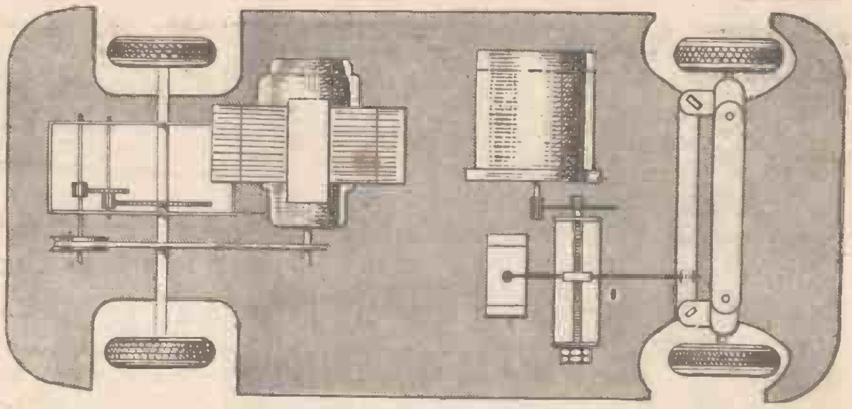


Fig. 10.—A layout diagram of the author's model.

Other gadgets will no doubt come to the mind of the more ingenious reader. A horn could be fitted and full lighting. It will depend on the size of the car what innovations are included.

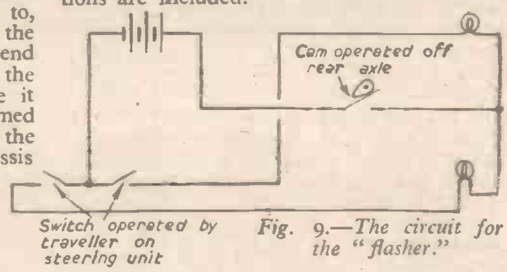


Fig. 9.—The circuit for the "flasher."

RADIO CONTROLLED MODELS

(Continued from page 131)

The unit is shown in Figs. 6 and 7.

A Yaxley-type switch is the basis of the unit, and this has an outer ring carrying the six contacts corresponding to the speeds mentioned above. The centre rotating contact is moved a step at a time by a six-tooth ratchet wheel. A second ratchet wheel and detent prevent return motion. The driving ratchet is engaged by a pawl carried on a drum which is in turn driven by a Mighty Midget motor. The drum is free to rotate on the common shaft and actually moves about 65-70 deg. each time the sequence is moved to the next step (to make sure the pawl engages correctly). Originally this was done by a small length of cord being wound round the pulley of the motor when the signal was given and a spring was used to unwind the coil and reset the unit. Now, however, two limit switches are used to determine the degree of rotation and a paxolin striker is rotated with the drum, opening the two limit switches in turn. By correctly positioning the switches and shaping the striker the exact angular movement of the drum can easily be obtained. This method has the advantage that a spring return is unnecessary as the motor drives in both directions. Figs. 8 and 9 illustrate the method of constructing the unit, whilst Fig. 10 shows the method of wiring up the limit switches and motor into the circuit of Fig. 2.

The wiring up of the Yaxley switch to the main driving motor is shown in Fig. 11. It will be seen that a tap on the battery provides the current to give half-speed on the motor, which in this case is a Hoover 11.5-volt motor generator with the HT secondary removed and driving twin screws through reduction gearing. Full speed is obtained from the full battery voltage whilst astern is obtained by passing the current through a double-pole double-throw relay and then on to the motor brushes. When the relay is energised in the astern position it reverses the direction of current in the motor-field winding and, therefore, reverses the drive. Suitable relays for this purpose are hard to find, and it is usually necessary to resort to rewinding the coil of a small D.P.D.T. type with 24 or 26 s.w.g. enamelled copper wire. This is quite easy if done in the chuck of a drill, and it is not necessary to be careful about laying the wire accurately. Pile winding is quite good enough, but it may be necessary to experiment with wire gauges before the best results can be obtained.

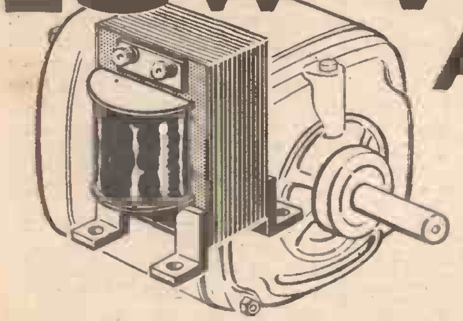
If the reader fancies an engine-room telegraph bell which rings for speed changes this can be incorporated by wiring the bell across the engine change-speed Mighty Midget motor. It will actually ring when the engine-speed button is pressed and ring again when it is released.

The results obtained with the system described are equal to those obtainable from a three-reed audio system.

Next month we will describe a mark/space system which is roughly equal to a four-reed control, but which also gives fully proportional control of steering.

(To be continued)

LOW-VOLTAGE A.C. SUPPLIES



Adapting an Old Radio Transformer to 24 Volts Output

By S. SIMPSON

OCCASIONS arise where a model-maker requires a low-voltage A.C. supply but does not want to go to the expense of a new mains transformer. This article shows how a discarded radio transformer may be adapted to his needs provided the faulty unit meets three requirements. These are: (a) it should be not more than two years old; (b) it should show no sign of overheating (clotted wax which has oozed from windings) as these points affect the condition of the enamel insulation on the wire; and, finally, (c) the primary winding must be in good condition. This is the innermost winding on the majority of transformers and comprises a large number of turns. After a period of service its insulation seldom withstands handling. Since many transformers fail because of a faulty HT winding, these provisos are not difficult to meet; many radio dealers will be able to supply such a unit.

If the transformer is a gift and time is no object, the internal examination of an overage unit may prove worthwhile: an overheated transformer, however, should be considered useless.

Dismantling the Transformer

The work, which in this instance will produce a 24-volt, 2-amp. supply, begins by removing any shroud surrounding the transformer and cutting the primary leads away from the connection strip; the leads should be kept as lengthy as possible. The transformer should now appear as a block of interleaved metal plates which surrounds a bobbin from which several wires emerge. The metal block, or core, is dismantled next. Start by removing the fibre packing piece usually inserted between the interior of the bobbin and the centre limb of the core; a flat and blunt-edged strip of bakelite is ideal for this task.

By inserting the blade of a knife between the top leaf, or lamination, and the body of the core, this lamination can be freed and slipped out of the bobbin. These laminations are commonly of two parts, one E-shaped and the other I-shaped. Having freed one the remainder can readily be removed and the operator will now have the hollow bobbin of roughly square section which carries the windings.

Put the laminations aside in a safe place and prepare a mandrel to fit the bobbin; this should be undersize to obviate damage due to forcing, packing pieces being used to secure the bobbin to the mandrel. Drill a $\frac{1}{4}$in. hole accurately through the axis of the mandrel; if the hole is not truly central difficulty will be experienced when rewinding. Now pass a suitable rod through the mandrel and secure one end in a bench vice; the rod should be of such length that the bobbin can wander slightly. Rubber washers slipped on to the rod on either side of the bobbin are useful in keeping the bobbin central. Stripping down can now begin.

The usual assembly of windings as one works into the bobbin is: (a) 5 volts, 2 amps; (b) 6 volts, 3 amps.; (c) HT winding, usually with three leads; and (d) the mains input winding. All these windings are insulated from each other by layers of impregnated paper of varying thicknesses as also the many layers of the HT winding. Remove the upper layers of insulation and then carefully remove the LT windings (a) and (b); save the wire, whether in good condition or not. Next remove the HT winding; only the papers are useful so the quicker the wire is run off the better.

Winding Details

Having got down to the mains winding and checked that the paper insulation is intact the required 24-volt winding receives attention. All of the wire comprising the original LT windings is replaced, the end

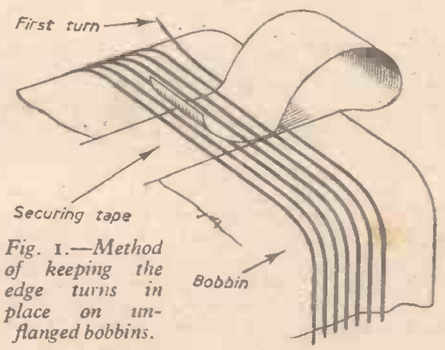


Fig. 1.—Method of keeping the edge turns in place on unflanged bobbins.

of one length being soldered to the beginning of the next, the joint being a "side-by-side" one and lying flat on one of the bobbin faces; adjacent turns to the joint should be spaced away by one wire diameter. The turns are counted as they are replaced and a layer of the heavier paper is inserted between layers of wire. Now divide the total number of turns by 11 and the answer is the "turns per volt" figure. Multiply this figure by 12 and you have the number of additional turns required to give an approximation to 24 volts. The additional wire must be of the same gauge and insulation as the original wire and is connected to it as described earlier.

A quick method of finding the extra length required is to add the lengths of the original windings together and divide by 11; get the answer in inches and you then have the inches required per volt. Multiply this figure by 24 (or any other voltage figure which suits the user's needs) and the result, plus approximately 6in. each end for connections, is the *total* length needed; this is the method of dealing with transformers whose LT windings are too poor to replace.

Difficulty is sometimes experienced in keeping "edge" turns in place on unflanged bobbins; one method of overcoming this is illustrated in Fig 1 and consists of placing pieces of adhesive tape, sticky side up, across each face of the bobbin. The tape should overhang by approximately 1in. Wind on the first turn, inserting the tapes as you proceed and keeping the starting end of the wire in place with the thumb. (This is probably the most difficult part of the whole job and requires a little patience.) Now fold over the free ends of the tapes. Wind on three more turns, binding down the tape, then pull the end of the tape in towards the bobbin centre. The single turn is now pulled by the tape, tightly against its neighbours. When within four turns of the other edge of the bobbin, lay the tape inwards and wind three turns on to it, leaving a loop through which the remaining wire can be passed; the amount to be passed through is fairly small and the job is not as difficult as it sounds. Again pull the free end of the tape and the last turn will be caught; the surplus tape is then cut away.

Testing

Having replaced the outer paper wrappings the mandrel can be removed. From one of the heavier wrappers cut four strips to guard the edge of the windings (see Fig. 2) and secure them in place with sellotape. Now, begin the core assembly, finishing with the packing-pieces so as to stop buzz caused by the frequency of the AC supply. When complete place the transformer on top of dry, insulating material in such a way that rocking cannot occur and ensure that the LT leads are well clear of each other and of surrounding objects. Connect the mains input leads to one pair of terminals of a two-way fuse block and a flex lead fitted with a suitable plug to the other pair of terminals. Fit fuses not greater than 2-amp. rating, then apply the mains to the transformer. It will kick once, more or less violently, then settle down to a steady hum (if the packing pieces are secure!). Watch the transformer for signs of smoking, indicating a faulty primary or shorted LT wind-

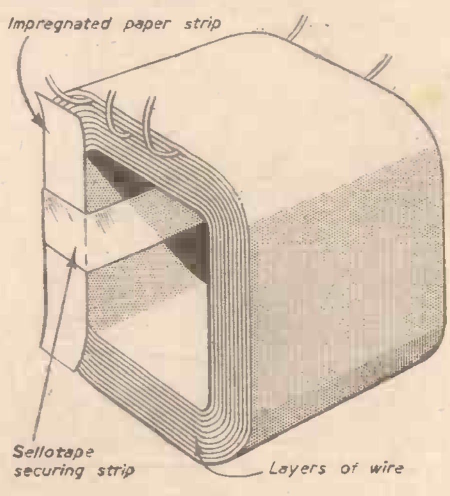


Fig. 2.—Fitting protection strips.

ing; if any, switch off at once and either reject the transformer altogether or consider rewinding the primary—no easy task.

If no smoke is seen leave the transformer running for about 20 minutes then disconnect the supply and feel the core; it should be barely warm. Now connect up, say, two miniature BC lampholders in series and take the two free leads, one to each lead of the LT winding. Fit two 12-volt, 24-watt car headlamp bulbs into the sockets and connect the AC supply to the transformer as before. The lamps should glow at nearly full brilliancy and should be left so for about 15 minutes. (They get quite hot and care should be taken regarding scorching.)

At the end of the trial run check for core heating which should now be considerably greater than when running off load, but should still be comfortable to the touch.

This completes the testing of the transformer and the shroud (if any) may now be refitted and suitable connections devised.

A word of caution, intended for users who are unfamiliar with the theory of transformer action, may be advisable. Do not, under any circumstances, connect the AC supply to the transformer winding if the core has been removed from the bobbin. The resistance, without the core, is very low and the current will immediately blow the fuses. The presence of the core adds inductance and the resulting "impedance" is quite high and safe for connection to the supply. Always check that the core is *tight*, even if only for testing.

Making a Pair of SKIS

Be Ready for the Snow This Year with Skis of Your Own Make

By T. H. E. MARSH

WINTER is the time for skiing, but there is still time before the snow arrives to complete construction of the necessary equipment. Skis are not beyond the skill of the average handyman to make and are well worth any little trouble for the pleasure they may give in use.

Construction

Basically, skis are made from good quality hickory, but birch or ash are quite good substitutes. Two good quality knot-free boards should be selected, about 4in. wide × ⅞in. thick and 6ft. to 6ft. 6in. long. Use the longer length if you are over 10 stone in weight.

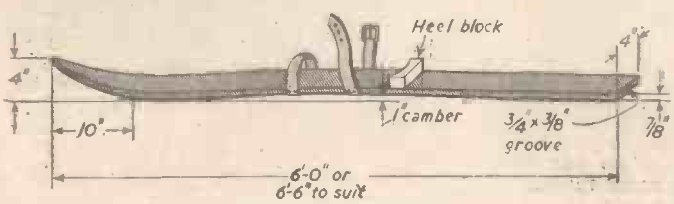


Fig. 1.—The completed ski.

Plane the boards all over and plane a groove ¾in. wide × ⅜in. deep along the full length in the middle of the bottom, leaving all bottom edges sharp. This groove should be semi-circular in section not a Vee, as a Vee groove would tend to pack tight with snow and defeat its object, which is to afford a measure of grip when climbing uphill. Next, taper off the lower surface at the front for a distance of about 10in. till the front edge is only ¼in. or ⅜in. thick.

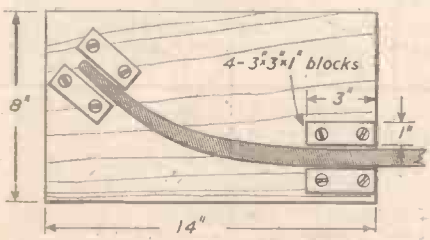


Fig. 2.—The bending fixture.

The front or toe end, which must be bent upwards, should be soaked in boiling water until it is pliable enough to bend. It is then set in the fixture (Fig. 2) and left overnight. The fixture is made of a 1in. thick baseboard about 14in. × 8in. with four 3in. × 3in. × 1in. blocks firmly screwed in place, as shown. The actual shape of the bend is not important so long as both skis are the same.

The Camber

Next, the centre of the ski must be soaked in boiling water to soften for setting of the camber, see Fig. 1. To do this wrap an old cloth round the middle of the ski and support over a basin of boiling water, ladling the water on the cloth. When pliable enough place ski bottom side down on the floor over a 1in. thick batten and weight the ends to meet the floor. When set, the ski will have a 1in. camber upwards in the middle. This gives the skis a flat surface to the snow when in use.

The Fixing Straps

The toe end may now be tapered or rounded off to taste. The fixing straps, made of ¾in. by ⅛in. leather, are now fixed in place, with brass or chromium screws and washers. The toe strap being fixed just behind the balancing point of the ski. It is advantageous to have the skier's boot in position on the ski when fixing both toe and heel straps. The heel block should be fitted at this time and this is a piece of hardwood, 4in. by 2in. by 1in. thick, shaped to fit the heel and firmly screwed into place. The skis are now ready for finishing after thoroughly glasspapering, leaving the top edges slightly rounded and the bottom edges sharp. Two good coats of "Spinnaker" or ship's varnish should be applied to top and sides only. The bottom is treated with paraffin wax well rubbed in. Some sports emporiums stock a special wax for this purpose.

The Ski Sticks

Ski sticks are made from cane or bamboo and are about ⅝in. or ¾in. diameter, and about 4ft. 9in. long. The grip is padded to suit with cotton wool and bound with leather sewn into place after binding on the hand strap. A ring of plywood, 8in. O.D. by 6in. I.D. and ¾in. thick, as shown in Fig. 3, is fixed with four ½in. wide leather straps to centre disc. This disc, 2in. O.D. by 1in. thick, is a tight fit on the cane and is held in place, about 6in. from the lower end of the stick, with one nail driven right through. Screws or washers must be brass or chromium plated. The ski sticks can be finished with a good rub with glass paper and given two good coats of "Spinnaker" varnish, all leather being oiled with linseed oil.

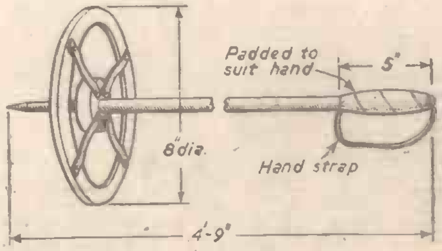


Fig. 3.—The ski stick.

THE EVOLUTION OF GUIDED MISSILES

No. 1.—The "Servo System": Achievement of the Wright Brothers: The German Effort: The V.1: Scope of Future Guided Missiles

By G. W. H. GARDNER, C.B.E., B.Sc.
(Director-General of Technical Development (Air), Ministry of Supply)

Fig. 4.—The X.4 rocket, a small bi-fuel rocket-propelled missile weighing 130lb.

IT is regretted that in interest this article will fall far short of the promise contained in its title. The scope, significance and, indeed, the fascination of the subject can be appreciated fully only by visiting the laboratories, workshops and ranges where work is proceeding. A journey of 25,000 miles would be necessary to cover British work on this subject so most of us must be content with an imaginative tour. Furthermore, the military significance of most of this work is such that disclosure is severely restricted. Since the writer is a member of the Scientific Service of Her Majesty's Government he is especially obliged to respect this restriction and to refer only in a very general way to those parts of the subject of which he makes mention in his article.

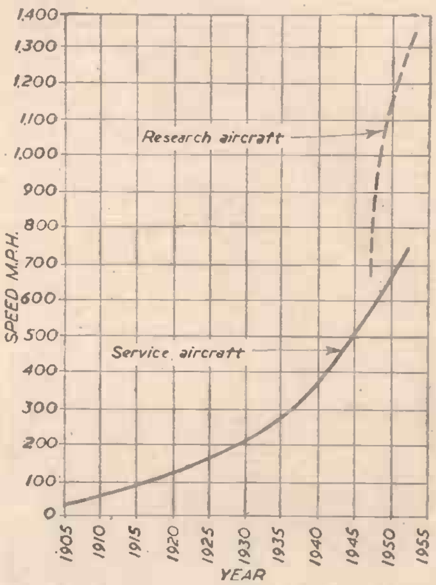


Fig. 1.—Increase in the maximum speed of aircraft during the first half-century of flight.

Fig. 2.—The "Larynx," an unmanned aeroplane with a range of 300 miles, and carrying a war-head of 250lb.

The article will refer to the evolution of guided missiles, very briefly to the types of missile likely to be included in the future in the armouries of fighting Services throughout the world, and, at somewhat greater length, to some of the problems being faced in the course of the development of these weapons. It is not intended to discuss the problems of space flight which are interesting many people.

Before proceeding further a few words should be said about the nomenclature of this subject. In this country the term "guided weapon" is used to mean the overall weapon system which comprises any ground equipment and the part of the system which flies through the air, namely, the guided missile.

The title of this article, however, was chosen in deference to more popular and cosmopolitan understanding.

Evolution

In this imperfect world in which we live national survival demands the pursuit at the same time of military strength and of peaceful agreement. The former requires the devotion of vast scientific and engineering resources to the creation and production of necessary weapons.

For those nations which entertain no aggressive intentions the supreme objective of this effort must be to deter a possible aggressor. The next objective must be to establish adequate defence in case diplomacy should fail. Such precious civilisation as is left for us to enjoy owes much to the pursuit of this policy in the past. The situation became more complex in the last half-century when modern industrial, transport and communications development made possible war on the world-wide scale which we have already experienced. Scientific advance, exemplified by the discovery of gunpowder and radar, and by the ability to fly and to release atomic energy, has also had a profound effect in the past and will have an even greater effect on military policy in the future when we fully understand the potentialities of modern explosives and gain the ability to deliver them at great distances. The synthesis of these new discoveries and of revolutionary advances in technology has undoubtedly increased enormously the seriousness of any threat of war and, fortunately, the effectiveness of any deterrent policy.

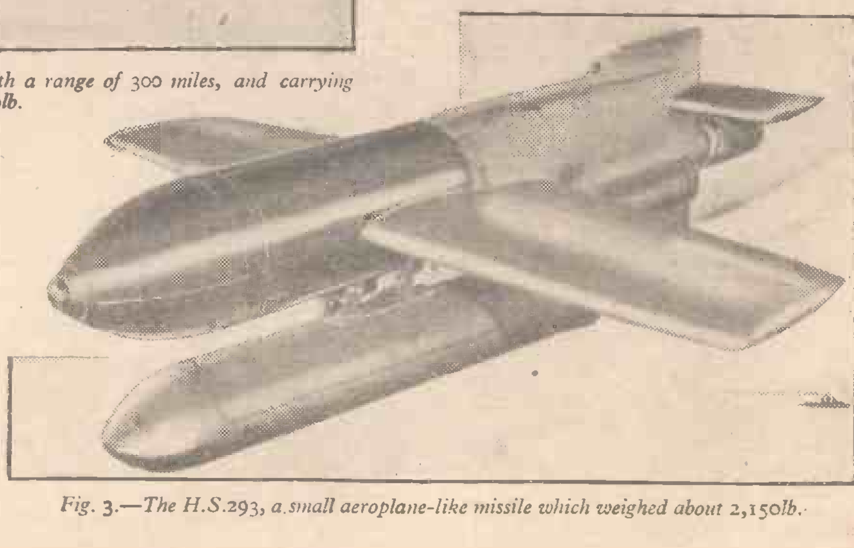


Fig. 3.—The H.S.293, a small aeroplane-like missile which weighed about 2,150lb.

" Servo System "

It is interesting to reflect on some of the evolutionary process which has occurred and to note the rising tempo during the last twenty years. For centuries the effectiveness of weapons depended on the skill and strength of the human being whose " servo system " reached a remarkable level of perfection and reliability. The simple action of picking up an object and the more complex actions involved in playing a game of billiards or in playing the piano demonstrate this achievement. This servo system with such perfect negative feedback has evolved during millions of years and, no doubt, embodies many modifications as the result of experience and of changing needs. When this system was used to aim and propel a missile, limitations of range and accuracy were encountered and these stimulated the development and use of catapults and visual aids such as telescopes. In turn, chemical propellants were adopted and much later radar to overcome visual obscurity. With great skill and persistence these advances have provided the fighting Services with weapons—of which the modern gun and its sighting system is a good example—whose accuracy is remarkably high against targets which are fixed or whose future position can be predicted accurately. The range of the gun, however, remains strictly limited and its performance is inadequate against unpredictable target movements.

Achievement of Wright Bros.

The achievement of Orville and Wilbur Wright on 17th December, 1903, opened up a new vista and gave man the opportunity again of exercising his skill in carrying his missiles high above the earth through distances which have steadily increased to thousands of miles. During this half-century, the speed of flight has also steadily increased and we now find Service aircraft flying in the region of the speed of sound (Fig. 1). In the United States, research aircraft are already flying at twice this speed. During the same period the automatic pilot was developed and it then became possible to devise an unmanned aeroplane and use it as a missile (Fig. 2). A weapon of this kind was developed in Britain in 1927; its code name was " Larynx," derived from the description " long range gun with Lynx engine." It had a range of 300 miles and carried a war-head of 250lb. The automatic pilot caused it to fly on a pre-set course at a pre-set height to a pre-set range. Similar developments were proceeding at this time in other countries and it is of interest that the German V.1, with which we were bombarded seventeen years later, was similar in general conception to the " Larynx."

The next step in Britain was the development of a series of unmanned aeroplanes capable of taking off and landing, and of manœuvring in response to commands transmitted by radio from the ground or from a " shepherd " aeroplane, and suitable for use by the Services as gunnery targets.

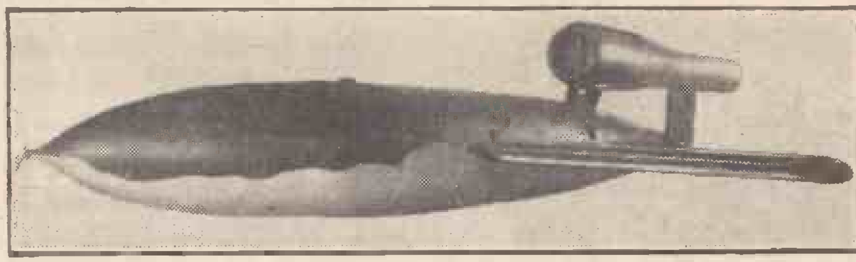


Fig. 6.—The German V.1, the first guided missile to exercise a major influence in war.

German Effort

At about this time the Germans decided to apply a major effort to guided-missile development and we in Britain experienced the first result of this work during the 1939-45 war when our ships were attacked by two different kinds of air-launched missile. The H.S.293 was a small aeroplane-like missile which weighed about 2,150lb. and carried a war-head of 1,100lb. (Fig. 3). It was propelled by a liquid-fuel rocket motor and flew at a speed of 450 m.p.h. The missile was visually guided in response to commands transmitted by radio from the parent aircraft. The other anti-ship missile was the " Fritz X " (Fig.5) which weighed 3,500lb. and was a free-falling bomb, also guided in a manner similar to H.S.293. Six ships were sunk and ten suffered damage by these missiles.

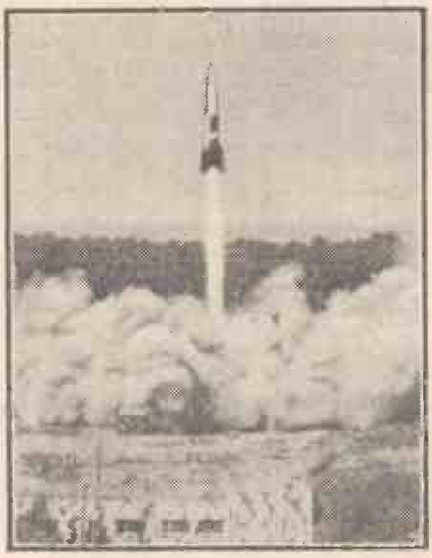


Fig. 7.—Launching of the V.2.

A series of air-to-air missiles was being developed also by the Germans but the war ended before they could be used in combat. The most interesting of these was the X.4 (Fig. 4), a small bi-fuel rocket-propelled missile weighing 130lb., including a war-head of 44lb., and intended to be detonated by an acoustic proximity fuse. It was capable of flying slightly above the speed of sound and was visually guided by commands transmitted from the parent aircraft through two wires which unwound from spools mounted on the wing tips of the missile. Each spool carried 6,500 yards of 0.008in. diameter enamelled-steel wire.

Four German ground-launched anti-aircraft missiles were under development at the end of the war. At least one was intended to fly at supersonic speeds and to be guided by the aid of radar. The target and the missile were to be continuously tracked by radar and commands were to be sent by radio to the missile in an attempt to achieve interception of the target.

The V.1

The first guided missile to exercise a major influence in war was the all too familiar V.1 (Fig. 6) which was first used against Britain on June 13, 1944, followed by over 3,000 in the first five weeks of the bombardment. The novel technical feature of this missile was the pulse-jet motor which was exceedingly simple and gave a thrust of 860lb. at sea level with a fuel consumption of 3lb. per lb. thrust per hour. The whole missile was notable for its simplicity of construction; each missile required only 900 man hours of effort to produce.

The V.1 bombardment was followed on September 8th, 1944, by the first V.2 (Fig. 7). The development of this missile was a most remarkable technical achievement. The German designation was A.4, and it was the only one to be used operationally of a range of missiles, A.1 to A.10, on which work had been done. Although much information about the V.2 has been published, it may be of interest to mention again some of the leading features (Fig. 8).

The total weight of the V.2 was 12½ tons, including a war-head of just under 1 ton and the fuels just under 9 tons. Two fuels were mixed in the main rocket motor, one a 75 per cent. solution of ethyl alcohol in water and the other liquid oxygen. Over 300lb. of fuel were burnt every second, the

Fig. 5.—" Fritz X " : F.X. radio-controlled glide bomb.

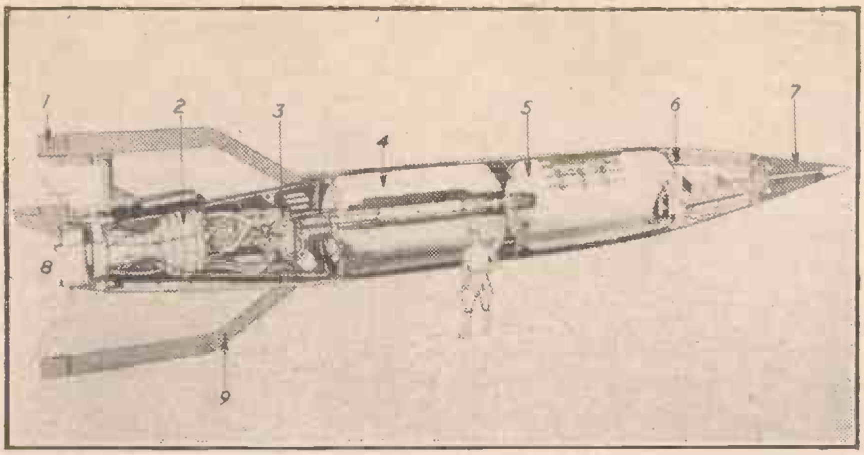


Fig. 8.—A sectional view of the V.2. 1. *Four external control vanes ;* 2. *Combustion chamber and venturi ;* 3. *Turbine and pump assembly ;* 4. *Liquid-oxygen tank ;* 5. *Alcohol tank ;* 6. *Control compartment ;* 7. *War-head ;* 8. *Four internal control vanes ;* 9. *Four stabilising fins.*

gas-discharge velocity was about 7,000ft. per sec., and maximum thrust was about 30 tons. Fig. 9 shows a typical trajectory. The maximum speed was 5,000ft. per sec. and at this speed the rocket motor was developing over 600,000 h.p. The maximum height was about 60 miles. The range in operation varied widely but averaged 185 miles. The total time of flight was about 5 minutes.

The most ambitious German war-time project was the A.10, which was intended to weigh 85 tons and to carry into the stratosphere A.9, which was an A.4 with wings. The Germans hoped its range would be about 3,000 miles.

Scope of Future Guided Missiles

After the war, study of the German achievements resulted in an intensification of the attention already being paid throughout the world to the potentiality of new guided-missile conceptions embodying up-to-date techniques, particularly radar. Such conceptions in the anti-aircraft rôle did not require visual sight of the target, nor the intervention of a human operator in order to guide the missiles.

It seemed possible not only to detect and track an aeroplane from the ground or from another aeroplane, but also for the missile to seek and track its target and to detonate its war-head in the proximity of the target. By this means the point of aim could be carried to the target and continuous aiming corrections could be made during the flight of the missile. It appeared that a wide range of electromagnetic wave lengths could be exploited. The flexibility of anti-aircraft missiles could thereby be extended to their use in all weather conditions by night or by day. Again, it seemed possible to exploit detection of targets on the ground or at sea by radar or other means, and thereby to direct air-, ground- or ship-launched missiles against these targets. Advances in aero dynamics and propulsion offered the possibility of flight at high supersonic speeds for any missile in which this feature would improve its effectiveness. Improved knowledge of servo-mechanisms and automatic control systems promised the ability to use the positional intelligence, obtained electromagnetically, to direct and steer the missile to the vicinity of the target with sufficient accuracy to offer a good chance of causing damage.

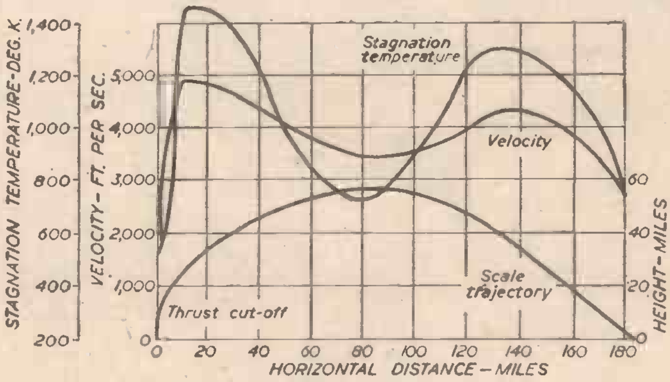


Fig. 9.—Typical trajectory of V.2.

These possibilities suggested a wide range of applications for attacking ships under or above the water line, for the purposes of air-, ground- or ship-launched anti-aircraft weapons and for attacking land or sea targets from land, sea or air.

Some of the Problems

We shall discuss only one type—the ground-to-air guided weapon.

The requirement for the ground-to-air weapon may be for the defence of vulnerable points such as towns, factories and ports, or of large areas such as the whole of Britain. Attack may be launched at any height up to the maximum operating height of bombers within the next 10 years (say, 60,000ft.). Contemporary bombers fly at subsonic speeds but we must expect to have to be prepared to contend with supersonic attack in 10 years' time, say, at 1,000 m.p.h., or nearly 17 miles per minute. Early warning by radar of the highest bombers is limited by the geometry of the system and this means a maximum warning time of about 10 minutes before bomb release at 60,000ft., and progressively less at lower heights. During this time the strength, height and direction of the raid must be assessed, a decision made to select and put into action appropriate defence units (including the acquisition of the targets by ground-based radar control system) and to launch missiles in time to permit them to intercept and destroy their targets.

This at once emphasises some of the advantages and disadvantages of the guided missile relative to the manned interceptor aircraft. The missile is not subject to the physiological limitations of the human pilot, nor does it have to return to base. It can be provided with ability to accelerate more violently and can therefore take off, climb to height and manœuvre into position for the final phase of interception in a much shorter time. It can be fired in any weather conditions.

On the other hand the manned interceptor retains the benefit of supervisory human judgment at all stages of its flight and the versatility of mobility over a wide front. The need for effective guided missiles becomes more acute if a raid by atomic-bomb carriers is expected.

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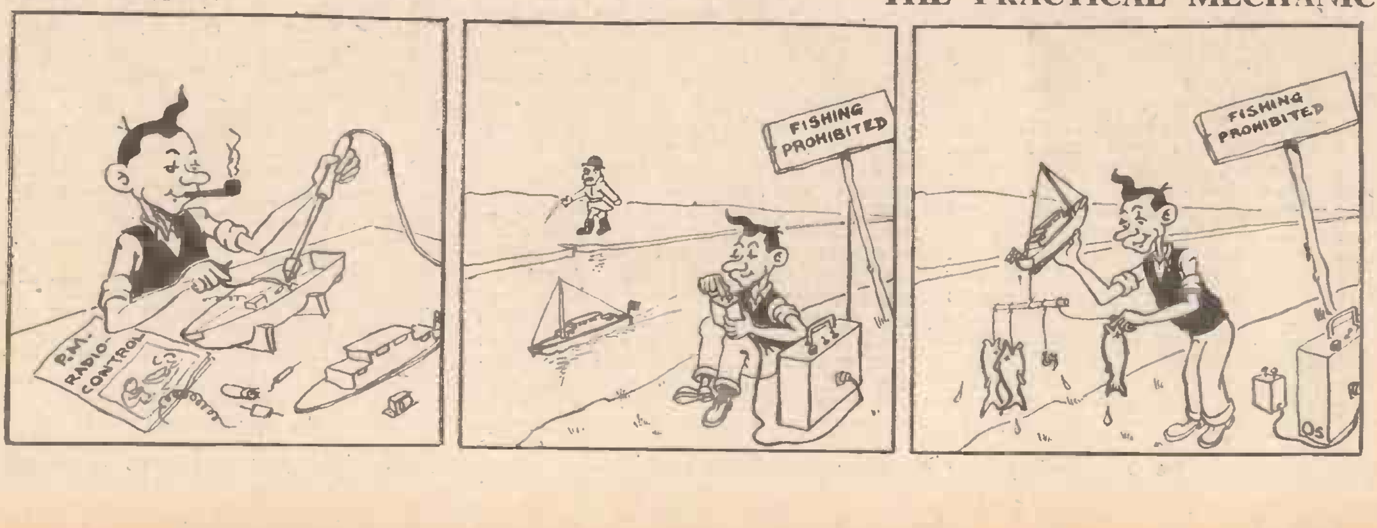
(To be continued.)

ANDY MANN **THE PRACTICAL MECHANIC**



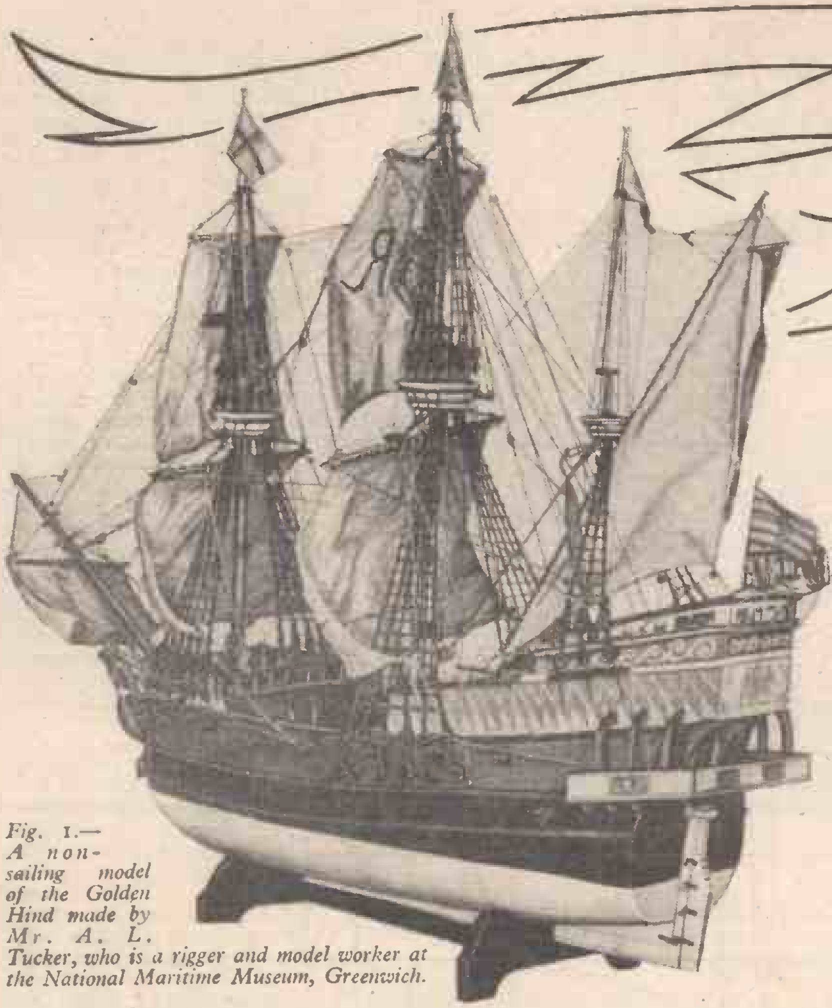


Fig. 1.—A non-sailing model of the Golden Hind made by Mr. A. L. Tucker, who is a rigger and model worker at the National Maritime Museum, Greenwich.

A Sailing Gold

A Simplified Scale Model of

By E. W

IN the year 1577, on November 15th, that intrepid explorer, pioneer and adventurer Sir Francis Drake set sail from Plymouth in his own ship, the *Pelican*, 120 tons, accompanied by the *Elizabeth*, 80 tons, the *Marigold*, 30 tons, and a small vessel of only 12 tons. He was ostensibly bound only for the West Indies, but Drake had other views. By various means, partly by insubordination on the part of one of his commanders, partly by storm and partly by losing touch with his one remaining vessel, the *Elizabeth*, in the Straits of Magellan, Drake found himself alone when he reached the Pacific Ocean. When sailing along the coast of Peru he decided to change the name of his vessel from *Pelican* to *Golden Hind*.

After various adventures and the pillaging of many Spanish treasure ships, as well as looting mule trains coming down to the coast, he finally fell in off San Francisco with a veritable floating treasury of gold and precious stones, and then he declared himself satisfied and turned his thoughts to getting home. He dared not risk returning by the way he had come, so he turned southward and westward and, crossing the Pacific, proceeded via the East Indies, the Indian Ocean and around the Cape of Good Hope. This meant a voyage of 20,000 miles, by uncharted seas through the greater part of which no white man's keel had ever passed. Drake had to rely solely on his own genius and indomitable courage, the stoutness of heart of his crew and the kindness of Providence.

From the southern extremity of Africa it was plain sailing, and on September 26th, 1580, the *Golden Hind*, battered by wind and storm, clogged by barnacles and worm eaten, bearing the marks of many a fight with the Spaniards, staggered into Plymouth Sound, carrying her proud commander, the first Englishman to circumnavigate the world.

This feat of seamanship and the vessel which was sailed became famous, and will always be looked upon as an outstanding example of what English hearts and English oak could do.

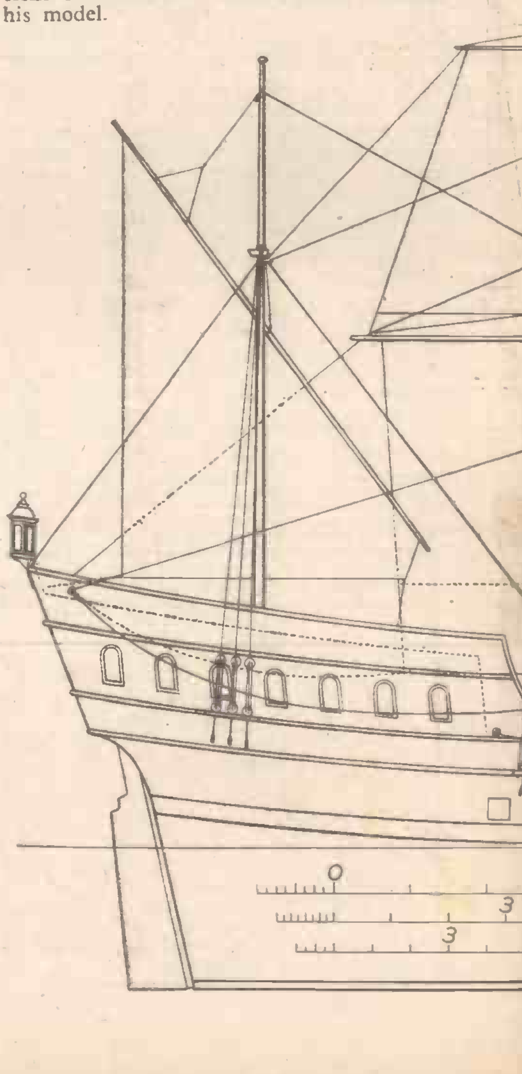
The making in miniature of galleons and ships of the time of Queen Elizabeth I has for many years been a very popular hobby. Most of these, however, cannot sail. Often the galleons are crudely proportioned, have too much freeboard, their masts and sails are too massive and their hulls do not draw enough water. Were the models hollowed out they would almost certainly capsize, even if ballasted, or if the ballast were heavy enough to maintain an even keel there would be insufficient buoyancy and the ship would sink.

I suggest that the model maker follows the procedure of the model yacht enthusiast and builds a model which will float and sail, be correctly proportioned and at the same time picturesque. Drake's ship was not a galleon. The true galleon was the type of vessel which was rendered independent of the wind by being provided with banks of oars manned by galley slaves.

The majority of the so-called galleons which I have seen are too brilliantly painted and generally wrong colours have been used. It may be taken as a rule that the main colour for the hull above the waterline was either brown or black, with gold leaf on carving and relief work. When colour was used it was employed sparingly, and heraldic colours only were used. Often the colour was confined to shields of arms hung or fastened on the outside of the bulwarks. Yellow was never used because there is no such colour in heraldry; instead of yellow, gold, i.e., gold leaf, was used, and silver instead of white. Occasionally white with green was, however, used on Elizabethan ships. So, in decorating a model, gold leaf should be laid on beadings and carved work and gold and silver leaf in heraldic bearings

Choosing the Size

In Fig. 3 is shown a sheer plan of the hull and of the sails, and to this drawing is added three scales so that the reader can, with a pair of dividers, take off all dimensions on whichever scale he wants to make his model.



Model of the
en Hind

Sir Francis Drake's Famous Ship

VINING

Personally I should prefer the largest, measuring 24in. long on the load waterline, although the 16in. would be more convenient for carrying. The 12in. L.W.L. I do not recommend for sailing, and if it is made as an ornament and not for sailing it may as well be left solid and the hull not hollowed out. Readers contemplating a non-sailing model will be interested in the photographs, Figs. 1 and 2, which show a fine model made by Mr. A. L. Tucker, who is a rigger and model worker at the National Maritime Museum, Greenwich. Readers will note several differences between this and the sailing version, but the latter has been somewhat simplified. If the 12in. model is hollowed it may sink to a little below the L.W.L. shown (unless the thickness of the hull is reduced) and its directional stability will not be very good when sailing. The ability of the 16in. to keep on a course will not be so good as the 24in., and that, with other important reasons, is why the greatest of the three lengths is recommended.

The proportions of the masts, sails and yards to the hull are about right; most models of ships of this period are over-masted and have too large a spread of canvas for the displacement and draught. With the sail area shown in Fig. 1 no reasonable wind will lay her on her beam ends. The rigging, yards and sails will, however, be dealt with later.

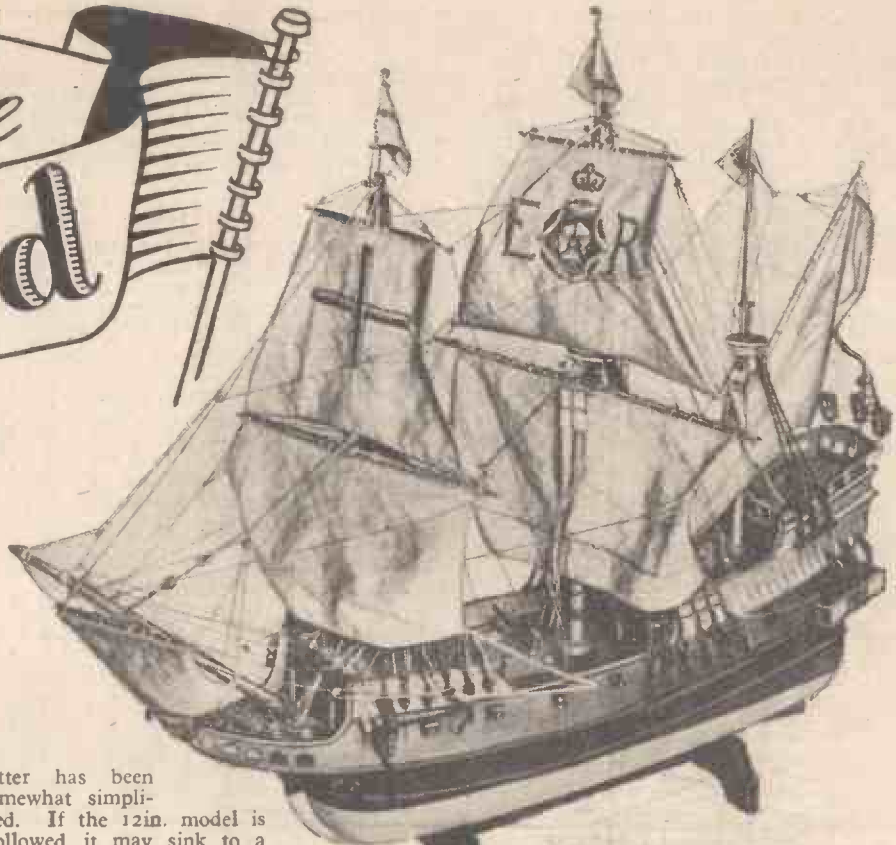


Fig. 2.—*Another view of Mr. A. L. Tucker's model.*

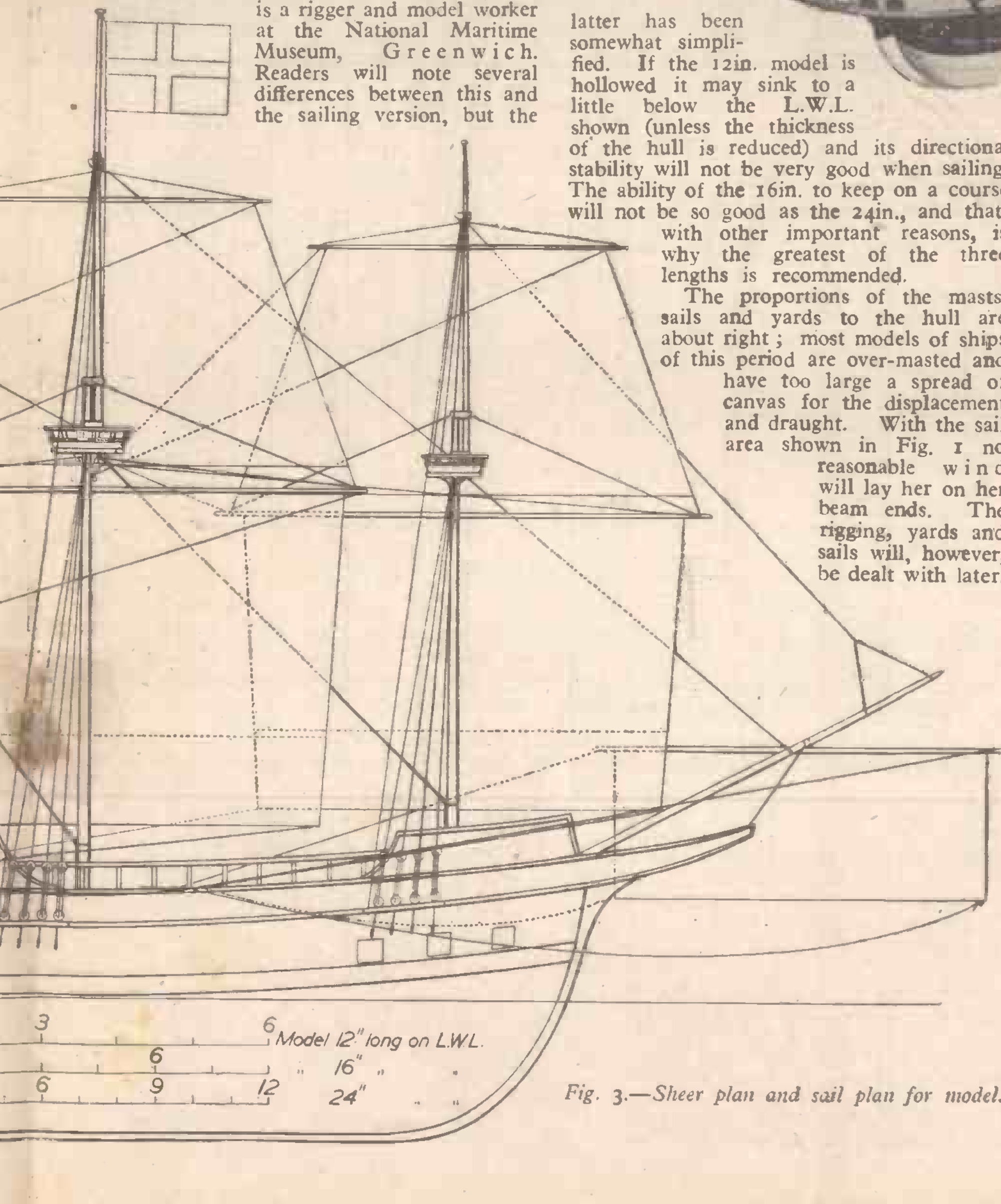


Fig. 3.—Sheer plan and sail plan for model.

The lines of the hull are given in Fig. 4; they are complete, with the exception of the fact that no buttock lines are given. In a model such as this they are not necessary, for the form of the hull and its curves can be obtained from the waterlines and the bodylines alone.

It is not necessary to go into the details of the building up of this hull; the method of bread-and-butter construction was fully dealt with in connection with the model paddle steamer (November, 1954), and the procedure to be followed will be exactly the same as regards the sawing of the planks, the gluing with casein, the clamping and final shaping by paring and glasspapering. The chief difference will be in the tumble home of the part of the hull above the load waterline, the addition of plywood to form the forecastle and poop and the addition of lead for ballast.

All necessary details are given for the woodwork in Fig. 5. In this drawing it will be seen that between waterlines Y and Z and the piece at the stern above Z the sides have to be rebated to receive the plywood forming the upper works of the poop, etc., but this rebating will not need to extend any further forward than bodyline No. 2 because the forecastle and prow will overhang the sides and bows and have a deck and underpiece beneath the bowsprit.

As shown in Fig. 5, the bowsprit is stepped into a transom crossing just aft of the bows. The stepping of the mainmast is provided for by a little block of wood glued to the bottom of the hull, whilst the fore and mizzen masts can be stepped into sockets in the hull plank between waterlines D and C.

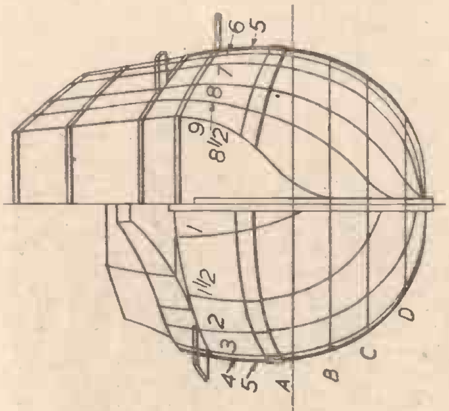
The Ballast

The keel can be a strip of lead, but this will not be the only lead required; lead strips will have to be put inside of the hull on the centreline and the weight of lead required cannot be stated because the quantity will depend upon the size of the model, the amount of wood that has been cut away from the inside and the weight of mast spars and sails. In determining the amount of lead it would be well to make all the sailing gear and add everything which is to go on the vessel, put lead in the hull until it sinks nearly to the L.W.L. and then temporarily erect the masts and everything carried by them so that the hull is brought down to the waterline, adding or taking away lead until it does so. In order to change the quantity of lead the main deck must be removable and to render it so, it should be secured with, say, $\frac{3}{8}$in. or $\frac{1}{2}$in. No. 2 screws.

Having arrived at the required weight of lead, and it is assumed that it will be in several pieces, or perhaps many pieces, divide the total quantity into two by weight. Melt one part first and cast it in a simple wooden box so that it becomes a square bar just long enough to fit in between the mainmast step block and the stern. Then melt the other half and cast in the same wooden mould. Both of the bars so cast should be drilled to take two fine wood screws by which they may be screwed down to the centreline of the hull one bar aft of the mainmast and one forward.

The Plywood Parts

The thickness of plywood used may be the same for all three scales ; it does not need to be more than 2mm. thick for the largest model, and 1mm. would be thick enough for the 12in. and 16in. Note that it is aircraft quality plywood that must be used. All parts of the plywood should be screwed together, using $\frac{1}{4}$in. or $\frac{3}{8}$in. No. 2 screws, countersunk heads. This applies particularly to the attachment to the



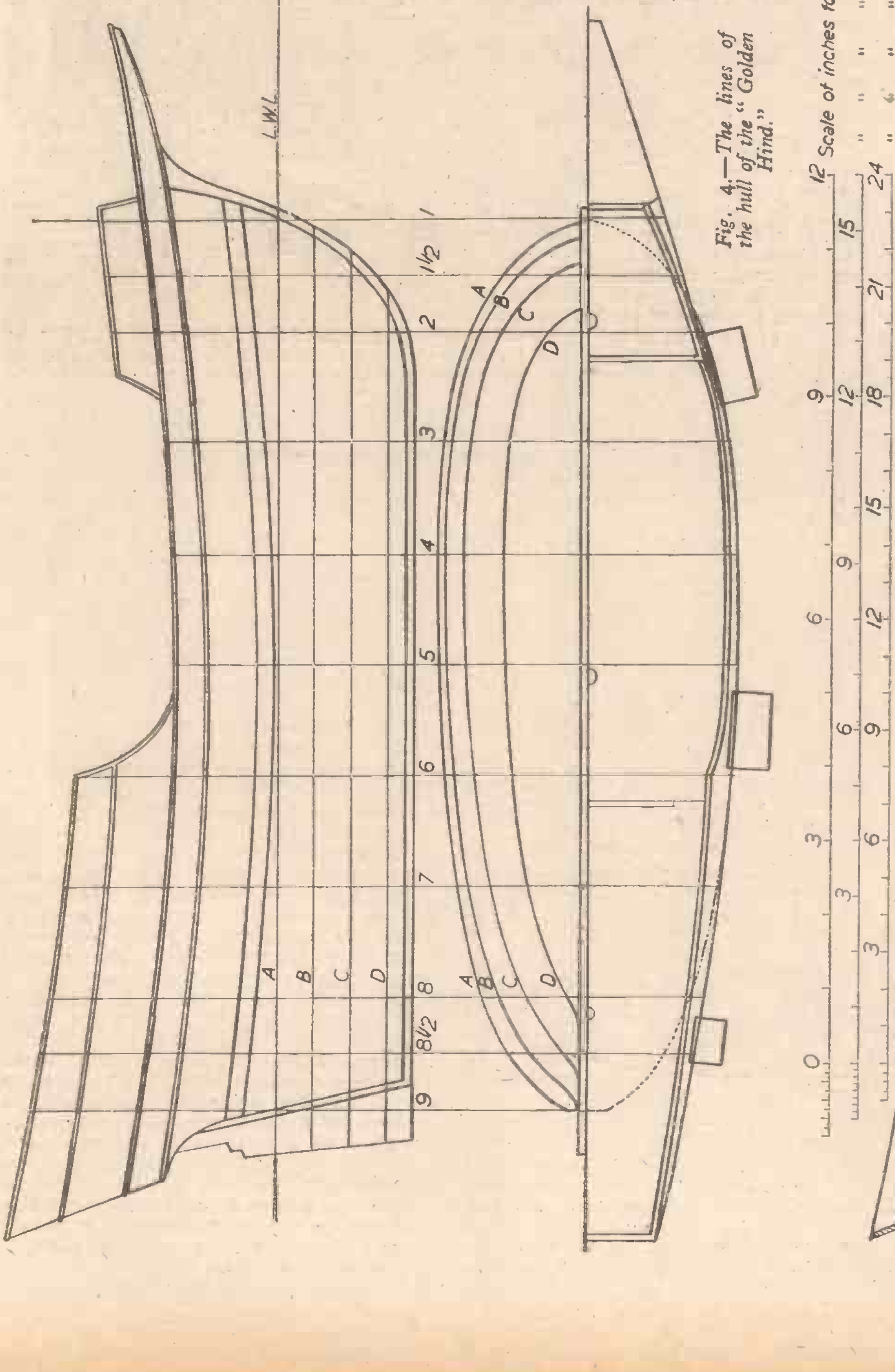


Fig. 4.—The lines of the "Golden Hind."

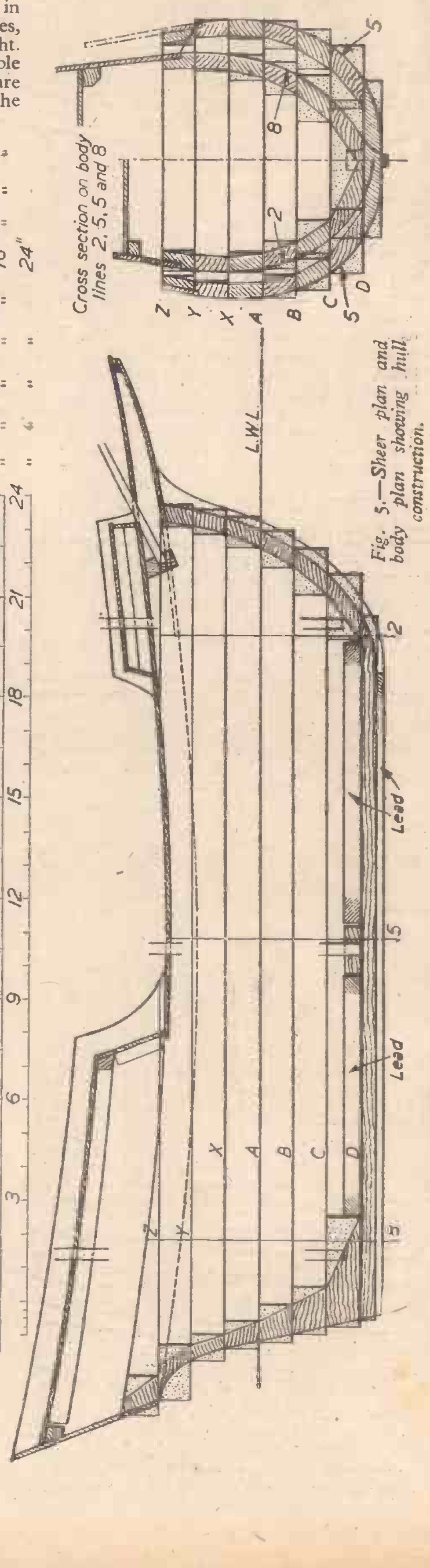


Fig. 5.—Sheer plan and body plan showing hull construction.

hull. It could be glued, but screws would still be needed to pull the joints up tight, and as it may be convenient at some time to take some part away for repair or to obtain access to the inside of the hull it would be better to leave the joints dry. The only exception is the forecastle, but casein glue would be unsuitable for these small pieces and the use of celluloid cement is suggested here, of the kind which is used in model aeroplane construction.

In the sheer plan (Fig. 1) is shown an open bulwark to the main deck. The uprights of this should be secured with Durofix to the inner faces of the plywood upper sides of the hull and the plank Y Z notched out to clear the upright. To the tops of the uprights the top rail of the bulwark will be secured with Durofix and the ends of the rail will be attached to the plywood at poop and forecastle by the same means. Then, should it be necessary at some time to remove the whole of the plywood on one side, the rail, with the uprights, will come away with it.

It will be seen that in Figs. 3 and 4 there is shown above the load waterline a broad band or strake, curved to the same camber as the beadings and sheer of the decks. This band can be left and shown later by a broad painted line, or it can be added in relief. It can be cut together with the one for the opposite side from mahogany or walnut veneer, the cutting being done with a very sharp knife or a stiff razor blade. The beads can also be cut in this way, but they will be of thicker material. All of this relief work should be cemented on with Durofix and be well protected from water by being covered with a coating of the same.

The Rudder

As it will not be practical to fit any form of automatic steering and as any other kind of steering is out of the question there is no point in hanging the rudder on pintles or pivoting it in any way; it may therefore be fixed to the hull in some way and the most simple method will be by pinning and cementing it with Durofix. It could, of course, be fixed by brass strips put on in pairs, crossing one another and pinned to the rudder and to the stern. This would have a more realistic appearance, but the other way is the more simple. Model power boats are usually given a movable rudder so that the vessel may be set to steam on a circular course, but a square-rigged sailing ship model cannot be made to sail about a radius, so a movable rudder would be useless.

There is very little reliable information available on the *Golden Hind* and it is difficult to recommend anything definite about guns and gun ports. There was constructed some years ago a large man-carrying model of the ship (see Fig. 6). This model sailed into Plymouth harbour and visited Salcombe and other South Devon and Cornwall ports during Navy Week, 1936, and, as can be seen in Fig. 6, it would appear that there were five guns on each side; four of these (on each side) are aft of the forecastle and one under the break of the poop. The positions of the ports are indicated in Fig. 1, but, for a sailing model, it is suggested that square incisions to indicate closed ports are cut. If guns are put in open ports some means would have to be taken to meet the eventuality of the vessel shipping water through them should she heel over. There is, of course, no reason why some guns should not be mounted on the maindeck and a few small swivel guns on the bulwarks of the forecastle and poop.

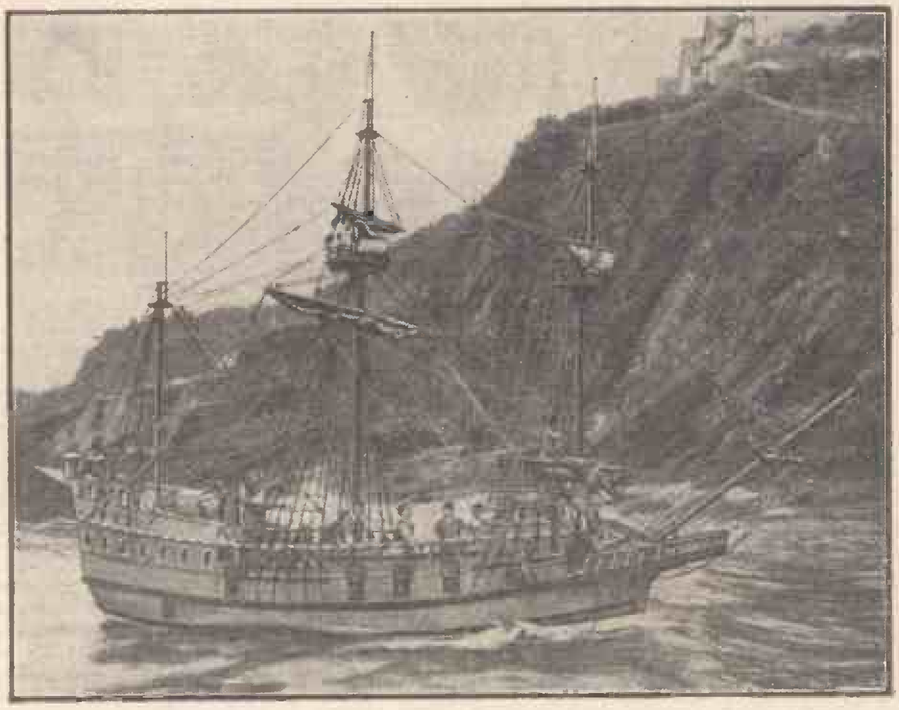


Fig. 6.—A model of Drake's "Golden Hind," one-eighth actual size, which cruised round the Devon and Cornwall coasts to advertise Navy Week in 1936.

In the case of a non-sailing model guns on the lower deck can be put in where I have shown the ports. Mr. Tucker's model in Figs. 1 and 2 shows seven guns each side, but as mentioned above there is no definite information available to say which is correct.

Science Notes

Radio-active Duster for Safety Glass

THALLIUM 210, a harmless radio-active material produced at Harwell, has found a novel application in industry. It is being used in a "duster" which removes dust from the surface of glass before it is laminated to make windscreens for fighter aircraft. This helps to ensure clarity of vision for fighter pilots, a vital factor in these days of supersonic speeds.

The Triplex Safety Glass factory at Birmingham has air-conditioned assembly rooms, but it is impossible to prevent minor particles of dust from operators' shoes and clothing from settling on the glass. In the dry conditions it is firmly held by an electrostatic charge. Because of the number of laminations used in a bullet-resistant panel, which may be 2½in. thick, dust accumulation could be a serious problem.

A piece of copper foil coated with Thallium 210 is mounted in a small protective case underneath a compressed-air pistol. The metal gives off radio-activity which discharges the electricity accumulated on the surface of the glass and plastic, and the compressed air then removes the dust completely.

Jupiter's Eighth Moon Rediscovered

TWENTY minutes of data processing by Univac, the amazing electronic computor, was necessary to plot the position of Jupiter's eighth moon, lost for 14 years in the vastness of interplanetary space 515,000,000 miles from the earth. It had not strayed from its orbit, which is so complicated that the moon had not been detected since 1941. Without Univac 16,000,000 calculations by hand would have been necessary.

Tanalith "C"

A NEW preservative for vacuum/pressure impregnation of timber was recently announced to the building trade. It is known as Tanalith "C" and produced by Hickson's Timber Impregnation Co. (G.B.) Ltd., of Castleford. It has universal toxicity to brown, white and soft rots, insect grubs and termites.

New Altitude Record

AN English Electric Canberra, powered by two new Bristol Olympus II turbojets, recently established a new world height record (Class C—Aeroplanes) of 65,876 ft.

A Plastic Caravan

BERKELEY CARAVANS, of Biggleswade, Beds, have produced what they claim to be the world's first Polyester resin-glass fibre caravan. After two years of experimenting and testing, the first model, a 14ft. 6in. touring caravan is being produced in quantity. It weighs 11cwt. and costs about £300, complete with furniture and fittings. Moulded in two halves and bonded down the centre to form a complete unit, the body is made of self-coloured resin glass fibre; it is stronger than steel and has a colossal impact strength. It is rust proof and scratch resistant. The interior wall facings, fixing units, etc., are pressed into the body during the moulding process. Design improvements, such as rounded contours, streamlining, etc., hitherto difficult and expensive with traditional materials like wood and aluminium, are now simply a question of moulding.

A PHOTOGRAPHIC DISHWARMER

A Thermostatically-controlled Heater for the Dark Room

By M. KATERS

THE dishwarmer described is used for print dish and developing tank solutions. The thermostat keeps the solution temperature to within half a degree of what is required. Any temperature setting can be obtained by altering the thermostat adjusting screw.

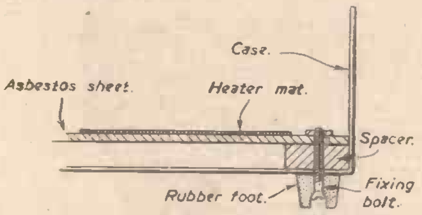


Fig. 1.—How the fixing bolt secures the foot, spacer and asbestos sheet.

The case of the dishwarmer consists of a tin biscuit box of the type shown in Fig. 2 and varying in depth from 1-2in. The heating element used is of the mat type which gives an even spread of heat. The dimensions of the mat are approximately 8½in. x 6½in., and, therefore, the minimum surface area of the box should be about 8in. x 9in. This gives ample clearance for the mat and the thermostat. There is no reason, of course, why the box dimensions should not be greater if so desired. The minimum sizes mentioned will take a wholeplate dish easily without fear of the dish topping over, and the one shown in the photographs can house a 10in. x 8in. dish.

Working temperatures are so low that the box edges can be of the pinched metal or soldered type. The reason for choosing a biscuit tin is that such tins are air- and water-tight and the lid is easily removable to give access to the interior for thermostat adjustment and, if necessary, the cleaning of the lid itself in case of spillage.

Construction

The case is drilled in five places only; four holes in the base to take the rubber feet fixing screws and one for the cable entry in the side. The cable entry hole should have a rubber bush of the type used in radio sets and the cable should be a tight fit in the bush in order to keep the case airtight.

The mat is of the black-heat resistance type. The most suitable is the 150-watt supplied by Wilco Electronics, 204, Lower Addiscombe Road, Croydon, or the 690 ohm. (approx. 80 watt) supplied by London Central Radio Stores, 23, Lisle Street, Leicester Square, London, W.C.2. Either of the above mats cost 2s. 6d. plus postage.

The mat is mounted on asbestos sheet which should neatly fit the case one way but be short in the other dimension by about ½in. either way. The reason for this is that when the heater is on the convection currents set up circulate, keeping the overall case interior at the same temperature.

The sheet asbestos can be obtained from a chain store where it is sold as a heating mat. The strengthening metal strips should be removed. Alternatively ⅛in.-thick asbestos board is obtainable through any working plumber's or ironmonger's workshop.

The resistance mat is attached to the asbestos sheet by pieces of wire looped through the covered ends of the resistance mat and the asbestos sheet where it is twisted to hold the mat in place. The mat is then mounted on insulated spacers—asbestos will do—to keep it off the floor of the case.

The wood screws were removed from the rubber feet (purchased in a chain store) and replaced by ⅛in. Whitworth nuts and bolts. The bolts went through the feet, bottom of case, spacer and asbestos sheet before the nuts were screwed on, as shown in Fig. 1.

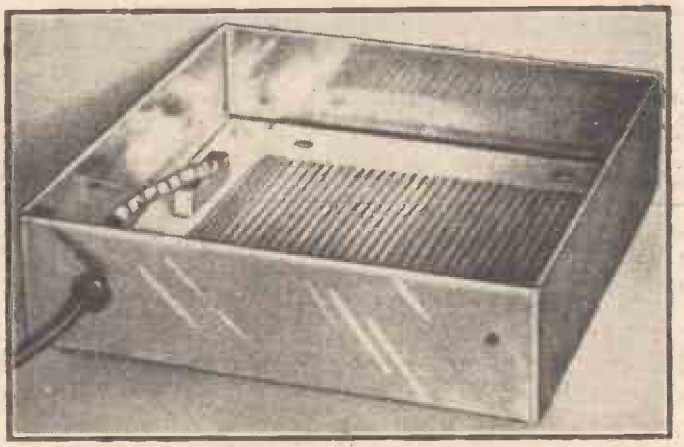


Fig. 2 (Left).—The biscuit box case with the mat in position.

Fig. 4 (Right).—A view of the interior of the dishwarmer.

The thermostat (model SN/40) is adjustable from 50-250 deg. F. and is obtainable from The Technical Services Co., Shrubland Works, Banstead, Surrey, at 5s. 9d. post free.

In one wall of the thermostat is a hole which can be used as a bolt hole to attach the thermostat to the asbestos sheet. A clearance hole for one of the thermostat connecting screws must also be made in the asbestos. By so doing it serves two purposes, namely, the thermostat wall is flush with the asbestos and it also prevents the thermostat from turning due to there being only one fixing bolt. In this position the thermostat adjusting screw is facing upwards.

The electrical connections are shown in Fig. 3, and are a guide to the non-electrically minded. The heating mats have bead-covered connecting wires, but as the temperature is so low they are not really necessary, and can be replaced by insulated sleeving if so desired.

Fig. 4 shows the interior of the dishwarmer.

Adjustment

Temperature adjustment is carried out by screwing in or out the grub screw on the thermostat. The temperature inside the

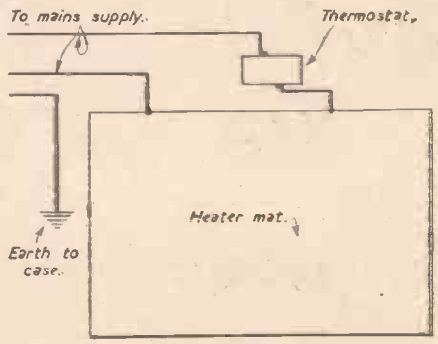
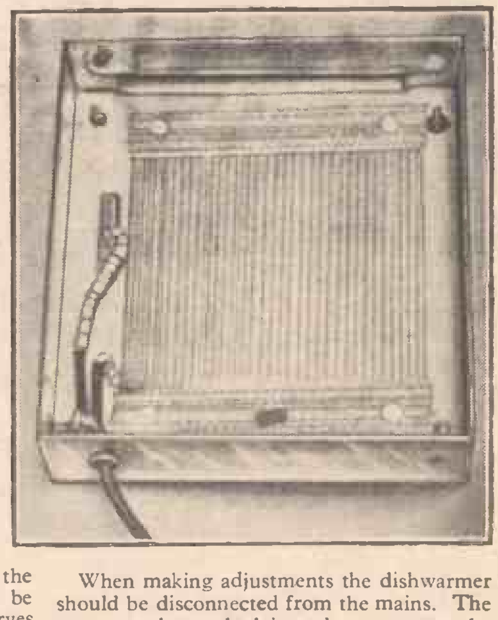
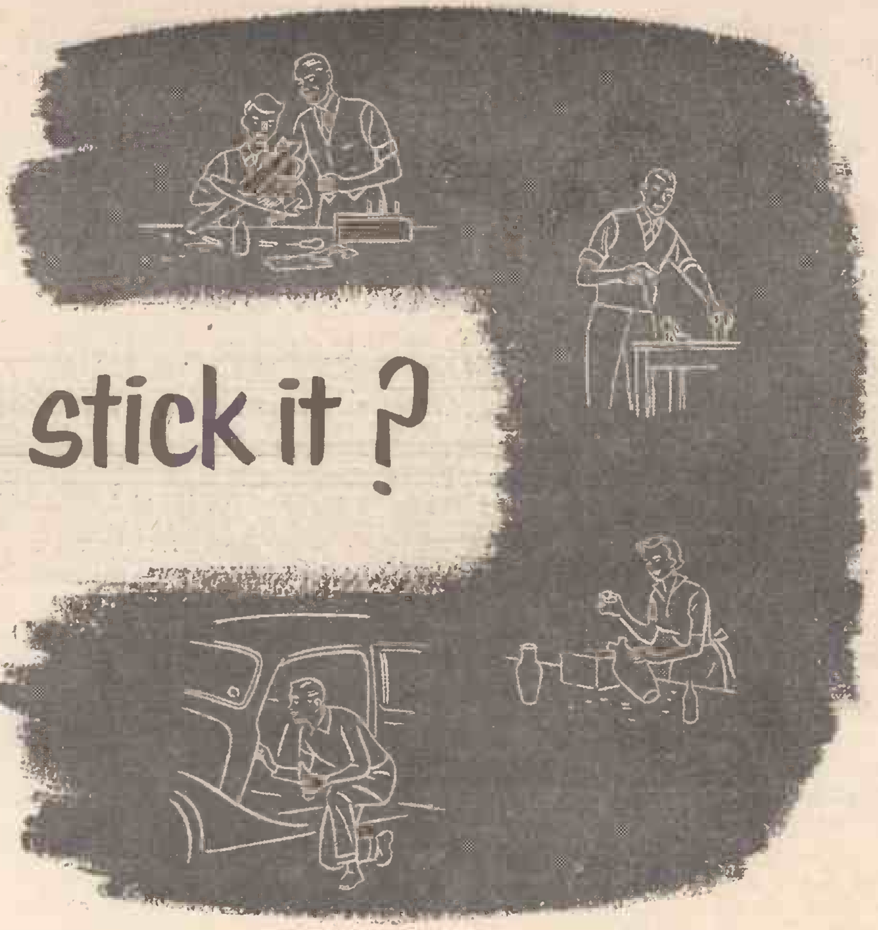


Fig. 3.—The electrical connections.

case is, of course, at a higher level than the actual dish temperature, due to heat loss. The temperature should be checked, therefore, under actual working conditions. If the thermostat requires to be adjusted time should be allowed after lid replacement for the inside temperature to become constant again.



When making adjustments the dishwarmer should be disconnected from the mains. The case must be earthed in order to protect the user against any possible electrical fault and the danger of the case becoming "live." Earthing merely consists of the earth wire of the three-core connecting cable being soldered or bolted to the case.



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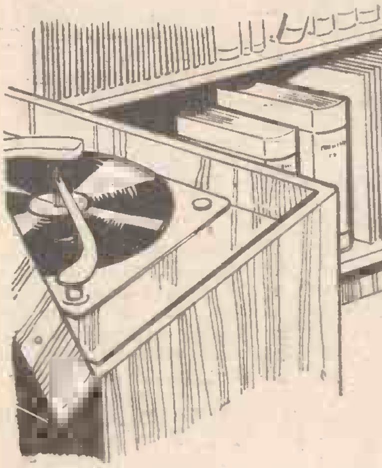
Making a Record library

A Filing and Indexing System for Gramophone Records

By F. H. HASKELL



MANY people stack their records in heaps or in boxes, and the trouble of searching out any particular favourite wastes so much time and is so inconvenient that all pleasure is lost. Even if one is keen enough to sort over the piles of discs the record is probably scratched or broken when found.

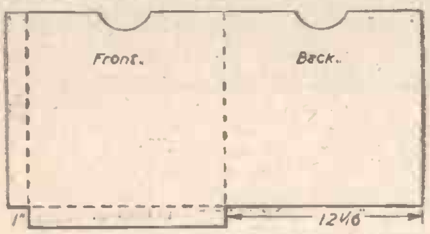


Fig. 1.—Method of making the envelope.

In direct contrast where a home library exists any record can be found in a matter of seconds, old favourites being as accessible as the latest purchase. Such a library can be matter for a spare-time hobby during the winter, and is quite a simple and straightforward task. Provision of suitable accommodation is a simple matter for over two hundred records occupy no more than twenty inches of bookshelf, or a cabinet for the purpose can be bought or built with no great trouble.

The first step is to settle down to playing each record in turn. Of course this need not be done at one sitting or even a dozen; but each item must be set down in an old notebook or on a sheet of paper. Any disc which is not worth further trouble can be scrapped straightway; but often an old friend can be given a new lease of life by being wiped carefully with a soft rag containing a few drops of paraffin. The wiping should follow the groove in a spiral from centre to outside or *vice versa*, most careful attention being given to the dozen or so grooves nearest the outer edge as this is where roughness is most noticeable.

If actual damage has been done a dodge which is quite often successful is to melt candle wax well into the groove and when quite cold and hard play the record over and wipe away the surplus wax that has been ploughed off by the needle.

Creased paper may be slightly damped and flattened out with a domestic iron, taking care not to scratch it in the process.

As the discs will be stored on edge between books or bookends, the envelopes will need to be reinforced to prevent crumpling and to ensure that the record does not tend to roll. For standard 12in. records corners as shaded in Fig. 2 should be cut from cardboard of approximately the thickness of the disc. The average grocery carton answers to this description, and here again the first corner to be cut out may be used as a template. For smaller records (10in. and 7in.) stiffeners as shown in Figs. 3 and 4 will be required. The best way here is to lay the card upon the open envelope and place the record over it with one edge level with the top and run round it with a pencil.

V.	Yeomen of England. Joseph Berryton.	1
I.	Somewhere. Trumpet Solo. Wm. Blower.	1
D.H.	Modesta. Barn Dance. Hawaiian Serenaders.	2
H.	With My Guitar. Hawaiian Serenaders.	2
M.	Sword and Lance. March. Royal Marines Band.	3
S.	Abide With Me. Choir and Organ.	3
V.	Southern Medley (1 & 2) White Coons.	4

Fig. 6.—The first unclassified list.

S.	Abide With Me. Choir and Band, Scots Guards	5
D.	Adorable You. Fox Trot. Victory Orchestra	91
V.D.	All By Yourself in the Moonlight. Foxtrot Song	7
V.	And He Likes It. Comic Song. Dorrie Deane.	20
Y.	Antique Shop. Yodelling. Daimler and Eadie	42
M.B.	[illegible] Lifeguards Band	10

Fig. 7.—A general alphabetical index.

HAWAIIAN

ALOHALAND. - Guitar Duet.	7
CHARMAIN. - Guitar Duet.	33
GARDEN of DREAMS. - Frank Ferera's Hawaiians. ...	77
HAWAIIAN HOTEL. - Guitar Duet.	7
HAWAIIAN STARDUST. - Waltz. Masters' Hawaiians	82
IF YOU ARE IN LOVE. - Waltz. Honolulu Serenaders	93
ISLE OF PARADISE. - Honolulu Trio.	110
KISS WALTZ. - Wai[illegible] Serenaders ...	121

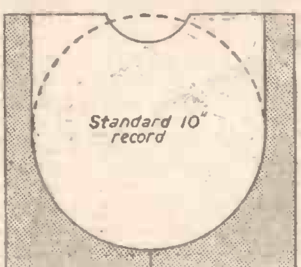
Fig. 8.—A section of a classified alphabetical index.

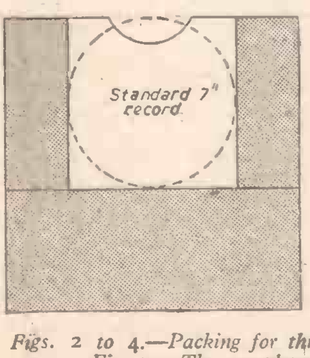
The Envelopes

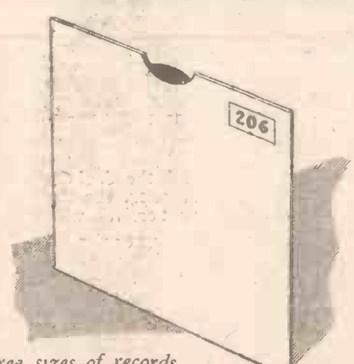
To store the records brown paper envelopes will be needed. Fig. 1 shows an envelope in its initial stage, and a good idea is to cut a cardboard template to this pattern and to pounce upon any piece of paper from which such an envelope can be cut. Another method is to cut a template 12 1/16in. square and mark out two squares side by side, adding a one-inch margin where required. Two pieces of paper can be joined along the centre line if they are not big enough otherwise. If the largest size of record is 10in. the envelope will be dimensioned accordingly.

Fold your envelope carefully and crease it well along the folds, then smear a little good-quality glue on one side of the cardboard and place it in position on the inside of the reopened envelope. There will be no need to wait for the glue to set and the face of the card can be dabbed with two or three spots and the envelopes folded down upon it. Now glue down the side flaps and stick a label upon the right-hand top corner. Cut out a small arc to expose the top of the record, and it can be numbered and put away.

Suitable gummed labels can be obtained from any stationer and are so cheap that it is not worth while to waste time on home-made ones. In case several records are out of their cases at the same time, as they will be if your gramophone has a record-changing device, it will be advisable to stick a label on the disc as well and number it or chaos will result in a very short time.







Figs. 2 to 4.—Packing for three sizes of records.
Fig. 5.—The completed envelope.

Indexing

It will take time and patience to accumulate enough envelopes, so the actual indexing can be undertaken between times. Your list will appear something like the portion shown in Fig. 6. As will be seen, no attempt at classification has been made except that the letters on the left-hand side signify Vocal, Dance, Hawaiian, Military, Yodelling, Sacred Music, etc. It will be obvious that both sides of the record share the same number.

Now a fresh list is made out, following alphabetical order, and your new list will be as the example in Fig. 7. Such a list may be used from now on to indicate the whereabouts of any record. Just look up the title, note the number on the right, flip over the top corners of the envelopes as they stand on the shelf until you come to the number required. A third and final list in which the items are classified is really worth while. This may be collected in some form of looseleaf holder, and the typewriter should be called upon as illustrated in Fig. 8.

Just one more aid to speedy location of a record is to number them alternately in red and black; i.e., all odd numbers of one colour and all evens the other. One is not so likely to flip over two corners at once with this system.

Converting OLD CLOCKS

Some Further Modifications to the Clock Conversions Described in our September and October Articles

By J. A. ROBERTS

THE author is continually modifying the Trip escapement, and its application to Bulle and French clocks, and those suggested here have been successfully carried out since the September and October articles were written. With these modifications construction is simplified considerably and running improved.

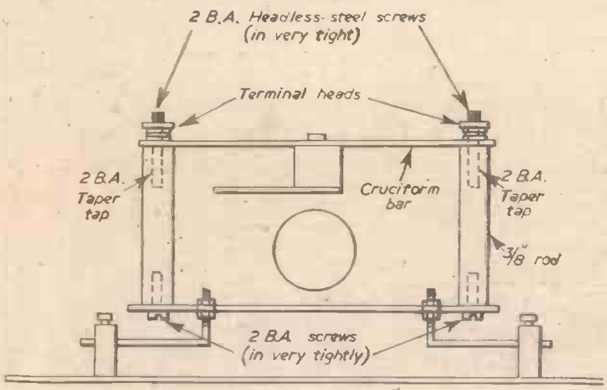


Fig. 1.—A modification to mounting method.

An Improvement in Connections

One lead only needs to pass from the output terminals of the power unit, through the holding screw, picking up the two leads from the motor coil, passing up the hollow main column, out of a small hole drilled in the rear face of same, and being connected to the contact side of the escapement switch assembly. The other lead, soldered to the heavy washer of the holding screw and nut, can be earthed to the column, the connection being picked up from one of the screws holding the escapement panel and going to the bell crank lever side of the switch assembly. Care must be taken not to reverse these two connections the bell crank lever being always at earth potential. The contact surfaces should be cleaned after lacquering.

A Mounting Modification

Instead of the whole mechanism being encircled by the ½ in. x ⅛ in. flat strip, a short length of the same material is used and bolted as before to the recessed rear face of the column. Two 2in. lengths of ⅜ in. rod are tapped 2BA at each end, and support the Bulle as shown in Fig. 1. Headless steel screws are forced into one end of each of these two rods, the holes being taper tapped for the purpose, the other ends are fully tapped and ordinary 2BA screws fitted. Terminal heads are fitted to facilitate the easy removal of the face and movement without disturbing the pendulum (necessary hitherto). The length of the cruciform bar will depend on the distance between the two outer holes in the Bulle main supporting bar, the other two being occupied by the two bent threaded arms carrying the face, as before.

This method of mounting (the third alternative) should suit also most of the French double-plate movements, if not so small and the pendulum not so short that the bob might foul the side arms. In this case the bob would have to be smaller, though there are very few clocks with pendulums of less than 4½in. described.

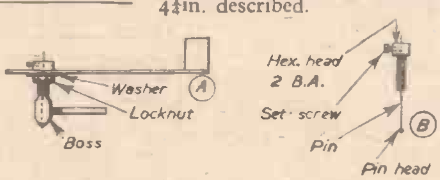


Fig. 2.—Using a pin as a pivot.

The Escapement

Figs. 2 and 3 show how an ordinary domestic pin, preferably case hardened, can save some work both in providing a suitably headed pivot for the bell crank lever boss, and also simplify the design of the striker wheel. A and B in Fig. 2 are self-explanatory. In Fig. 3, "A" shows the correct position for the pivot hole in the striker bar, and how the striker wheel is replaced by a 3/16 in. length of 3/16 in. case-hardened steel rod, revolving on a pin, bent as at B, and secured to the striker bar as at C. If so desired, and it is a good thing from the friction point of view, the striker wheel can be retained and mounted as at D.

Refer to the details in Figs. 2 and 3 in conjunction with Fig. 2 in the October issue, page 15. In order to facilitate a sharp return to the vertical after the end "F" of the horizontal arm "G" has been struck by the striker bar "D," the hole drilled transversely across the latter by the No. 60 drill should not be drilled through

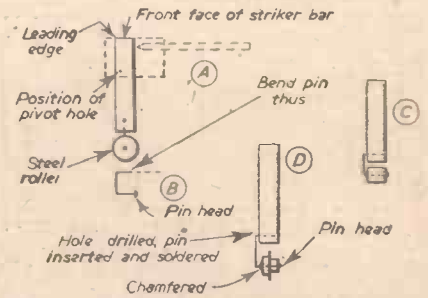


Fig. 3.—Modifications to the striker wheel and striker bar.

the centre of the front face but as near to the leading edge as possible. This simple modification is more important than it sounds. Although the weight of the roller or wheel will bring the striker arm "D" to the vertical after the strike to the left, in order to ensure a clean, rigid, operational strike to the right, the upper end of the striker arm should be resting on the pointed end of the rod "B" when this strike takes place. This will be ensured by the suggested "off-set" position of the pivot. Without this modification, though the striker arm may be vertical on the strike to the right, it may not be resting against "B," and it is upon this factor that the correct working of the device depends.

This is a H.S. Milling Cutter Bargain. All 1" bore, 3-3½" dia., ½"-¾" thick, including side and face cutters, plain and angle cutters. A most useful lot for any tool room. 6 ass. for 50/-. The present maker's price of the cheapest cutter in this selection is 40/-. You must get this lot, remember you get same on approval against cash.

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3,000 **Circular Split Dies** 1" dia. cutting ¼", 5/16", ⅜", 7/16", ½" Whit., B.S.F., also brass thread, 26 thread all sizes and American N.F., 12/- per set of 5 sizes. 2 sets 22/6, 4 sets 42/6. Taps to suit 9/3 per set, either taper or second or plug. 1" die-stocks, 5/- each ; 3/16" to ⅛" tap wrenches, 12/6 each.

1,000 **Hand Reamers,** 5/16", 3/6 each.

1,000 **High Speed Inserted Blades Expanding Reamers,** 9/16" to ⅝" 16/-, 11/16" to ¾" 17/6, ⅞" to 31/32" 18/6, 31/32" to 1⅛" 22/6 each.

7,000 **Pratt & Whitney,** circular split dies, superior quality precision ground cutting edges, 13/16" dia., suitable for machine or hand use. Sizes ; 2, 4, 5, 6 B.A., 8/6 per set.

5,000 **Ball Races,** ¼" bore, ⅞" o.d., ¼" thick, 4/- pair ; ½" bore, ⅞" o.d., 7/32" thick, 4/- pair; 6 mm. bore, 19 mm. o.d., 6 mm. thick, 4/- pair ; 9 mm. bore, 26 mm. o.d., 8 mm. thick, 4/- pair ; ⅜" bore, ⅞" o.d., 7/32" thick, 5/- pair.

4/9 Any LOT. Five lots, 22/6. 2 H.S. Tap or Reamer Fluting Cutters 1½" dia., ⅜" hole, ¼" and 3/16" thick, worth 7/6 each. 8 assorted Centre Nail Pin and Belt Punches, total value 12/6 ; one H.S. Tap or Reamer Fluting Cutter, 2¼" dia., ⅜" thick, ⅞ hole ; one ⅜" H.S. Hand Reamer, worth 10/-. Every item a good bargain.

500 **Sets Metal Figure Punches,** nine punches 0 to 8, the six is used reverse for nine ; size 5/64". 6/6 set, worth 15/- ; ditto ⅛" size, 8/6.

2,000 **Files.** 4" to 6" flats, half-rounds, rounds, squares, warding assorted, cuts, good general lot. 10/6 doz. ; three doz., 28/6.

600 **Circular Split Dies,** B.T.D. make 2¼" dia., ⅝", ¾", ⅞", 1" Whit. ⅜" Gas; worth 11/- each. Clear 7/6 each, new 2¼" die-stock to suit, worth 30/- each, clear 10/- each.

200 **Boxes A to Z Steel Letter Stamps** for marking metal, 5/64" size, 17/6 set ; ditto ⅛" size, 22/6 set, worth treble this price.

2,000 **Straight Shank End Mills,** size ⅛", 5/32", 3/16", 7/32", ¼", 5/16", list price 30/- set, handy bargains, 15/- set, also ⅜", 5/16", ½" ditto, 12/6 set, all in makers' wrappings.

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1,000 **Bevelled Wood Chisels,** handled, ¼", 5/16", ⅜", ½", ⅝", ¾", ⅞", 1". Actual value 32/6. Gift 25/- set.

3,000 **High Speed Routing Cutters,** straight shank, two lip, as used for cutting slots in wood, sizes ⅜", ½" dia., clear 4/- each.

1,000 **Toolmakers' Needle Files,** good assortment of shapes and cuts, worth 1/9 to 2/6 each, 12/6 doz.

10,000 **High Speed End Mills Straight Shank,** 3/32" to 3/16" dia., some with teeth cutting both end but not standard sizes, clear 5 assorted, 10/-.

100 **doz. 6" Three square Saw Files,** 10/6 per dozen.

1,000 **Semi High Speed Centre Drills,** Slocombe brand, 5/16" body dia., 3/32" point, 1/6 each, 16/6 per doz.

1,500 **H.S. Morse Taper Shank Twist Drills.** Brand new, Firth Speedicut, Balfour Capital, etc. All best quality drills, No. 1 and 2 Morse Taper shanks, sizes from approx. ⅜" dia. to approx. ¾" dia. Five assorted £1, actual value £4. One dozen assorted, 42/6.

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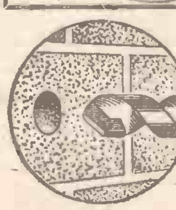

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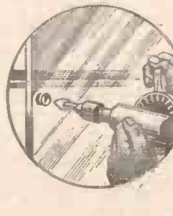

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Miniature 12 or 6 v. Relays, 10 amp. Silver Contacts. SM, DM or SM and B, SCO, 7/6.

Veeder Counters. P.O. Type, 24/50 v. D.C. 0.9999, 15/6.

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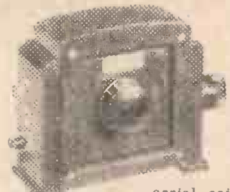

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A Low Voltage Spotlight

A Unit Suitable for Small Concert Halls or Amateur Photography

By S. HARTLEY

THIS spotlight has been used in a small church hall pantomime production and has latterly been employed with success in various photographic projects.

After experimenting with several types of standard automobile bulb, it was found that a standard 24-volt 60-watt coiled coil bulb, slightly overrun at 28 volts, gave the best results; the life of the bulb is not appreciably shortened (the original one has been in use for over 12 months).

There are several excellent transformers on the surplus market giving a range of voltages which would be quite suitable, the current required for the 24-volt lamp being in the region of 3 amps. Alternatively, for short periods such as are required in photography, car batteries could furnish the required power. The safety point should not be overlooked, as by using a low-voltage supply the lamp is perfectly safe to handle, the transformer and high-voltage leads can be kept close to the source of supply and the low-voltage lead supplying the lamp extended out to the operating position.

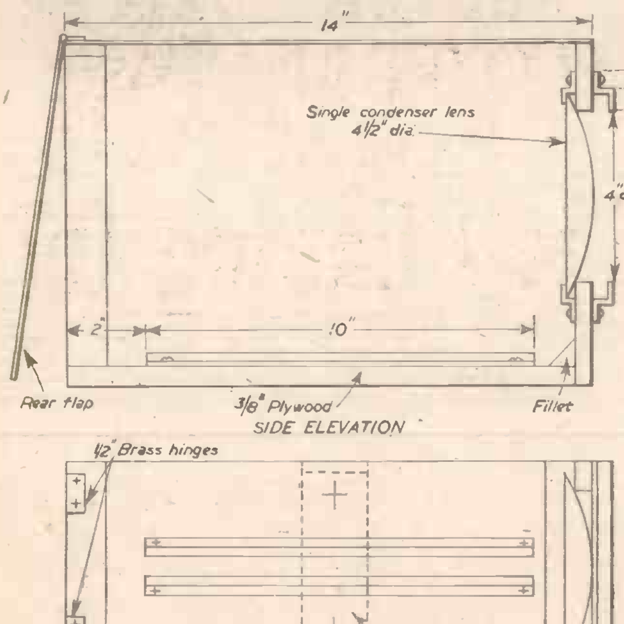

Fig. 1.—Side elevation and plan views.

Construction

This presents no difficulty, and apart from the lens most of the materials used were odds and ends found in my workshop.

Commencing with the base, cut two pieces of ⅜in. plywood, one piece being 14in. by 5½in. for the base, the other piece 9in. by 5½in. to form the front. After squaring up, cut a 4in. diameter hole in the front panel, chamfering on the inside to form a seating for the lens. Assemble with wood screws and glue, with a small fillet in the corner for strength (see Figs. 1 and 2).

Obtain a length of metal sheathing such as used by electricians for covering exposed cables and cut with a fine saw along the centre line. Cut two 5½in. lengths and mount these on the front panel, as shown in Figs. 1 and 2, to form a slide for holding colour slides; the remaining 10in. lengths should be screwed along the base centre line so as to enable a piece of 1in. by ¼in. black iron strip to slide along comfortably. Do not make this too slack, as the lampholder assembly might move and alter the focus.

Secure the lens by means of small metal clips as shown in Figs. 1 and 2, taking care not to exert too much pressure, as this might damage the edge of the lens.

At the rear end fit a frame of ¾in. by ¾in. strip wood the same outside dimension as the front panel (see Fig. 2). This will form a strengthener for the sheet metal cover and also a support for the hinged back flap. Set this portion aside.

The Lamp Mounting

From a length of ⅝in. square or hexagon mild steel bar, cut a 4½in. length, drill ¼in. clearance holes in the centre and ½in. from either end. Drill and tap 2 B.A. into the ends and from the side at the centre, as shown in Fig. 3; these are for the locking screws. Into a piece of 1in. by ¼in. strip iron 4in. long secure a piece of ¼in. rod by drilling and tapping, leaving sufficient thread on the rod for a lock-nut (Fig. 3). The lampholder is mounted on to a 2in. length of ¼in. dia. rod by means of a strip of thin sheet metal, bent round the lampholder, let into a sawcut, and secured by means of small nuts and bolts; the two views in Fig. 3 will make this clear. The rod is mounted into the front hole of the cross-piece (the hole at the rear end was originally intended for mounting a concave reflector, but after testing it was found that sufficient light was obtained without one.

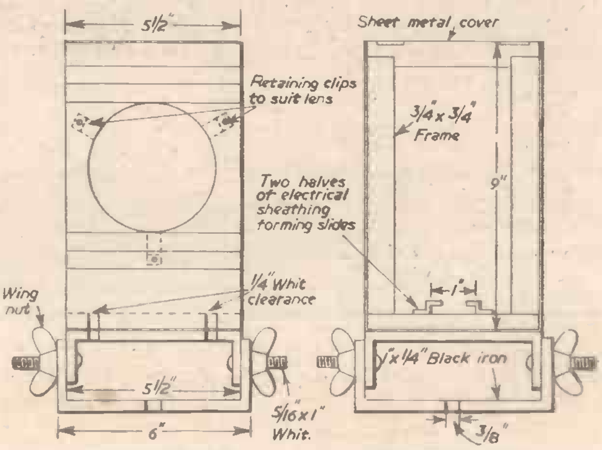

Fig. 2.—Front and rear elevations.

Connect one side of a standard 5-amp. two-pin connector, the pin side, with a short length of twin rubber cable to the lampholder, which is a standard S.B.C. holder, leaving about 6ft. of cable outside lamp.

The Metal Cover

The whole is now encased with a piece of 18 to 20 s.w.g. sheet metal. The two sides and the top are formed of one piece of metal, bent to shape and screwed into the baseboard by means of small round-head screws. The

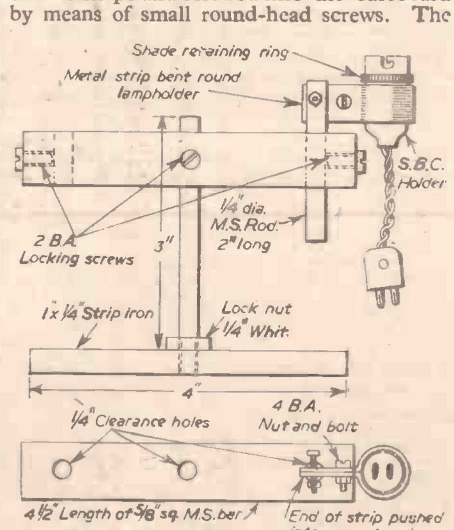

Fig. 3.—Side and plan views of the lamp mounting.

hinged flap is made from the same material and should be cut ¼in. larger than the finished flap, the margin being folded back and pressed flat, thus making the flap more rigid. Finally, it should be attached by ½in. brass hinges to the rear frame. Details of the metal cover may be seen in Figs. 1 and 2.

The Mounting Bracket

The mounting for attaching to the floor stand is made, as shown in Fig. 2, from 1in. by 3/16in. strip iron and bolted to the base with

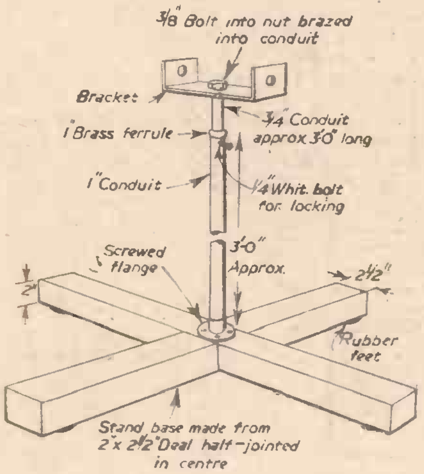

Fig. 4.—The stand and mounting bracket.

LIST OF MATERIALS

1 single condenser lens, 4½in. dia.
1 24 v. 60-watt S.B.C. coiled coil auto bulb.
1 S.B.C. lamp holder, pendant type.
3ft. of 1in. conduit.
3ft. of ¾in. conduit.
1 1in. brass ferrule.
1 1in. screwed flange.
4in. × 1in. × ¼in. black iron strip.
14in. approx. × 1in. × 3/16in. black iron strip.
4in. × ⅝in. × ⅝in. square or hex. steel bar.
8in. approx. × ¼in. mild steel rod.
4ft. × 2½in. × 2in. deal.
2 pieces ⅜in. plywood, 14in. × 5½in. and 9in. × 5½in.
2ft. of ⅜in. × ⅜in. strip wood.
4 Rubber feet.
15½in. metal sheathing.
1 pair ½in. brass hinges.
Strip brass, wood screws, etc.

¼in. bolts with washers on the inside. A matching bracket of the same material is made and fixed by means of 5/16in. bolts and wing-nuts to enable the lamp to be tilted. For swivelling the lamp, a ⅜in. bolt is passed through the lower part of the bracket into a nut that has been brazed into the end of a length of ¾in. electrical conduit (Fig. 4), it may be necessary to file the corners off the nut before driving into the conduit.

The Floor Stand

The lower half of the floor stand is constructed from 1in. conduit with a brass ferrule filed out to form an easy slide fit for the ¾in. section. This length is fixed to the timber cross-piece by means of a screwed flange. The cross-piece is made from two 24in. pieces of 2½in. by 2in. deal half-jointed, glued and screwed.

Four small rubber feet (ladies' round rubber heels are ideal for this) complete the stand. The whole can be given a coat of enamel to suit individual taste.

Focusing is carried out by moving the lamp along the slide after adjusting the height of the filament to the centre of the lens.

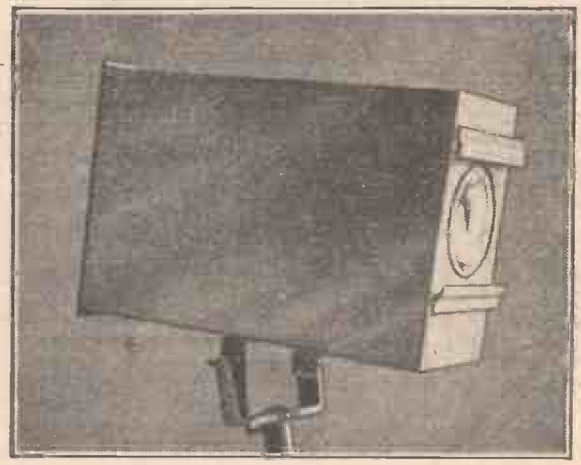

Fig. 5.—A view of the completed lamp, showing the mounting bracket.

How to make your own TRANSFERS

By J. JONES

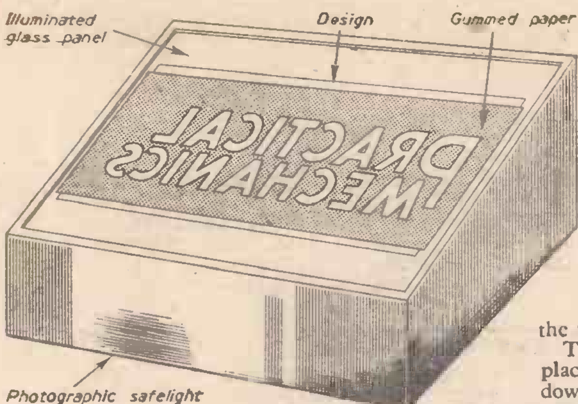

Fig. 1.—Method of producing transfers.

TRANSFERS are probably very cheap to buy, but the results fully justify the trouble taken in making your own. They are quite simple to produce and with a little patience and care excellent results can be obtained.

The materials required are very cheap and readily obtainable. They are as follows:

(1) Gummed paper, which is obtainable in various widths at most stationers.

(2) Coloured cellulose paint, obtainable from any model stores in small quantities.

(3) Clear varnish (preferably a quick drying one such as Valspar).

(4) Transfer fixing lacquer.

The outlay of a few shillings will probably make all the transfers one will ever require.

The use of some type of illuminated glass panel, such as a photographic safelight, will be necessary.

The first step in making the transfers is to draw out correctly the name or design it is desired to use. This should be done on fairly thin paper. If a copy of the design can be obtained, such as an advertisement in a magazine, this can be used instead, making the work easier.

The completed drawing is then placed on the glass panel right side down so that when the light strikes through you will have a reverse image. The gummed strip is placed on top of this image gummed side up and secured with some Sellotape or ordinary adhesive tape, as in Fig. 1. The image can then be traced carefully on to the gummed paper and removed from the glass panel. It should then be placed on a flat board and secured with four drawing pins.

The next step is painting in the design, which is now in reverse. I found a great deal of help in the article in the September PRACTICAL MECHANICS on Sign Writing and I would advise those who have not read this to do so. A good deal of care should be taken if worthwhile results are to be obtained. Although using cellulose paint any mistakes can easily be taken care of with a soft cloth dampened with thinners. Of course, any mistake on one letter means that the whole letter will have to be erased and painted again.

The paint will need a little thinning, but this is not to be overdone. Do not have too much paint on your brush. Allow the paint an hour to dry, and then give it one coat of clear lacquer, either following the outline or making a neat oblong according to the shape of the design. The clear lacquer should be allowed to dry for 24 hours, when the transfers will be ready for use.

The method of fixing the transfers is the same as for the manufactured article. A little more care is necessary, however, as they do not slide off as easily.

Soak in hot water for about 5 minutes, then slide off on to the work it is required to decorate. All the excessive gum should be washed off carefully with warm water and a soft brush; lightly dab the transfer with a soft dry cloth to exclude all air bubbles and when the transfer has dried on to the workpiece give a coat of transfer-fixing lacquer to secure it permanently in position.

Equipment for the Home Workshop

8.—The Storage of Taps and Dies

By TUBAL CAINE

(*Continued from page 83, November issue.*)

STORAGE presents quite a problem especially where space is limited, and tools are usually heaped into drawers and cupboards with no thought that they can easily damage each other through a heavy member falling on to a fragile section of another tool. In this article I wish to illustrate a very useful storage rack which has the dual advantage of preventing damage to the tools in question but also saving time. The perspective sketch, Fig. 1, shows the basic principle of the design.

The Design

The easiest way to save time when searching for a particular article is to have it within sight. Imagine we require a set of 2B.A. taps and no storage rack is in use. The box containing the taps is taken from the drawer and as a rule a dozen or so are examined before the required set is available—the time taken varying from one to four minutes according to how much searching is needed.

Now if that set was immediately visible on the workshop wall it would take but a few moments to reach up and bring them to the bench or machine and use them.

With this in mind I decided to scrap all the boxes as far as possible in which I had stored my tools, and as taps and dies formed rather a comprehensive item these were first taken in hand. Anyone contemplating such a move is not advised to make an identical rack to the one referred to in these notes, but to sit down with all the tools set out in various piles near at hand and give some thought to his own requirements before attempting any wood cutting.

Tool Range to be Accommodated

The first point to consider is the range of taps and dies you will use, but as British Association and Whitworth will probably form the majority, I suggest they are placed in the most convenient position; other less used members are then regulated to either the topmost or bottom sections which are perhaps not quite so easy to reach.

B.A. threads are used extensively in all forms of model work, and you should bear in mind your future requirements as well as viewing your existing stock, so that the necessary space for this class of tool may be allocated. Generally, model engineers use all sizes from O down to about 12, but allow for expansion and make this 14, and this makes 15 sets of holes for that type of thread.

The Whitworth thread is similarly treated and in this case the following are, I consider, the most frequently applied: $\frac{1}{8}$, $\frac{1}{4}$, 5/16, $\frac{3}{8}$, 7/16 and $\frac{1}{2}$in.

I have not included the 3/16 in. Whit. as this is so close to the 2 B.A. that one seldom specifies it. There are, of course, larger threads, but unless your work is of massive proportions then the above will be satisfactory and you can arrange the holes in the rack to suit them.

Though the above will cover most articles you intend to make, what are known as Model Engineer threads now appear extensively on parts of various dimensions. These are available at 32, 40 and 60 t.p.i. in diameters ranging as follows.

In the 32-thread tools we have 3/16, 7/32, $\frac{1}{4}$, 9/32, 5/16, $\frac{3}{8}$, 7/16, $\frac{1}{2}$ and 9/16 in. diameters, making nine different sizes in all.

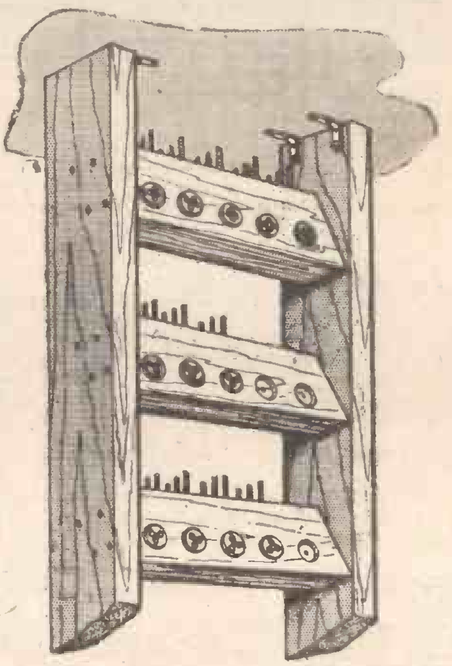

Fig. 1.—A perspective view of the rack for taps and dies.

Next for consideration is the very popular 40-thread screw. The diameters are: $\frac{1}{8}$, 5/32, 3/16, 7/32, $\frac{1}{4}$, 9/32, 5/16, $\frac{3}{8}$, 7/16 and $\frac{1}{2}$ in.—again nine sizes.

Finally we come to the 60-thread version, and though these do not perhaps have the same popularity as the previous thread they are particularly useful for screwing thin pipes and similar items. Diameters are: 3/32, $\frac{1}{8}$, 5/32, 3/16, 7/32, $\frac{1}{4}$, 5/16 and $\frac{3}{8}$ in.—eight different diameters this time.

I suggest that those readers who design their own models and equipment limit the size and number of threads used as this not only simplifies the storage problem but also reduces the cost of tools.

There is no need, unless some special article having the thread arises, in include British Standard Fine, Unified thread or the Metric screws; British readers will rarely encounter the different threads used in the United States.

If you decide that the above-mentioned threads are all needed in your workshop—fifteen B.A., six Whitworth, nine Model Engineer 32 t.p.i., nine Model Engineer 40 t.p.i., and eight Model Engineer 60 t.p.i., then we have 47 sizes to accommodate on this rack.

However some of these taps are not in "sets"—one only being sufficient to secure the desired thread because they are so shallow; thus the reader is advised to purchase them if possible before drilling holes in the cross members of the rack.

On referring to the drawings some readers may be tempted to simplify the amount of work and, instead of boring a series of holes to suit the outside diameter of each die, they may suggest using nails as an alternative. By placing the very fine threaded dies on one of these nails, however, there is a definite risk of damaging the "teeth" despite the use of the brass version with the head removed. I think also that rows of nails would appear unsightly after going to so much trouble making a rack of this type, so bore the recesses as I have indicated in the cross-sectional drawing (Fig. 2) and give the finished accessory a professional appearance.

The Timber

The side members were made from 3$\frac{1}{2}$in. wide floorboards—tongued and grooved incidentally, but I planed off the tongue and used that edge facing the shop. These are $\frac{3}{4}$in. thick and amply strong for the small weight they must carry. There is no need to use anything more massive than this, and pieces $\frac{1}{2}$in. thick will do just as well. The length will, of course, suit the particular site on which the rack is to be installed, but I think if you can arrange it to run from the ceiling to floor instead of simply placing it over the workbench or lathe then not only is there more room for the tools, but the long sides are useful for hooks on which you can hang innumerable spanners, keys and other small pieces instead of placing them in drawers. My racks are 7ft. 6in. high and 12in. between the uprights, and on each side I have spaced at various intervals 36 hooks (a total of 72) which considerably increases my storage space.

The cross members are set angularly between the uprights in order to make it impossible for the die to fall out of the recess, and though this angle is in no way important, it is suggested that you endeavour to maintain them all at a similar angle, otherwise the rack has a slovenly look.

These cross members were cut from a piece of 1$\frac{1}{2}$in. thick timber I had in stock and though something slightly thinner would undoubtedly perform the same task it should not be too thin or the holes for the taps will come too near the edges. Mark off the angle of 30 degrees on both edges as depicted in Fig. 2 and either saw or plane off the surplus

Tool Arrangement

The next step is to arrange the tools in some form of order and besides spacing out each type of tap and die, i.e., all the B.A. threads together, etc., you should endeavour to create an impression of orderliness by grouping them at regular intervals and not having too many on one particular board. Stand the dies where you wish them to come—five or six in a row is ample and this gives you a very good visual appearance of the final assembly with all the items in their respective places; it also has the added advantage of speeding up the marking out process because it eliminates to a great extent any guesswork which often occurs.

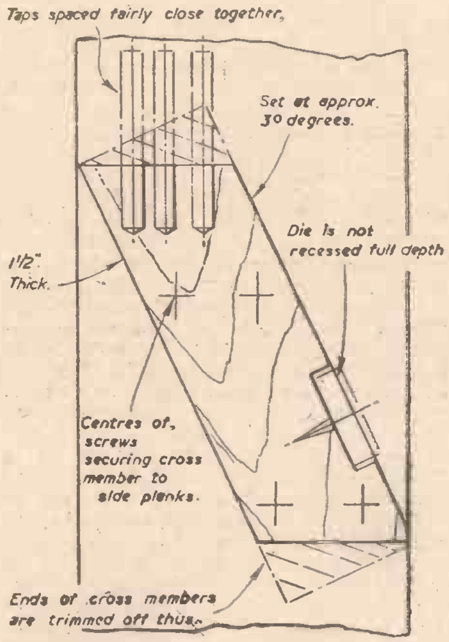

Fig. 2.—A side elevation showing constructional details.

Number the side of each cross member consecutively starting at the top with "1," and also add the sizes of tap and die on the ends when you have finally decided where they are to rest. I stress using the ends for this as they are, of course, later covered over by the vertical boards. After all the drilling and boring has been completed you can mark each front face carefully to give an easy and quick reference to each particular size of tap or die.

Drilling the Tool Recesses

The only remarks I can make concerns the size and depth of these recesses. Do not make them too deep, otherwise difficulty is experienced in removing the dies; you might even have to pick the tool out with a nail or the tang of a file. If the diameter of the hole is made a close fit on the die you will find that this problem again occurs, so I suggest boring the recess for every die about two-thirds the die thickness and making the diameter approximately 1/16in. larger. You may have to vary this latter dimension a little to enable you to utilise existing drills. I hardly need say that if the holes have a wide variation and the dies are then placed in them, the final appearance on the wall will again seem slovenly. Remember that when you stand away from the rack every die should appear to fit the recess closely, yet must fall easily into your hand when removing it for use.

The taps are inserted into holes drilled in the top face and the larger these are the easier they will drop into place. A depth equal to half the tap length is sufficient, but this may be less if the thin boards are used. Drill them about $\frac{3}{8}$in. apart for the small tools and a little greater for the $\frac{1}{2}$in. sizes: this will keep them fairly close together and enable you to pick up a set in one hand. Each set of taps is arranged, of course, immediately above the die of that size, and in rows, one behind the other, as shown in Fig. 2.

Assembling the Parts

The side members are not grooved to fit the cross pieces as the weight of these tools is never very great and a few screws passing through the sides is sufficient to hold them together. You must place them fairly low down otherwise there is a possibility, if you have the two end sets of holes for the taps too close to the edge, that they will foul the screws when the latter are screwed home. By keeping them low in the cross pieces this situation cannot arise, and as only three are needed in each side there is plenty of room to space them well apart.

Fixing to the Wall

When properly assembled the rack should resemble a ladder, and this now requires securing to the wall of the workshop. Some simple brackets bent up from about 16 S.W.G. brass strip will do this quite well, and you can easily make these by tapping over the vice jaw material of the necessary width. Pieces about 2in. long, bent, making a right-angled bracket with 1in. sides, do not look unsightly, and two holes in each "leg" are enough for holding purposes. I suggest six brackets—two at the top, centre and bottom—to hold the rack rigid. Whether the brackets are screwed to the floor and ceiling depends on the construction of the workshop, but I expect many will find the wall fixing satisfactory.

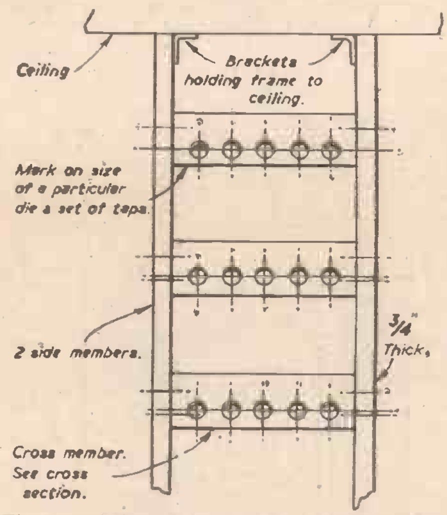

Fig. 3.—A front view showing holes for dies.

General Notes

Some readers may regard this rack as elaborate for what they will term the mere storage of a few tools, but the time saved over even a short period is soon noticed in the workshop and if taps and dies are replaced immediately the thread has been cut, then the orderly appearance has much to commend it.

The advisability of leaving taps and dies exposed in this way may be questioned, and it may be asserted that eventually they will rust. Nearly every tool will rust if neglected, and I cannot imagine a better place where this can occur than tucked away in some remote corner of a drawer in a tin which is perhaps far from being waterproof. Having the tools visible to the eye is preferable, and one can check daily by casually running the eyes over them to see whether any show signs of rust. There is no need to oil each tap and die on placing them on the rack. It is preferable to keep them clean and dry to avoid smothering the rack with oil stains.

Finishing

Whether painting is considered essential is a matter of personal taste—mine was primed and given two coats of flat paint. The colour used was a very light shade of cream—almost white. Do not stain the rack as this tends to darken the interior of the workshop and I for one never like working in this condition. Staining will not show the oilstains so much as the painted surface, but mine has been in use now for over twelve months and to date it does not show any real signs of becoming saturated with oil and grease.

Finally we come to the question of providing a cover to keep out dust and dirt. If this is considered necessary then I think a proper cupboard with either a swing or sliding door is preferable—a construction which requires both extra time and thought. I have never found this important, and a monthly brush down is enough to keep my rack reasonably clean.

The rack took me some ten hours to make, but now I cannot think how I ever stored my screwing tackle without one.

(To be continued.)

READERS' SALES AND WANTS

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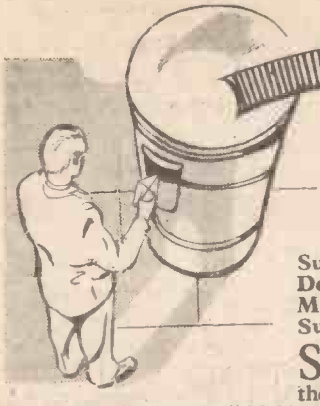
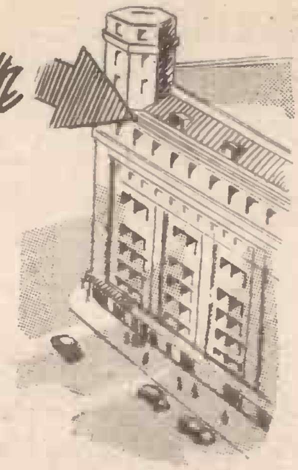


Letters to the Editor



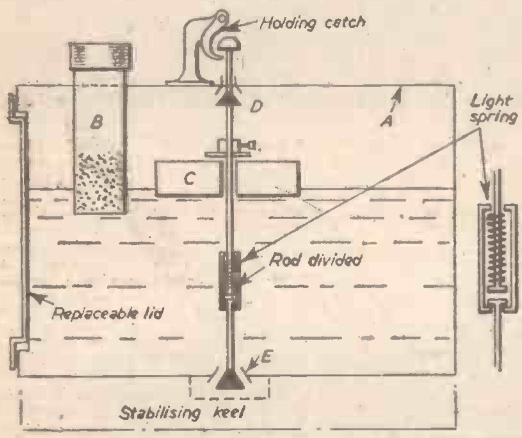
The Editor Does not Necessarily Agree with the Views of his Correspondents

Submerging Device for Model Submarine

SIR, — With reference to the article by Mr. D. M. Hughes on "Making a 2ft. Submarine" in the October issue of PRACTICAL MECHANICS. Maybe Mr. Hughes would like to see his submarine submerge and rise again at least once during a trip.

I suggest an experiment with a syrup tin, or similar tin, on the lines of the sketch below. The tin (A) would represent a ballast tank in a proper submarine.

Valve E would let in water slowly until float C would close E, carry on up and then close the air valve D. The gas-forming powder such as sherbert, health salts or even calcium



Mr. S. N. Shurman's submerging device.

carbide (B) would by then be wet and expel the water out through bottom valve E, this giving way to the slight spring pressure.

E would remain closed by means of the holding catch on top of the vessel and so no accidental sinking should take place should a recharge of powder be forgotten.

Alterations, or a new submarine, would be necessary to incorporate the scheme. The capsule tube "B" could be provided with easily removable capsules.—S. N. SHURMAN (Lancs).

Photo Flood Lamp

SIR,—With reference to the photo flood lamp described in the October issue of PRACTICAL MECHANICS. I have made a similar reflector and suggest that in addition to the "pudding basin" an aluminium jelly mould is obtained with a top outside diameter of about 4in. The bottom of the basin is cut so that the inside top diameter of the jelly mould is visible when riveted to the underside of the basin. The hole for the lampholder is then cut in the bottom of the jelly mould (a circle is already pressed so this is easy). The lamp will then be well recessed in the reflector.—G. F. SIMPSON (Twickenham).

Cutting Glass Bottles

SIR,—I note your reply to a query from L. Burke (Swindon) on "Cutting Glass Jars."

I have "cut" many quart beer bottles and made drinking vessels, after taking off a razor-like edge ! More recently I have cut a certain make of ink bottle of fancy design to convert, with coat of flat coloured paint, into flower vases. The dead straight cut always needs a rough rub round with oil stone, "wet and dry," or even sandpaper to remove the very clean, sharp edge.

The method of cutting glass bottles to an even line above the base is to place the bottle on an even surface and fill with *oil* to required height for "cut." Any garage can let you have, by arrangement, disused engine oil. This is the old oil, fairly thick, I have always used with 100 per cent. success. The bottle is stood up with oil up to mark and a *red-hot* poker is passed through the neck. If "poker" is too big a mass, a ½in. rod of mild steel or iron must be used. By *red-hot* I mean intensely red, not cherry red. After a few seconds with the hot metal about 1in. into the oil, you will hear a "click" or "crack" and will find you can lift the top portion off at a line exactly to where oil was. In hot summer weather there is some delay but a sprinkle of cold water from a water can will produce the desired "crack."—P. W. SAIT (London, E.15).

Reversal Developing

SIR,—In reply to the query from Mr. Chadderton *re* reversal developing, he should find the following of use. The quantities are worked out for 35mm. film in Johnson's Universal Tank, and can be proportionately increased or decreased to meet requirements.

Films—Ilford FP3 or HP3: developer—.52 grammes metol, 17.5 grammes sod. sulphite (xtals), 2.1 grammes hydroquinone, 34.5 grammes sod. carbonate (xtals), .13 grammes pot. bromide, 2.8 grammes sod. hyposulphite. Make up to 350 ccs.

Solution A—4 grammes pot. permanganate. Make up to 1,000 ccs.

Solution B—20 ccs. conc. sulphuric acid. Make up to 1,000 ccs.

Clearing solution: 8.75 grammes pot. metabisulphite. Make up to 350 ccs.

Fixer: 105 grammes sod. hyposulphite, 8.75 grammes pot. metabisulphite, 4.37 grammes chrome alum. Make up to 350 ccs.

Dissolve hypo. and metabisulphite first in hot water. Dissolve chrome alum in warm water. Mix when cool and make up to 350 ccs.

Process: 1. develop 12 mins. at 68 deg. F. 2. Wash 3 mins. 3. Bleach 5 mins. at 68 deg. F. (equal parts A and B). 4. Wash 2 mins. 5. Clear 2 mins. 6. Wash 2 mins. 7. Expose 30 secs. at 18in. from 100 watt lamp. 8. Develop 6 mins. (using developer above at 1). 9. Wash 3 mins. 10. Fix 10 mins. 11. Wash 30 mins.—N. A. GILL (Leics).

Space Travel

SIR,—I am rather puzzled over V. A. Miller's letter in the October issue of PRACTICAL MECHANICS. How can any rotating body have a directional force, as any rotating force applies an equal pressure all round the object, therefore once it overcomes the pull of inertia it remains stationary in space? I suggest that there is no wing at all rotating and the movement of the object is accomplished by "heat" caused by atomic or cosmic engine developing a forward reaction, therefore propelling the object through the universe. Perhaps one of the experts would be good enough to put forward an explanation.—R. DIGHT (Essex).

A New Force ?

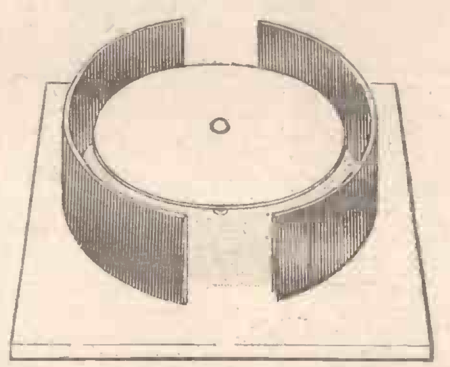
SIR,—Many years ago I discovered by accident during some experiments that a circle of thick tinfoil, pivoted centrally on a needle and using a small snapbutton for a pivot and two collarpieces of cardboard stuck down to the base at opposite sides of the disc, as in sketch, would revolve on its own accord. One of the openings had to be turned towards a window—open or closed !

It works better on a window-sill and the instrument may have to be manoeuvred around a little in order to find the best position for working.

I have constructed one with side pieces of fine filter, copper gauze netting, which works very well.

In operation the edge of the disc tilts at different places.

When placed on a window-sill (inside) with the window closed, it runs steadily for hours with very little variation of speed.



Mr. E. S. Humphrey's experiment.

Roughly speaking, without a direct draught, it revolves about the same speed as the Earth.

The Department of Scientific and Industrial Research call it a ventilating device !—E. S. HUMPHREY (Romford).

[*This idea is very old*—ED.]

A New Force, "Beware of the Night"

SIR,—I do not find myself in serious disagreement with either of your correspondents' very interesting letters in the October issue, one from "Interested" of Colchester, and one from W. J. Hughes of Gosport. The "new force" is, of course, most unlikely. My own opinion is that convection currents and irregular radiation are, as stated, the cause of motion in this model. Electro-static effects may sometimes contribute.

The internal combustion engine is another and more complicated story; difficult to write in a few words. Perhaps this accounts for some misunderstanding. The basic trouble is that the normal I.C.E. is quite unsuited to traction, for it has no starting torque. Engines are made large and deliberately run inefficiently in order to secure power in a convenient or comfortable manner.

In many engines water injection is useful, but only because the engine is faulty. It is wrong to cool the burning gas; the heat should be, as Dugald Clerk always said, taken from the metal where it is not wanted. We have to keep mixture hot enough to remain suspended and cold to prevent loss of weight!

The word "explosion" is generally used non-technically because, however fast or slow, all this type of explosion is merely burning. These engines are queer things. We know that quick burning is thermally efficient, so we slow it with additives because it is convenient and helps in overall efficiency, of which comfort is a great part.

During the night the changes in atmospheric moisture content are not often enormous. Fogs and rain do not seem to have very much effect, so I incline to the belief that the major cause of "better" night performance is darkness. The moisture effect, I should have thought could only be detected by indication. Our senses are very difficult to check. Noise often seems less after a meal, but it is only the result of "nervous nourishment."

Am I not right in thinking that the load due to reciprocation is higher than that of piston effort? That, really, is all that was intended by my little paragraph. An open throttle often increases engine temperature and this too is, in my opinion, mildly undesirable in a new engine.—PROF. A. M. LOW.

Making Gelatine Filters

SIR,—The following is in reply to reader R. G. Saunders' enquiry on making Gelatine Filters for photography, which was published under "Information Sought" in the July issue.

The actual filter material is bought as squares of coloured gelatine in all values—K1 and 2, yellow, green, orange and red with the exposure factor given with them. Also required are some circular microscope slide cover glasses and ½oz. of Canada Balsam. The filter material is packed between two pieces of thin card when bought. A circle is marked off on this card as in Fig. 1, the same size as cover glass and large enough to cover camera lens, and then cut round with scissors.

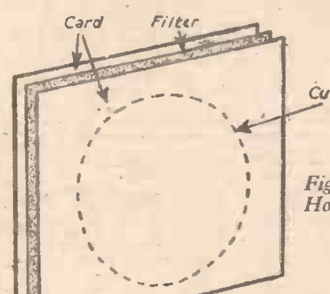


Fig. 1 (Left).—How the filter is cut.

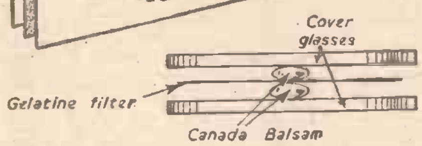


Fig. 2.—Cementing the filter between two cover glasses.

Take one of the cover glasses and place a drop of Canada Balsam in the centre. Lay the filter on the drop and then follow this with another drop of Canada Balsam on the filter and lay on the other cover glass. The "sandwich," see Fig. 2, should be pressed together to spread the Canada Balsam to the edges and then left under pressure for a few days to set. When dry a holder can easily be made.

A useful set of gelatine filters is K1 yellow (exposure factor 1½ times); yellow-green (3 times); orange (5 times); and red (6 times). These should all be available from a good photographic dealer. Two microscope cover glasses are required for each filter made, and these may be obtained from an optician.—C. H. RAMSDEN (Staffs).

Patent Delays

SIR,—I was particularly interested to read your recent vital comment on the subject of patent delays. The Institute of Patentees is constantly pressing for a review of the difficulties under which an inventor suffers. We organise exhibitions, give free technical and legal advice, and arrange lectures for the benefit of our members. We have also a companion section for the encouragement of young people.

The public does not yet realise the importance of invention to a country where the manufacture of prototypes can benefit industries which cannot undertake production on an American scale. We have been successful in so many cases that, although writing personally, I feel justified in saying that more help is required from the public to combat the falling rate of patent applications.

The institute has a defence fund to help in dealing with problems which affect inventions as a whole. Even apart from the matter of exports, inventions are the most vital asset of Great Britain. — PROF. A. M. LOW (President of the Institute of Patentees).

SIR,—You are to be congratulated on your subject of "Patent Application Delays," in your editorial for October. This is a subject of national importance which is badly neglected in this country. We have proved through many years to have the best inventive talent of the world, especially during two world wars, in spite of the neglect and opposition which our industry gives to its introduction and acceptance owing to the capital already invested in the mass production of objects which may suffer through failing economically to stand up to new ideas when these are once introduced into industry on practical lines.

Such a neglect, I am sure, could be lessened by the activities of a public body, formed for the help of inventors, being fully recognised both by the industry of this country and our colonies and all classes of inventors themselves.

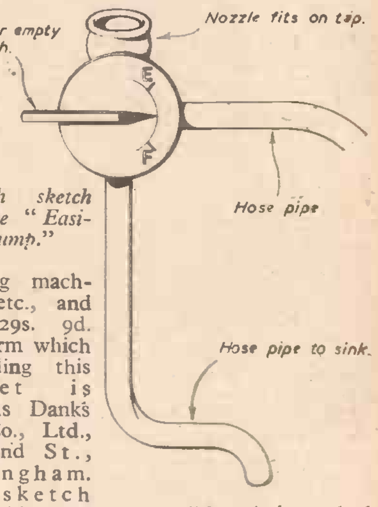
It only requires the enlargement of such a body as the Institute of Patentees, situated in London, which has been in existence since 1919 for the benefit of inventors. With better support this could provide a means of providing an introduction of a selection of the best ideas to industry by the creation of competition, through correspondence, interview and exhibitions. The latter would be held in the Mother Country, Great Britain, to the extent of three or four per annum round twelve industrial centres.

This is the type of body which will fulfil the requirements wanted by your readers, Messrs. Wace, Tew-Cragg and Humphrey, whom I advise to write to the secretary for full particulars.

This organisation, when once enlarged to be actively supported by the chief branches of our industry, both at home and in the Colonies, would be the best stimulus to the revival and maintenance of our export trade which, as we all know, is essential to the welfare of our country and would enable us once more to establish ourselves as the leaders of industry on the same lines as we once held it before the world wars commenced.—SIR ARROL MOIR, BT., B.A., M.Inst.C.E., etc.

Mains Pressure-operated Pump

SIR,—I note that in the September issue, in "Information Sought," a Mr. H. Partridge, of Cradley, asks for information regarding a pump for emptying his washing machine. I have seen the type of thing he wants and it is called the Easipump—it fills and empties receptacles, wash boilers,

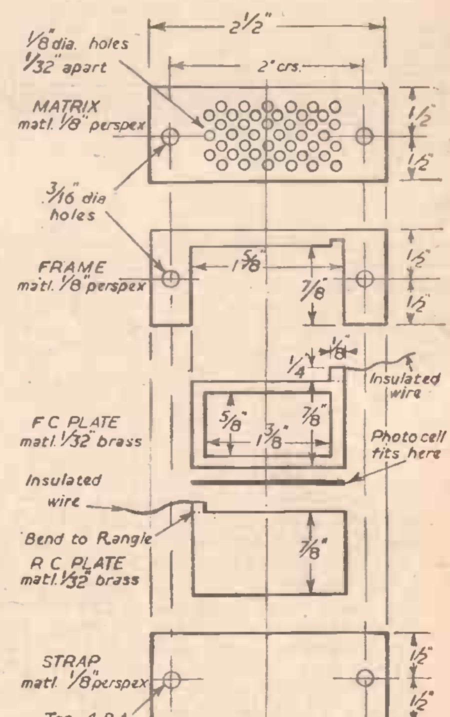


Rough sketch of the "Easi-pump."

washing machines, etc., and costs 29s. 9d. The firm which is selling this gadget is Thomas Danks and Co., Ltd., Thurland St., Nottingham. The sketch shows this as near as possible: it is worked from any water tap.—C. E. A. MOSS (Nottingham).

"Constructing a Photometer"—A Correction

WE apologise to readers for the fact that Fig. 4 in our article, "Constructing a Photometer" in the October issue, contained some wrong dimensions. The corrected diagram is shown below.

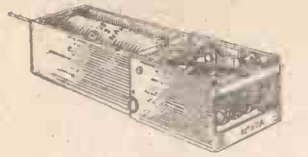


"Copying Diagrams"—A Correction

IN the short article, published under the above title in the September issue, an error appeared in the formula for a reducer. Owing to a typographical error a nought was transposed: the correct formula should be as follows:

Iodine, 3 grs. Iodide, 30 grs.
Water to 5 ozs.

ELECTRO MAGNETIC COUNTERS



Post Office type 11A, counting to 9,999. 2 to 6 volts D.C., 3 ohm coil, 12/6 each, post 1/-. Many other types in stock.
MECHANICAL COUNTERS to 99,999 only 7/6 each. Post 6d.
SNIPERSCOPES.—These were used during the war for seeing in the dark. We are offering the Infra-red image converter cell in a metal cylinder 6in. x 2¼in. for only 30/- cge. paid. They are new and packed in the original transit cases. A battery with cable is included, but the condition is not guaranteed. This is an opportunity for the experimenter.
Limited number—send your 30/- now.
THERMOSTAT.—For frost protection, on at 34 deg. F., off at 49 deg. F., 1½ amps, at 250 volts adjustable, 4/6, post 6d.
CHARGING RECTIFIERS.—Full Wave Bridge 12 volts 2 amps, 13/6, 4 amps, 22/6. 2 amp Transformers 24/-, 4 amp, 27/3, post 1/6.
TELEPHONE SETS, MODERN DESK TYPE.—£8/17/6 per pair complete.
WALL TYPE also available. 2 complete units £5. Batteries 5/6. Twin Wire 5d. per yd.
RELAYS, HIGH SPEED SIEMENS 1,700 +1,700 ohms, just the job for radio-controlled models, 17/6 each. Post 1/-.
VENTAXIA EXTRACTION FANS, brand new, complete with cowl, 12 v. D.C., 6in. diam. blades, silent running. Ideal for caravans, etc. £4/10/- each. Post 2/6.
GENALEX EXTRACTION FANS.—230/250 volt 50 cy Induction motor, 1,350 r.p.m., 85 watts, 9 in. blades, silent running, £6/15/-. Cge. 7/6.
A.C. MOTORS, ¼ h.p. 1,425 r.p.m., ½ shaft, Ball Bearings, Standard foot mounting 220/230 volts Single Phase made by Crompton Parkinson. Continuous rating. Brand New. £6/10/0.
A.C. MOTORS, Capacitor start and run, 230 volts 1/10 h.p., 1,425 r.p.m., foot mounting, 7in. x 6in. x 5in. overall, £3/10/0. Cge. 5/-.
12/24 VOLT D.C. MOTORS with double ended shaft 2in. x 3in., 8/6, postage 1/-.
KLAXON GEARED MOTORS.—230 volt A.C. Induction type, No. 1K5SB3-W7. Torque 15 lbs./in. 175 r.p.m. £10.
HEADPHONES, HIGH RESISTANCE.—4,000 ohms. New, 12/6 pr., post 1/6.
VERNIER DRIVES. Muirhead, scaled 0-180 deg. 38 to 1, diam. 3 inch, 10/6. Post 1/-.
ACFIL PUMPS.—These pumps enable you to fill all accumulators on the bench with the carboy at floor level. Brand new. Only 30/-, post 2/-.
LOW VOLTAGE CIRCUIT TESTER.—A self-contained unit for making a complete and rapid check of the generator-battery circuit of a vehicle. Battery voltage, regulator and cut-out settings and generator performance can all be easily determined. American made. Complete with instruction book. £5/10/-. Cge. 5/-.
BALL RACES.—No. EE2, ⅜in. x ⅞in., 3/-. 30/- doz., post free.
THRUST RACES.—13/16in. x ⅜in., also ⅜in. x ⅞in., 1/6. 15/- doz. Post free.
SWITCHES.—A row of 5 in a flush mounting bakelite moulding 5⅛in. x 1⅛in. x 2in. Ideal for model railways, etc., 5/6, post 9d.
ROTARY CONVERTERS.—From 24 volt D.C. to 230 volt A.C. 100 watts, 92/6 ea. Cge. 7/6.
VACUUM PUMPS or Rotary Blowers.—Ex R.A.F. Brand New, 7 cu. ft. per min. 10 lbs. per sq. inch at 1,200 r.p.m. Ideal for a brazing torch, etc. Size 6in. x 4in. x 4in., 2 x ½in. shaft. 22/6 each. post 2/-.
PORTABLE ELECTRIC BLOWER.—This unit is a powerful 220 watts electric motor, operating on 220-230 volts. Enclosed type with handle, 8ft. of metallic flexible hose and nozzle is included, also 7 yds. C.T.S. flex for connection to the mains. 130/- complete. Carriage 7/6.
INSPECTION LAMP.—with Battery case. Fits on forehead. Leaves hands free, 7/6, post 1/-. Ever Ready Battery, No. 1215 2/9, post 6d.
VOLTMETERS.—0-20 M.C. 2in. Flush, 10/6 each, post 1/-.
INSTRUMENT RECTIFIERS.—Full wave Bridge 1 mA., 8/6; 5 mA. 7/6; 50mA. 5/- ea.
CELL TESTING VOLTMETERS.—3-0-3. In leather case with prods, 25/-, post 2/-.
MICROAMMETERS. 250 F.S.D. 3¼in. **FLUSH. MODEL S37.** Specially scaled for test meters. Knife edgepointers. Guaranteed, 55/-.
VOLTMETERS for A.C. Mains 50 cy. reading 0 to 300 volt with clear 5in. dial only 60/-; 0/15 volts A.C./D.C. 2¼in. Flush, 15/6.
VOLTMETERS.—0/300 D.C. 2in. Flush Square with external resistance, 10/6; post 1/-. Easily converted to read A.C. by using a 5 Milliamp meter rectifier at 7/6. Post 6d.
AMMETERS.—2in. Flush 0/20, 10/6 ea. 20-0-20, 12/6 ea. Moving Coil D.C.
LOUD SPEAKERS.—P.M. 12in. Plessey, 3 ohms, special price 32/6, post 1/6. Also 10in. in Portable Wood Case 17in. x 17in. x 6⅛in., complete with flex and plug in special compartment, only 50/-, carriage 5/-.
LISTS AVAILABLE.—Motors, Meters, Telephone, Rectifiers, Relays, Potentiometers, Resistances. Send large S.A.E.

WILCO ELECTRONICS

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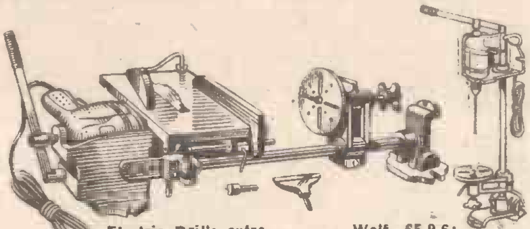
204, LOWER ADDISCOMBE ROAD CROYDON.

GAMAGES
Most Efficient
ALL-PURPOSE MACHINE

SAW BENCH—
LATHE—
DRILL PRESS



Electric Drills extra . . . . Wolf, £5.9.6; Black and Decker, £5.19.6; Bridges, £7.19.6.

The finest multi-purpose machine of its type, based on a popular American design, with all the features of expensive machines. *A WORKSHOP IN ITSELF!* Driven by ½in. capacity electric drill, such as "Wolf Cub," "Bridges" or "Black and Decker." Strong alloy castings with black crackled finish.

SAW BENCH
5 in. Rip Saw with arbor for fitting into drill chuck. Oil-impregnated bearing table. 8 in. by 7 in. with rise and fall tilting action, Sawguard, Sliding Fence, etc. Depth of cut 1½ in.

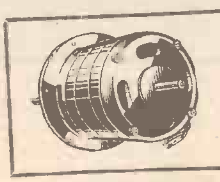
LATHE
4 in. faceplate, fixing and revolving wood centres with screw type tailstock (drill chuck is removed to fix faceplate on to drive). Will turn 11in. x 6in. timber

DRILL PRESS
The end bed bar is hinged to allow the machine to stand on end and convert into a useful Drill Press. Overall length 29 in. Overall height 9 in. Polished Steel Bed Bar ⅞ in. dia.

Spare blades either Rip or Fine tooth for cross-cutting. 12/6 extra

ALL COMPLETE FOR
£9 : 12 : 6
Or 45/- deposit and 10 monthly payments of **16/-**
Tool Dept., Ground Floor

*Carr. & Pkg. 7/6 outside 50 miles radius of Holborn in Eng. & Wales. Scot. 10/6.



1/10TH H.P. CAPACITOR START INDUCTION MOTORS—SAVING 15/6
With Double Spindles. Durable Black finish. Capacitor is separate. For driving small machines and models and for use as grinder and polisher, etc. Overall length 7¼ in. Spindle length 1¼ in. 200/250 volts A.C. single phase 2,800 r.p.m.
Usually 55/-
Carr. and pkg. 2/9.
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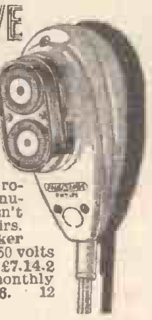
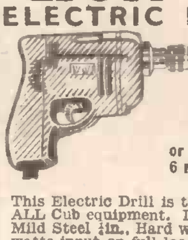
Try the wonderful Philishave Electric Dry Shaver FREE for 14 days. Send only 5/- deposit (returnable if not satisfied). Two shaving heads with two 6-bladed cutters have unique rotary action which genuinely shaves—doesn't just snip at the hairs. Result—better, **quicker** shave. Operates 110/250 volts A.C./D.C. Cash Price £7.14.2 or 5/- deposit and 8 monthly payments of £1.0.6. 12 months' guarantee.



Illustrated Brochure of this and other Shavers Free on request.

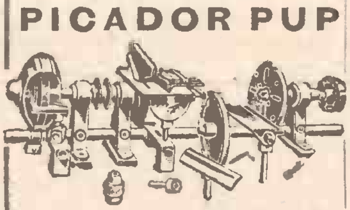
Wolf Cub
ELECTRIC DRILL AT ONLY £5-9-6



or 6/- deposit and 6 monthly payments of 19/6.

This Electric Drill is the power unit for ALL Cub equipment. Drilling capacity: Mild Steel ¼in., Hard wood ½in., with 210 watts input on full load. Complete with ¼in. three-jaw chuck, Allen key, 5ft. cable. TV suppressed. State voltage. ALSO Home Workshop Outfit (Drill, Saw, Lathe, Sanding and Polishing Kits) £16.17.6 or 40/- deposit and 8 monthly payments of 41/6. *Send for Illus. Brochure of the complete WOLF Cub range of tools*

THE MOST VERSATILE TOOL EVER
PICADOR PUP



Save ground space with the **PICADOR PUP.** It comprises a wood turning lathe, a rise and fall, fully tilting circular saw, a hooded grindstone with drill sharpening attachment, together with sanding and drilling attachments. It GRINDS, including Twist Drill Grinding. TURNS, SAWS wood, plastics, etc. Only £6.15.0 cash or 25/- deposit and 6 monthly payments of £1. 3in. four-jaw Chuck suitable for the above —£3 cash or 16/- deposit and three monthly payments of 16/6.

Send 3d. for illustrated Brochure.

ELECTRIC PAINT SPRAYER

Cash 75/-. Or 4/- deposit and 6 monthly payments of 13/6.

Paint easily, evenly, and twice as fast with the Burgess Electric Paint Sprayer. For paint varnish, light oils, etc. A.C. mains—state your actual voltage. Cash 75/-, or 4/- deposit and 6 monthly payments of 13/6. Fully guaranteed. ALSO Horvell Electric Paint Stripper, 30/-, or 4/- deposit and 3 monthly payments of 10/-.

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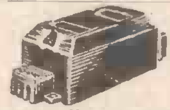
Soldering Irons. Our new stream-lined iron is fitted with a Pencil Bit. 200/250 v. 50 watts, 11/6, post 6d. **Standard Iron** with adjustable bit, 200/250 v. 60 watts, 13/6, post 6d. **Heavy Duty Iron,** 150 watts, 16/6, post 8d. All parts replaceable and fully guaranteed. **Small Soldering Irons,** for use on gas, 1/4 post 4d. Resin-cored solder for easy soldering 6d. packets or large reels 5/-, post 9d.
Ex-R.A.F. 2-valve (2-volt) Microphone Amplifiers as used in plane intercom., in self-contained metal case; can be used to make up a deaf-aid outfit, intercommunication system, or with crystal set; complete with valves and fitting instructions, 20/-, post 2/-. Useful wooden box with partitions to hold amplifier, 2/- extra. Ditto, less valves, 10/-.
Sparking Plug Neon Testers, with vest-pocket clip, 3/3, and with gauge, 3/6, post 3d. **S.B.C. Neon Indicator Lamps,** for use on mains showing "live" side of switches, etc., 3/6, post 4d. **Neon Indicator,** complete with condenser (pencil type), with vest-pocket clip, indispensable for electricians, etc., 7/6, post 5d.



Bell Transformers. These guaranteed transformers work from any A.C. Mains, giving 3, 5, or 8 volts output at 1 amp., operate bulb, buzzer or bell. Will supply light in bedroom or larder, etc. **PRICE** 9/-, post 8d. **Similar Transformer** but with output of 4, 8 or 12 volts, 12/6, post 10d. **Transformer** with similar output, but with fused secondary and earth terminal, 18/-, post 1/-. **BELLS** for use with either the above or batteries, 6/6, post 6d. **"Big Ben" Chimes.** Housed in Cream Plastic Case. Easily connected to give Two-Note Chime from Front Door, and Single Note from Rear. Operated from 6-9 volt Batteries or Transformer (shown above), 21/2, post 1/-.
Crystal Sets. Our latest Model is a real radio receiver, which is fitted with a permanent crystal detector. Why not have a set in your own room? 12/6, post 8d. Spare Permanent Detectors, 2/- each. When ordered separately, 2/6. With clips and screws, 2/10, post 3d. **Headphones,** brand new, S. G. Brown, G.E.C., etc., 23/-, and super-sensitive, 30/- a pair, post 1/-.
Headphones in Good Order, 6/-. Better quality, 7/6 and 10/-. Balanced armature type (very sensitive), 13/6. All post 1/-. **New Single Earpieces,** 3/6. Balanced armature type, 4/6 (two of these will make an intercom. set). Ex R.A.F. earpiece, 2/6, all post 4d. **Headphones** with moving coil mike, 15/-. Similar phones with throat mikes, 12/6, post 1/-. **Headphone Cords,** 1/3 a pair, post 3d. **Replacement Bands,** 1/3, post 4d. **Wire Bands** 6d. **(All Headphones listed are suitable for use with our Crystal Sets.)**
Hand Microphones, with switch in handle and lead, 5/6. **Tannoy,** 7/-. **Similar** instrument, moving coil, 8/6. All post 1/-. **Mask** type with switch, 3/6, post 4d. **Mike Buttons** (carbon), 2/-. **Moving Coil,** 4/6; **Transformers,** 5/-. All post 4d. each.

Black & Decker ¼in. Drill (as illustrated). Universal A.C. or D.C. motor fully suppressed against interference, £5.19.6, post 2/6. **B. & D. 5in. Sander Polisher,** as above, but the addition of side handles makes it an ideal tool for waxing and polishing cars, furniture and floors, sanding to remove paint or rust, etc., £8.7.6, post 2/6, or complete with sander and polishing kit, which includes ¼in. chuck for drilling, lambswool bonnet and pads, polishing and sanding discs, £9.17.6, post 2/6. **B. & D. Lathe** for use with either of the above, £5.5.0, post 2/6. **B. & D. Bench Stand,** for use with either drill or sander, £3.7.6, post 2/6.
Morse Keys.—Standard size keys wired to work Buzzer or Lamp, 3/-, post 6d. Slightly smaller keys, 2/6, post 4d. **BUZZERS,** 3/9, or heavy duty, 4/6, post 5d.
Terminals, brass 2BA, mounted on strip, 6d. pair. .0005 **Airspaced Variable Condensers,** 2/6, post 4d. .00003 twin gang with trimmers, 2/6, post 4d. 24 volt, 15 mm., **M.E.S. Bulbs** for model railways, etc., 1/- each, 10/- doz., post 4d. **Wander Plugs,** Brass, 1/6 doz., post 4d. **Fuses.**—1 amp., 1¼in., packet of 10, 2/6, post 3d. Also 150 mA. and 250 mA., same price. Ex-G.P.O. Telephone Twin Bells, with box, 5/-, post 1/-. **Single Telephone Bell,** 3/6, post 6d.
Bargain Parcels, of really useful equipment, containing Switches, Meters, Condensers, Resistances, Phones, etc., 10/-, or double assortment, 17/6; treble 25/-. All carriage 2/3. This country only.
Meters, 20 amp. 2¼in. m/i, 12/6. 15 v., 2¼in. m/c., 9/6; 150 v., 2in., m/c., 10/-; 3.5 amp. 2in., T.C., 6/-; 4 amp., 2¼in. T.C., in case with switch, 9/6; 100 mA 2in., m/c., 7/6; Meter Units containing 2-500 microamp. movements, 7/-, post 1/-.

Money refunded if not completely satisfied.

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New Illustrated List sent on request with 1½d. stamp and S.A.E.

Trade Notes

Set of Photographic Enlarger Castings

FROM L. M. Norfolk, The Studio, Earl Road, East Sheen, S.W.14, we have received details of a construction kit for making a 35mm. enlarger.

The set comprises the metal parts necessary for making an enlarger for 35mm. negatives, capable of producing prints up to a maximum size of 12in. by 15in. using the pillar provided. It is intended for construction by amateurs of average skill who have access to a 3½in. screw-cutting lathe. For those with workshop facilities which do not include screw-cutting, the lens mount can be supplied with the thread already cut, for a small additional charge. A negative carrier and lampholder are included in the set and the only additional parts required are the optical equipment, baseboard, bulb and electrical connections. The optical equipment consists of items in current production, which are readily available.

The castings as supplied and completed enlarger.

The spinnings for the top and bottom sections of the lamp housing and the reflector are complete and the only work necessary on them is the drilling of six ventilating holes in the top portion of the lamp housing. All castings are of good quality aluminium, and work to be carried out consists of facing, boring, drilling, tapping and assembly. Detailed and dimensioned full size and twice full size prints of every item and of the complete assembly are supplied.

These parts are also available to special order completely machined and ready for painting and assembly.

Price of the set of parts as described, not machined, £3 10s. Price of parts, machined but unpainted, £6 10s., plus 2s. 6d. post and packing.

Bassett-Lowke Catalogue

A COPY of the newly-published Model Railway Catalogue of Messrs. Bassett-Lowke Ltd. has been sent to us. It contains details of the range of Gauge "0" and Gauge "00" model railways for the 1955-56 season. The full range of locomotives, rolling stock, track, buildings, signals, etc., is listed and priced. The catalogue is available from Bassett-Lowke, Ltd., price 2s. post paid.

The "All-in-line" Rip Saw

ADDING to their range of economically priced powered tools Portable Electric Tools Ltd., of 31a, Sloane Street, London, S.W.1., introduce a new "All-in-line" Rip Saw attachment which will fit on to any electrical hand drill from ¼in. upwards.

An outstanding feature is the fact that it is a geared unit using nylon gears. This geared design affords the operator complete comfort and safety in use with a full and clear view of the workpiece.

The 5in. diameter Sheffield steel blade will attack tough cuts within the capabilities of the electric drill. There is a visual guide for straight cutting, depth gauge for accurate depth cutting and a graduated scale with easily adjustable thumb-screws for bevel cutting.

Retailing at only 69s. 6d., complete with fittings, this powerful little tool is ideal for both the amateur and professional woodworker. It is quick and easy to attach and simple to use.

The "All-in-Line" Rip Saw.

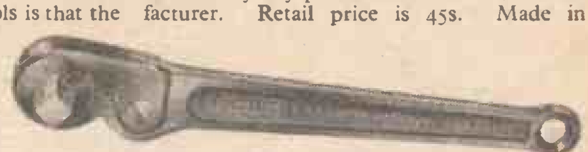
New Reversible Ratchet for Socket Wrench Sets

ONE of the major difficulties in ratchet tools is that the distance of travel of the handle between two teeth of the ratchet is insufficient to enable the nut to be finally tightened. This drawback is eliminated with the new "Walter" Improved Reversible Ratchet which is provided with a ½in. square drive for use with a similarly sized socket wrench set.

This new "Walter" tool is operated on a patented friction band. When the lever is moved in the direction of tightening, the nut bites immediately without any free play or free movement before tightening action takes place. There is no dead point between two teeth as is the case with normal ratchets.

The tool is reversed simply by pushing the ½in. square drive connecting piece through the head of the wrench to make it protrude on the opposite side.

The "Walter" improved reversible ratchet is guaranteed provided the tool is not dismantled by any person other than the manufacturer. Retail price is 45s. Made in Germany, it is imported and distributed by E. F. Allchin and Co., 137, High Street, Aston, Birmingham, 6.



The "Walter" Improved Reversible Ratchet.

BOOKS Received

Science Magic. By Kenneth Swezey. Published by Nicholas Kaye, Ltd. 180 pages. Price 15s. net.

NONE of the very clearly described experiments set out in this book could be classed as a "trick"; each one is backed by sound science and has a practical application. The reader is enabled to discover for himself the answers to 120 scientific problems, using mainly ordinary household objects such as tumblers, bottles, drinking straws, etc. Many of the experiments would provide interesting after-dinner entertainment, and at the same time explain some point of everyday science. Each experiment is clearly explained and illustrated with photographs.

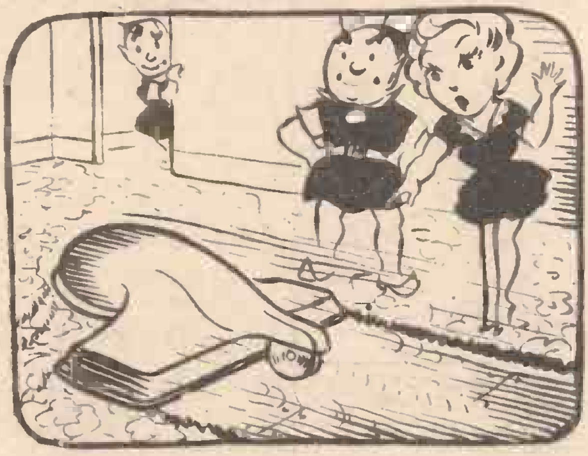
The Exploration of Space. By Arthur C. Clarke. Published by Temple Press, Ltd. 198 pages. Price 8s. 6d. net.

THIS book has been written for those who are interested in the subject of astronautics and who cannot or do not wish to go too deeply into the technicalities. Scientific accuracy is claimed, but with a subject that has its being so much in the future, some use of the imagination must be made. Some remarkable illustrations, in both black-and-white and colour, give the author's conception of the way in which space-travel may be achieved. The many engineering and medical problems which will have to be overcome before space-travel is possible are fully discussed. There are chapters on establishing a space-station, building a lunar base, and on colonisation of planets reached. The final chapter discusses the ultimate effects which astronautics may have upon humanity.

The Foreseeable Future. By Sir George Thomson, F.R.S., Sc.D. Published by Cambridge University Press. 166 pages. Price 10s. 6d. net.

THE subject of this volume is a forecast by the author of what life may be like in a hundred years' time. His predictions deal mainly with the future of technology, as this is governed by scientific principles, and provides a basis for reasonably accurate conjecture. Energy and Power, Materials Transport and Communications, Meteorology and Food are some of the chapter headings under which the author traces the probable path of future development.

THE "FLUXITE QUINS" AT WORK



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Self-propelled vacuum-cleaner—for you !
Now watch the dust go."
Cried OO, " Yes, I know,
But look ! Our carpet's gone too ! "

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and its famous equal
THE
SOLDERING PASTE

Simplify all Soldering!

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of proved efficiency
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Your Queries Answered

Painting on Fabric

CAN you tell me how to paint some gold lettering on silk ribbon, e.g., "House Points," "House Captains," etc. ? When tried, the oil in the paint ran into the silk, leaving a "surround" to the letters which would not dry out; also the gold of the letters quickly wore off, as they received a fair amount of use.—Schoolmaster (Devon).

SINCE the lettering has to be painted and not actually printed on to a textile fabric, the only type of paint which you can possibly use is one of the cellulose-based gold paints having a fairly viscid medium. You can buy this gold paint from most retailers of artists' materials. Alternatively, you can make it up for yourself by dissolving 30 parts of polyvinyl acetate (obtainable from our advertisers of plastic materials) in 70 parts of warm methylated spirits and by grounding into the resulting thick medium a small quantity of gold bronze powder. An alternative medium for the bronze powder is a thick solution of gum arabic, but this will not be waterproof.

Polish for Rubber Floor

CAN you suggest a practical and economical formula or formulæ for a preparation for preserving and polishing an inlaid rubber floor ? The flooring material is about ¼in. rubber and cut and laid like linoleum.—K. L. Lambert (Bradford).

YOU will find it very difficult to make a satisfactory polish of this nature yourself because, in addition to selecting the right ingredients, there is a certain "know-how" regarding the process. However, the following formula and outlined procedure for the making of a polish of this type may be of interest and of use to you:

Carnauba wax (Prime Yellow)	11.9 grams.
Candlilla wax	1.3 ,,
Oleic acid	3.0 ccs.
Triethanolamine	1.9 ,,
Water (hot)	1,000 ,,
Water (cold)	50 ,,

Method :

Melt the waxes in a vessel surrounded by boiling water, then add the oleic acid and the triethanolamine. Reduce the heat a little and with the temperature of the mixture at 95 deg. C. add the hot water (preferably boiling) in small amounts at a time, the mixture being rapidly, and preferably mechanically, stirred until a paste is formed. Then add the remainder of the hot water and finally the cold water.

The perfume which you note in these preparations is due to a compounded perfume which is added after the last of the hot water has been stirred into the mixture. Any essential oil perfume will suffice for the purpose. For a beginning we suggest that you could use an ordinary pine oil or a pine oil essence.

Power Load on Small Meter

I WOULD like to install in my workshop a 10in. circular saw requiring a 1 h.p. motor. Could I run this from the same power line as I run my lathe and drill ? These are two ¼ h.p. motors and are run from the same fuse box and meter as the house lighting, but on a line of their own.

The house meter: single-phase, A.C. watt-hour meter. 5 amp., 230-250 volts, 50 cycles.

Can I run the saw effectively on a ¾ or ½ h.p. motor ?—J. T. Cooper (Northumberland).

RULES

A stamped, addressed envelope, a sixpenny, crossed postal order, and the query coupon from the current issue, which appears on the inside of back cover, must be enclosed with every letter containing a query. Every query and drawing which is sent must bear the name and address of the reader. Send your queries to the Editor, PRACTICAL MECHANICS, Geo. Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

A 1 h.p. 230/250 volt induction motor requires a full load current of about 6 amps. The existing meter is rather small although it would probably be satisfactory for short periods if current was not used for other purposes at the same time. It may be that larger cables will be required to supply your workshop if the 1 h.p. motor is used in addition to other apparatus at any given time.

We consider that a 1 h.p. motor should be used for a 10in. circular saw.

Laying Quarry Tiles on a Concrete Floor

PLEASE advise on the best method to lay quarry tiles on a concrete floor without breaking up the existing floor.—G. H. Clarke (Gt. Yarmouth).

SPREAD a ½in. layer of Portland cement over the existing floor, and while the cement is still soft lay down the tiles edge to edge, filling any spaces between them with the cement. After the cement has hardened out the tiles will be firmly bound down in position. Care must be taken to see that the tiles are not laid loosely. They must be firmly wedged in position and they must be all on the same surface level, otherwise they will tend to be kicked up by foot traffic. Another commonly used medium for tile laying is asphalt. This has to be applied hot, but it is very effective—more so, indeed, than cement, for it is highly resilient and does not tend to crack. Because the tiles have to be laid in the molten asphalt it will only be possible to lay a very restricted area of them at the one time. Be satisfied with laying merely a square yard of the tiles at a time. You should be able to obtain asphalt mastic from any local asphalting firm or from a builders' merchant.

Paint Flaking on New Cement

THE toilet in my house has cement-faced brick walls. Every few months these walls have to be repainted because of a white, powdery substance which forms below the painted surface, gradually breaking through and causing the paint to blister and flake off. Is there any way in which I can overcome this trouble ?—H. W. Seal (Co. Antrim).

THERE is no cure for the trouble which you describe. The white, powdery substance is coming from the brick and passing through the concrete. Very likely the wall is continually damp. For the most part the white substance or efflorescence consists of sodium sulphate; it is soluble in water and can be washed off. This trouble occurs very frequently with new bricks. Fortunately, it is not a lasting trouble. After the soluble salts have all left the brickwork no more will form. Usually it takes about two and a half years for all the salts to escape. If you cover over the brickwork with cement, paint or any other material the salts will still form, but will be slower in coming to the surface.

In the circumstances the best treatment which you can give to the walls is to strip away the paint from the cemented surface, and then brush the powdery deposit away from the cement surface as and when it forms. Do not wash the powder away, for, by this means, you will tend to dissolve it and send it back into the cement, from which it will again rise to the surface. After two or three years of this treatment you should be quite free from the trouble.

Terrestrial Eyepiece for Telescope

I HAVE completed the telescope described in "Practical Mechanics," June, 1952. I followed the details of the article to the best of my ability, but find that although the range is perfect everything is upside down. Is this a fault of the construction or is it supposed to be that way for looking at the stars?

How can I rectify this?—A. Lewis (Aberdare).

YOU do not appear to be aware of the fact that in *all* astronomical telescopes the image is upside down. The instrument described is essentially intended for purposes of astronomical study and not for use on terrestrial observation. The stands shown in the drawings are unsuitable for terrestrial telescopes.

The terrestrial eyepiece.

Our advice is: keep the telescope just as you have made it and use it for looking at the moon and planets, but if you want only to see things on the earth you will have to add two more lenses and fit them, with the present eyepiece lenses, in a much longer drawtube (see diagram). F and EY are the present lenses and EL, EL the new erecting lenses. The arrow A, B, represents the image brought to a focus by the object glass whilst A¹ and B¹ show this image inverted by the erecting lenses. The dotted lines show the paths of the light rays. The additional lenses can be two more similar to F, the field lens. The positions for EL had better be found by actual test, also their distances apart. Make the tube 7in. or 8in. long initially, and let the cardboard mount for EL be capable of sliding for adjustment.

"Making a 6in. Reflecting Telescope"

ON page 19, of the October edition of "Practical Mechanics," in an otherwise detailed description of a 6in. Reflecting Telescope, the following points are not clearly set out:

(a) The location of the eyepiece.

(b) The characteristics of the aluminised mirror.

(c) The elliptical diagonal flat mirror.

(d) Eyepieces.

I should be glad to have some further information on these, as well as the address of possible sources from which these mirrors and eyepieces may be made available.—G. Bradley (Eire).

(A) and (b). The location of eyepiece depends on the focal length of the 6in. mirror. In the mirror shown the focal length was 48in. Therefore allow about 43in. from surface of 6in. mirror to centre of diagonal mirror, and 5in. from there to centre of eyepiece. Hence eyepiece is located about 43in. along tube from surface of 6in. mirror. (c) The position of the elliptical diagonal mirror is indicated above, it is set at 45 deg. to axis of tube and its size approx. 1¼in. by ⅞in. (d) Any eyepiece that fits can be used, and the magnification obtained is given by $\frac{\text{focal length of 6in. mirror}}{\text{focal length of eyepiece}}$. Serviceable ones can be made from single lenses, but much more useful ones can be purchased for the purpose.

The original supplier, who advertised until recently in P.M., has gone out of business. It is believed, however, that Grubb Parsons Ltd., of Newcastle-on-Tyne, manufacture 6in. mirrors (for about £15), and eyepieces. The following may also be able to supply the necessary optical parts: Brunnings (Holborn) Ltd., 135, High Holborn, London, W.C.1; Ilford Optical Co., Forest Road, Barkingside, Essex; Mr. J. K. M. Holmes, 65, Stephenson Street, North Shields, Northumberland.

Information Sought

Readers are invited to supply the required information to answer the following queries:

An Infra-red Drier

IS it possible to make an infra-red drier suitable for the rapid drying of resin-type glues? The articles concerned are small, i.e., wooden fancy goods, tray frame joints, picture frames, etc. I also require a similar type of drier for cellulose and varnish.—L. CALLUMBELL (Stoke-on-Trent).

Plastic Drip Tray

I WANT to make a plastic drip tray to fit in the bottom of an existing cupboard in which I have fixed racks for holding saucers and plates, etc.

Can you tell me how to go about it without using any special equipment?—H. R. HOPKIN (Farnborough).

Small Electric Kiln

CAN you help me in the making of a small electric front-opening kiln, chamber about 9in. by 9in. by 12in.?—J. TAYLOR (Birmingham).

Refrigerator Showcases

I AM interested in building refrigerated showcases and counters and as these would consist of a lot of glass, please tell me the best construction to give greatest insulation.

The usual procedure, I believe, is to have double glass. Would treble glass giving two still-air cavities be better? Failing complete vacuum, which would be difficult in larger areas, would partial vacuum give better results?

How is the glass stopped from steaming-up?

What form of lighting would give out least heat?—F. G. ALLWELL (Canvey Island).

Model Lighthouse

I WISH to make a model revolving lighthouse which throws a beam of light. Could you please give me the best method of construction?—R. W. MASON (Birmingham).

Imitation Cotswold Stone; Dyes for Cement Paths

PLEASE advise me on the composition of moulded building blocks made to represent buff-coloured "Cotswold stone."

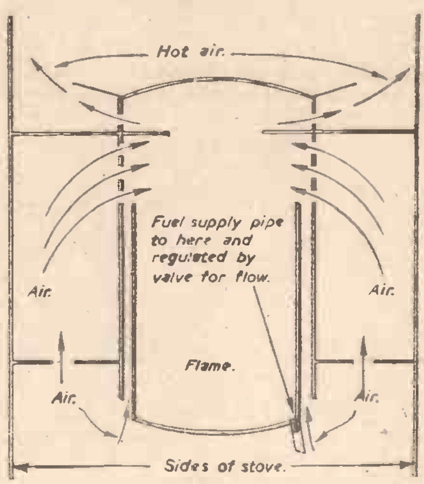
Please tell me also what dyes may be used with cement for paths, etc., with proportions to be used in the mixture.—W. D. PAGON (Wilts).

Using Tar Oil

IS there a practical method of burning Gasworks Tar Oil? It is an impure oil derived during the process of making gas. I have been experimenting to use it for boiler work and have had a good white flame with the use of air under pressure, but the container always fills up with carbon.—W. RENOUF (Guernsey).

Stove Conversion

I AM interested in converting an Otto Slow Combustion Stove from solid fuel burning to paraffin.



C. W. Barker's proposed stove conversion.

I feel this might be effected by use of the "blue flame" principle as per sketch, and I am told such installations are used on the Continent.—C. W. BARKER (Edgware).

Fitting an Engine to a Speedboat

I WISH to fit a twin-cylinder motor-cycle engine into my hydroplane speedboat. Could you tell me the best type of motor, means of fixing, drive on to shaft, starting of engine and size of prop? The size of boat is 11ft. x 5ft.—R. C. HICKS (Falmouth).

"While-You-Wait" Camera

I HAVE a ¼ plate Kodak camera with a ground-glass screen which I intend to convert into a "While-You-Wait" camera. Can you tell me how to construct a suitable box, what kind of film to use and how to develop and fix it?—V. D. BERGSTEDT (Cape Town).

"Pump-up" Air Gun Valve

PLEASE tell me the type of valves used in a "Pump-up" air rifle of the fairground type, using compressed air drawn from a cylinder.

My intention is to use one for underwater fishing as a spear gun.—E. BLACKLEY (Luton).

Checking Rifle Sights

I HAVE in my possession a B.S.A. ·177 Cadet Major air rifle and wish to check the sights of the gun properly for targets at different distances. Can you suggest how this may be done?—I. CLARKSON (Hull).

Fowl Plucking Machine

I WISH to make a machine for plucking fowls. I have seen one which comprises a small motor and a drum to which is attached rubber tubing at intervals. Can you tell me how to make one of these?—C. B. COPSON (Bromwich).

Fluorescent Stage Costumes

I HAVE recently seen one or two stage shows in which artistes wore costumes treated with a paint which caused them to become fluorescent in total darkness under what appeared to be ultra violet light. This fluorescence was particularly brilliant. Could you kindly give the address of any firm manufacturing such paint and also details of the type of lights to use?—L. BOUCHER (Somerset).

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Phone: Temple Bar 4363
Telegrams: Newnes, Rand, London

WHAT I THINK By F. J. C.

Increased Purchase Tax

THE stupid fiscal policy which exhorts us to work harder to earn more money and then takes the money away from us on the specious argument that it will stop people spending it and so force manufacturers to export most of their goods has been pursued in the autumn Budget by Mr. Butler, who has increased the purchase tax on bicycles from 25 per cent. to 30 per cent. But bicycle manufacturers are already exporting a high percentage of their production and we do not think that it is possible for them to increase their sales in the markets of the world, unless they are prepared to sell at a loss. German and Japanese competition is fierce, and those countries do not have to support social security systems such as we have over here. Nor indeed do they have to pay the same comparatively high wages. It cannot be expected that foreign buyers are prepared to pay a higher price for British goods in order to support a social security system which their own countries do not possess. Business is business, and buyers buy in the cheapest markets.

The increased purchase tax, therefore, is merely a penal tax on the working section of the community, to most of whom a bicycle is a necessity. No one really believes that purchase tax will have the effect desired. The demand for bicycles on the home market will not be affected and the increased revenue will therefore go into the coffers of the Exchequer.

The tax may have a beneficial effect on the sale of second-hand bicycles, but taking an overall view the sale of bicycles on the home market will continue at the present level.

Certain items of equipment are also increased in price, to the extent of the $^1/_5$th increase in purchase tax. The tax on touring bags and tool bags, formerly 50 per cent., goes up to 60 per cent. Other cycling accessories and cycle frames are still tax free.

Another National Body

IT has been decided by delegates from veteran cycle clubs to found a national body under the title of "The National Veteran Hike and Cycle Club," the membership of which is open to private members and to affiliation by cycling clubs. The Secretary is Derick Roberts, 198, Sherwood Park Road, Mitcham, Surrey. They propose to issue a journal four times a year.

The Closing Year

THE year now closing has been a momentous one in some respects and disappointing in others. It has not seen an end to the long drawn out disputes between the massed starters, the time trialers and the track men. It has seen, however, some spectacular times, particularly in time trials, but nothing very spectacular in the sphere of road records. There is a general and, indeed, increasing lack of interest in the sport of cycling nowadays, and it is difficult to see how three bodies can continue to exist in view of this apathy. For, make no mistake about it, the appeal of time trials is passing and the time when crowds would flock to see track racing passed a long time ago. Herne Hill is a white elephant. Massed start racing, however, in our view, is likely to increase in popularity. One has only to examine the achievements or lack of them of famous clubs to realise the truth of this. They are now knife-and-fork clubs where elderly members foregather and relive their past glories for a couple of hours or so after the usual back-scratching speeches.

In some districts there are far too many cycling clubs, and the R.T.T.C. could perform useful work by forcing amalgamation. Practically anyone can start a cycling club and in time gain R.T.T.C. recognition when it desires to promote opens. On the other hand, some of the happiest and liveliest clubs are those who own allegiance to nobody. Far be it from us to suggest that each club should plough a lonely furrow. There is strength in unity, if the unity does not become the basis for a dictatorship. It cannot be denied that the controlling bodies have become dictators. Instead of serving the clubs they represent they have become the masters. The clubs themselves are to blame for this, for if they selected delegates of the right calibre, and adequately instructed them, it should be possible at annual general meetings to put the various organisations on a proper footing.

In the case of the Cyclists' Touring Club, this would need some major changes.

Smaller Wheels ?

THE diameter of bicycle wheels has changed in the course of a half-century, and so have tyre sections. Twenty-six and 27in. wheels are now practically standard. That diameter was chosen because it "bridged the pot holes" better than smaller wheels, which tend to follow every undulation on a bad surface. But with the better roads of to-day the smaller wheel, which gives a more comfortable ride and a lower centre of gravity, making for greater safety, could be reintroduced. Such smaller wheels would certainly result in faster times on track and road, for reasons which need not be entered into here. Very little technical experiment is conducted in connection with the bicycle, which to-day is largely an assembly of fittings made by different makers, with minor exceptions. This system is bound to lead, as it has done, to stagnation of design. Any attempt to break away from it is frowned upon by manufacturers who wish to continue to make use of their old tools rather than invest money in new. It is high time, for example, that the shaft drive was reintroduced in conjunction with a bottom bracket gear. The diamond frame is not the most efficient method of utilising a given weight of metal for the purpose of connecting two wheels and the exposed chain is not an ideal form of transmission, with its multiplicity of moving parts exposed to grit. We suggest that the industry could well afford to set aside a sum of money each year for technical development—before other countries take a step in this direction and produce a new world beating design

Silbury Hill.

Evening Classes in Cycling

FOR the first time in history, as far as is known, cycling appears in the syllabus of evening classes of the London County Council. The classes take place every Tuesday evening at the Men's Evening Institute in South-east London, and the course is intended to attract newcomers to the sport, as well as to teach how to keep the bicycle in good order. There will be lectures on map-reading and touring. A similar course is planned for Enfield in the new year.

Wayside Thoughts

By F. J. URRY, M.B.E.

The Broad Outlook

WE old fellows think of cycling as a game which has chased us through all its phases, but is now concentrated on keeping us going and still discovering its enjoyments. We are apt to forget the younger people who come and go with the years—far too many of them go after a brief period—and concentrate on our own phase of the game. I know I do, and have frequently been called to order because of the one-way outlook; but my contention is that if "once a cyclist always a cyclist" was a more normal rule the people of the world would be a happier race and a more healthy one. Those snatched hours of quiet joy amid the lanes, the song of birds, the wind walking the wheat, or in deep diapason amid the woods, the storm you see afar and seek shelter from before it falls are among the fundamental things of life and therefore unapproachable except in the quietude of contemplation. They are not of the athletic mood, need no special preparation to attain, but their contemplation sustains our faith and that real love of country which is beyond the gift of words.

These things are worth retaining for their pleasure; they condition a man to face the present-day realities and provide a happy background to the disillusions. That is part of my present-day faith in cycling, and I offer all these things and more to the younger riders who seem to forget, when their active powers decline, there is still much left to learn. The outlook broadens as speed powers fail, and its visual joys and spiritual urges increase with the gently gathered knowledge of nature's secrets and the land's loveliness.

A corner of this beautiful village set in a lovely dale valley. Behind the old cross stands Ilam Hall with its fine parkland belonging to the National Trust. . . .

The Good Game

SOME weeks ago I had given a route to some young friends of mine who wanted to explore wild Wales on the lines of George Borrow modernised, and the enthusiastic account of their mild adventures through the little known valleys and over the lonely tops makes a special appeal to an old rider who may not go those ways again. I know people go abroad for the fun of it, the change of human atmosphere and, not least, the future desire to brag of their wider wanderings. They say, when you mention how little they know of their own land, "there will be lots of time to repair that lack of knowledge in the years to come, and as the present opportunities to go foreign ways may not return, to take advantage of them now seems wisdom."

Probably they are right *if* (and it is a big if) they remain cyclists. They must keep the cyclists' flair for the remote and lonely tracks that seam this lovely land, and are so seldom used except by walker and rider to penetrate its wild beauty, and know their country the more intimately and love it more deeply because of these things. That I have gone these ways many times in the past is to me always a compensation for the loss of the vigorous activity that needs to be part of the make-up of the penetrating and adventurous cyclist. It is good to know that this form of touring is still calling the land lover to the desire of discovery and I am glad to feel that I have had a little to do with its cult.

Is the Change Coming?

DURING the many years I have been riding a bicycle most of my machines have been of an all-black finish, except the very modern ones. With these, the all-black was difficult to get because makers were equipped to give the many tinted finishes with chrome plating and looked upon any departure from fashion as a nuisance. I have recently been told, however, the all-black type is returning to favour and I hope it is so, because long experience has proved to me its long-lived satisfactory appearance and its better weather resistance. It was only natural, I suppose, that after the grim years of war youth fell for the flamboyant finishes; but this "dressing up" added nothing to the riding value of the article, and one winter of neglect made a shabby looking article of a comparatively new machine and certainly detracted something from its second-hand value. I still have a Marston Sunbeam of 1922 in its original enamel and, except for the usual bruises of use, no one, looking at it casually, would dream it was over 30 years old. Probably if the all-black finish became the fashion again the superb old Sunbeam enamelling would be modified to the hastier processes of to-day, but I am certain this type of bicycle dress would give the constant rider value and give him an always-presentable machine.

A Phophecy?

I HAVE lived through a longish period of cycling history, but except for the very early days of our incursions into Continental road racing—the days of George Pilkington Mills, T. A. Edge, S. F. Edge, etc.—we have not been even reasonably successful or spectacular. England was early in the road racing game and its then representatives knew the technique of their day, taught it to foreign competitors and were themselves magnificent riders. Our present representatives may be as fine cyclists, but if so they lack the technical riding ability to match the best of the Continental competitors, and I for one am sorry, because I was counting on far finer performances after many weeks of road practice amid the scenes and in the conditions of the Continental sport.

Now what is going to happen? A good deal of money has been spent on these adventures to seek top-class laurels in top-class company and the result has been a near flop. It must be a great disappointment to the sponsoring firms expecting the boast of triumph and the riders themselves must be distressed, for reputations have suffered. Probably there will be wholesale dismissals from employment, for no firm can afford to see good advertising money wasted in failure. I can visualise, almost feel, the time is not far distant when the sponsored performances, except for native records, or the singularly exceptional performer, like Reg. Harris (now unfortunately crippled by accident), will cease, and we shall return to the less hectic, but more enjoyable, form of native competition mainly promoted by the clubs. In 20 years the face of road racing in this country has changed—perhaps not for the best—and it is almost due to change again. The process will be a painful one, but when completed may be of great benefit to the real cycling sport of our native clubs.

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