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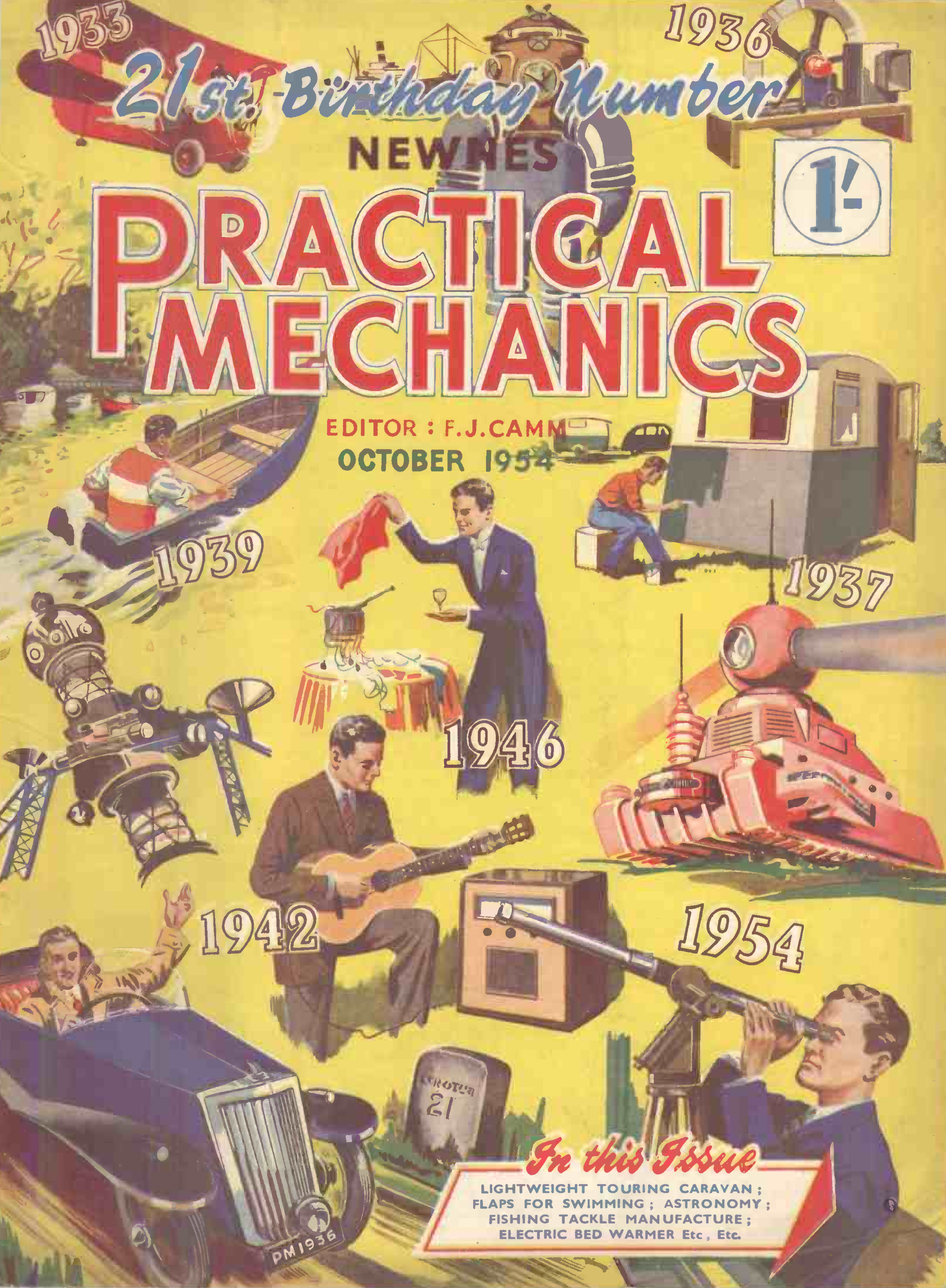
PRACTICAL MECHANICS

1/-

EDITOR : F. J. CAMM

OCTOBER 1954



In this Issue

LIGHTWEIGHT TOURING CARAVAN; FLAPS FOR SWIMMING; ASTRONOMY; FISHING TACKLE MANUFACTURE; ELECTRIC BED WARMER Etc, Etc.

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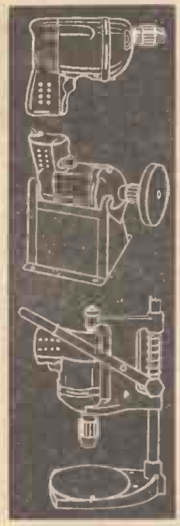

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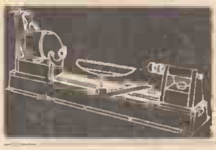

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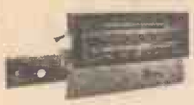

3 colour, 3 waveband scale covering standard Long, Medium, and Short wavebands, scale pan, chassis punched for standard 5 valve superhet, pulley, driving head, springs, etc., to suit. Scale size 14½in. x 3½in. Chassis size, 15in. x 5in. x 2in. deep. Price 15/-, plus 1/6 post.

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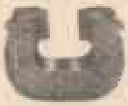

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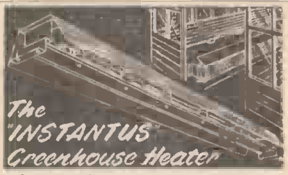

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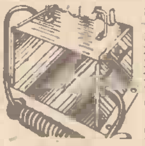

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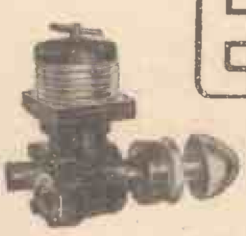

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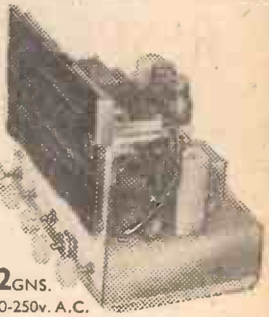

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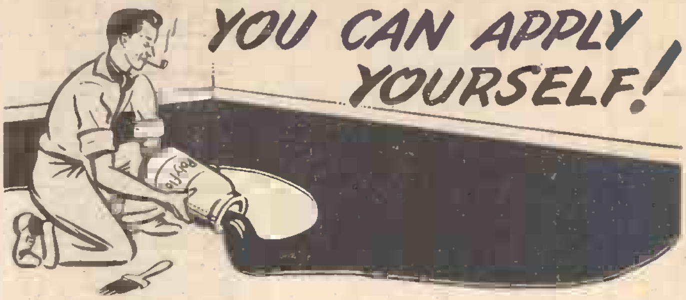

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VOL. XXII. No. 250 Editor: F. J. CAMM OCTOBER, 1954

FAIR COMMENT

By

The Editor

"Twenty-one To-day"

THIS issue celebrates the passing of the 21st milestone in the history of this journal. Elsewhere in this issue I have dealt with the progress of PRACTICAL MECHANICS since October, 1933, when the first issue was launched, but I want here gratefully to acknowledge the large numbers of letters of congratulation which have reached me during the past few weeks. This journal was launched almost exactly a year after the publication of the first issue of our companion journal, *Practical Wireless*, and it is with some pride that we can look back on the past 21 years of continuous progress. No journal survives 21 years unless it has fulfilled the objects which inspired its foundation, and the most accurate method of assessing the success of that policy is to examine circulation figures. The sales of this journal have continued to rise month by month from its first issue, until to-day it can fairly claim to be a journal without a rival. Its reader service is unparalleled and its advice on a wide diversity of topics, as can be verified by an examination of our Questions and Answers pages, is eagerly sought by a vast readership drawn from every class of society and whose interests vary from astronomy and flying saucers to models, aircraft, chemistry, electricity, engineering, conjuring and in fact almost every subject within our sphere.

We enter our 22nd year with renewed zest and vigour and with the promise that we shall continue to expand our policy and to keep our readers abreast of the times in the latest developments in those spheres with which it treats.

A National Museum of Models?

IN view of the large space required for a museum of full-sized examples of particular objects it would be wise if either the State or the Science Museum considered the possibility of founding a National Museum of Models. A museum of all of the developments in bicycles, motor-cycles, motor-cars and horse-drawn carriages would occupy an enormous space, and even then full-sized examples of some early vehicles are no longer available. Illustrations, however, are, and it should be possible for such a museum as I suggest, equipped with workshops and a staff of professional modelmakers, to produce within a few years accurate models all to one scale of every known vehicle. This idea could be extended to other industries, crafts and sciences. This thought occurred to me when visiting the Science Museum at Kensington recently and noting the gaps in the chronology of some of the exhibits. Lone workers have produced splendid models of machine tools, carriages, steam engines, locomotives and even buildings. A national appeal for such models might provide the nucleus from which such an exhibition should spring. Thus, in one building could be housed models of prototypes which, in full-size form, would require several buildings.

The Flying Saucer Controversy

THE Australian *Daily Telegraph* has recently published pictures of flying saucers which are acknowledged fakes. They very closely resemble pictures already taken of flying saucers and which claim to be genuine. Whether the publication in the Australian newspaper is intended to suggest that those which claim to be genuine are also fakes is not clear. It would indeed be a dangerous argument to suggest that, because it is possible to simulate by faking that which is genuine, the genuine article is also a fake. Such would be a perfect example of the *non sequitur*.

The *Melbourne Argus* offered £1,000 for the first fully authentic picture of a flying saucer taken in Victoria. The first photograph submitted shows a weird object in the sky, but the photographer did not claim that it was of a flying saucer, although he did claim that it might be the answer to the flying saucer riddle. The Nuclear Physics Division of the United States Navy after months of intensive investigation tried unsuccessfully to kill the saucer stories, in spite of the continued reports from qualified observers that they had seen them. The Division gave as its opinion that they were nothing more phenomenal than plastic balloons. Yet the Chief of Staff of the United States Air Force, General Twining, in a statement said that 10 per cent. of saucer sighting cannot be discarded and that the best brains in the United States are working on the subject. Captain Rickenbacker, American pioneer aviator, stated that too many good men who do not have hallucinations have seen flying saucers. Well, the photographs in the Australian *Daily Telegraph were* fakes. But that does not mean that all similar photographs are fakes.

It is a pity that Mr. George Adamski had to cancel the lecture at the Albert Hall which he was scheduled to give this autumn. His English publisher tells me that he had been lecturing so much in America that his voice has gone and it was upon doctor's advice that he cancelled his English tour. I am disappointed, as I had hoped to be present as a representative of my readers.

Mr. Adamski's are not the only photographs which have been taken of flying saucers. One was recently published in a Finnish newspaper which shows something solid in the form of a wheel with a hub. It is reported that the Admiralty has files on this subject. Nor is Adamski the only man to give an account of a landing. There is Truman Bethurum's account and that of Mr. Pry, of Whitesands Station. There was also an account earlier in this century from South Wales and another a few years ago from just behind the Iron Curtain. The Astronomer Royal has recently dealt with the subject very cautiously. When shall we know the answer to the flying saucer problem?—F. J. C.

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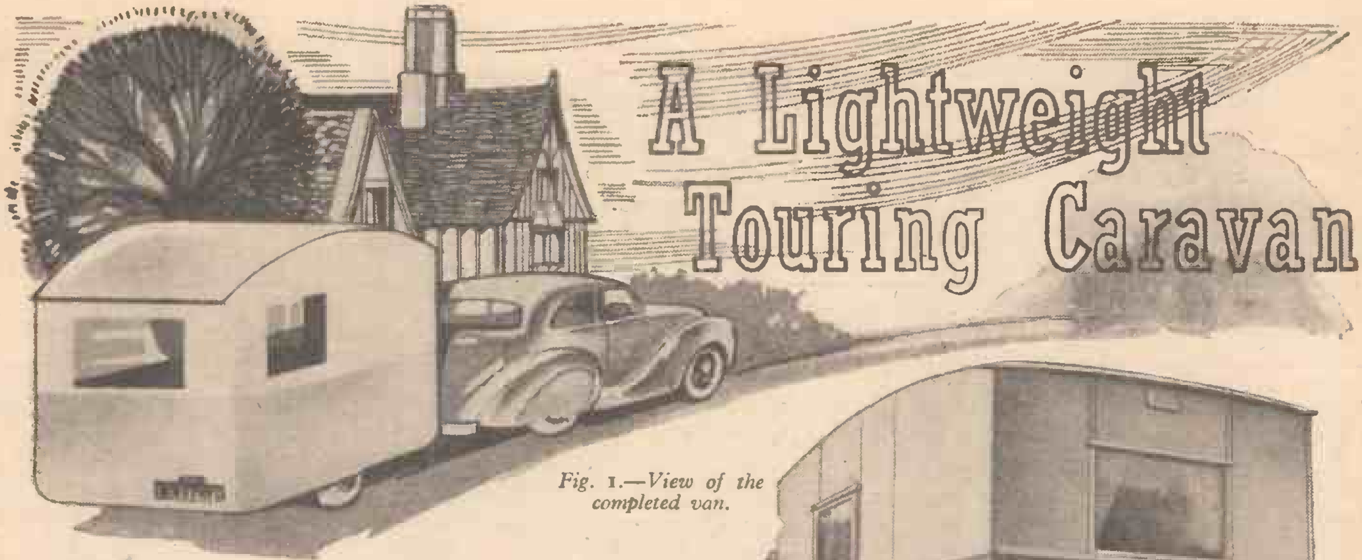


Fig. 1.—View of the completed van.

An Ideal Unit for the Small-car Owner

By J. E. GIBSON

THE caravan described was designed to meet my specific requirements in regard to lightness and mobility.

The usual width for a caravan is not less than 6ft., but in my case the driveway to my house limits the van described to 5ft. 3in. This is not, however, a disadvantage as it enables one to pass easily through the inevitable narrow farm gate, which always seems to be at the entrance to the most desirable site.

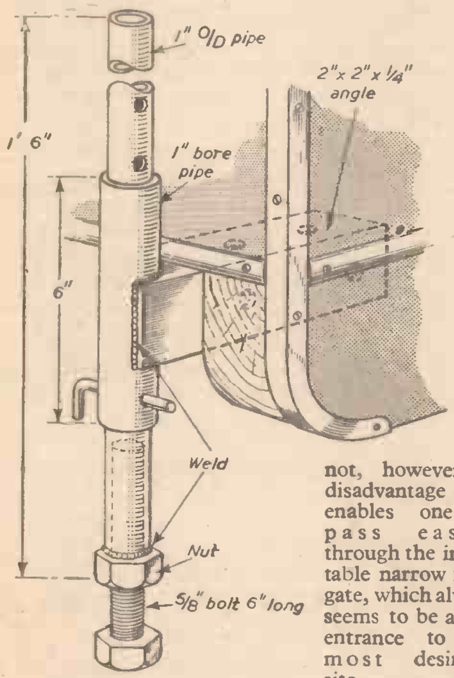


Fig. 4.—The front jack.

The interior layout has, therefore, been arranged to suit the narrower than usual width, and has proved in practice very satisfactory.

Chassis

There is no separate chassis in this design. For a van of this size the floor and side members form a rigid structure and reference to Fig. 2 will show that, with the method of independent wheel suspension used, the weight is carried directly by the main 3in. × 2in. longitudinal members, attached to the 5in. × ⅞in. tongued and grooved floorboards.

Features of this design are the low overall weight, maximum rigidity for the minimum material, with a wide spring base, actually wider than the wheel track, which results in freedom from roll and very good towing qualities.

The main through steel member consists of two 2in. × 2in. × 3/16in. angles welded together to form a box section, bolted to every other

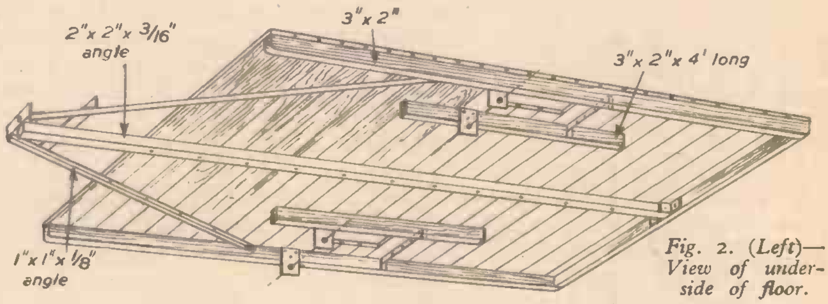


Fig. 2. (Left)—View of underside of floor.

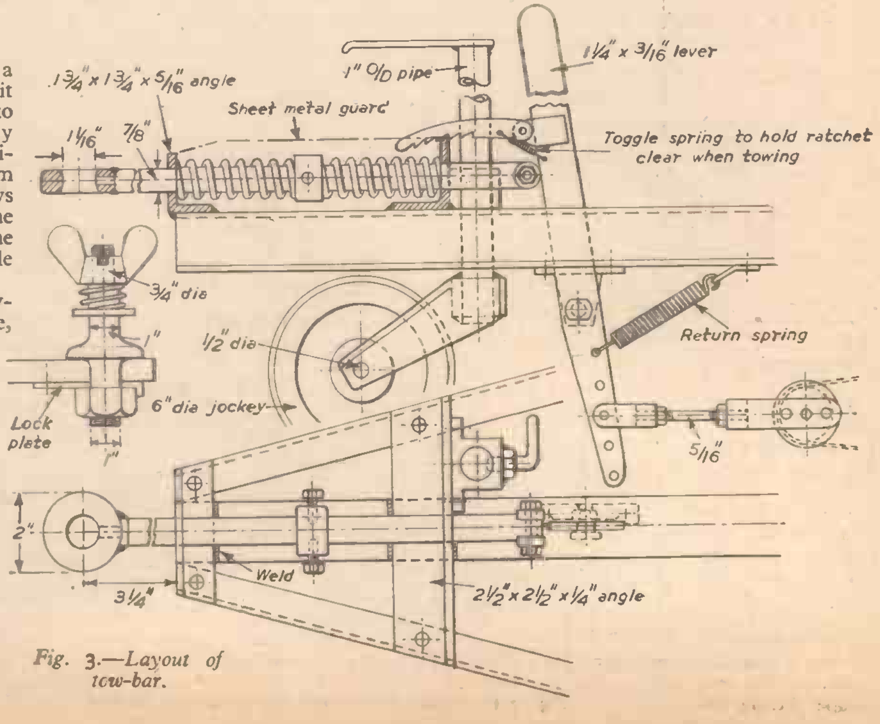
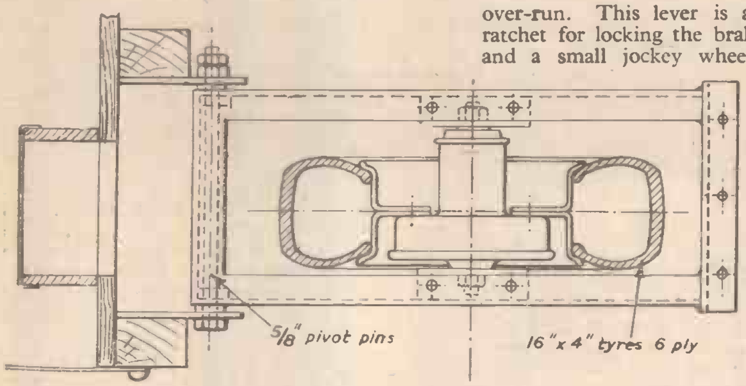


Fig. 3.—Layout of tow-bar.

floor board by 5/16in. cup head bolts, and secured to the rear cross member by angles and bolts. Lateral stiffness is provided by 1in. × 1in. × ⅛in. angles bolted to the front of the box section main member, and attached to the 3in. × 2in. side members, just in front of the wheel frame brackets.

A spring-loaded tow bar of the eye type is fitted, which, in the usual way operates the lever connected to the wheel brakes through the medium of an equalising pulley and wire rope during the over-run. This lever is also fitted with a ratchet for locking the brakes when parking, and a small jockey wheel is provided for ease in manœuvring. Details of the layout are given in Fig. 3.

A simple type of corner jack is shown in Figs. 4 and 5. These have the virtue of being light, and have proved satisfactory in use, provided a reasonably level pitch is found. No doubt the screw-operated type would be an advantage, but the type described were utilised because they were cheap and easy to construct. The figures mentioned should be self-explanatory.



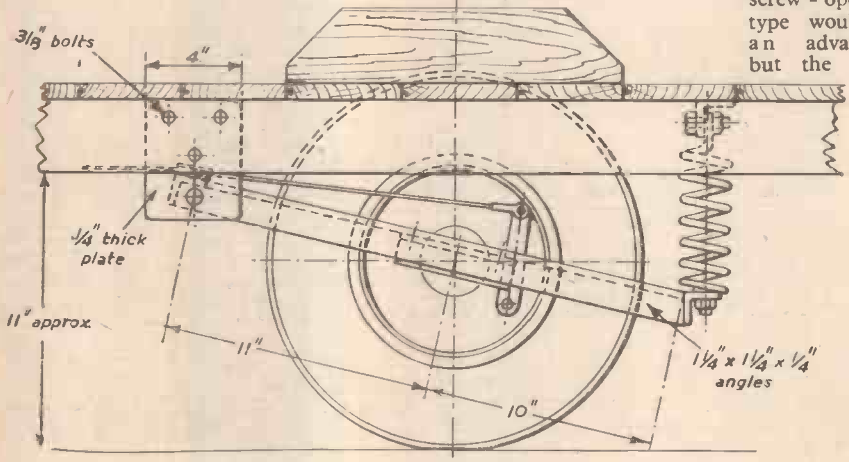


Fig. 6.—Details of wheel suspension.

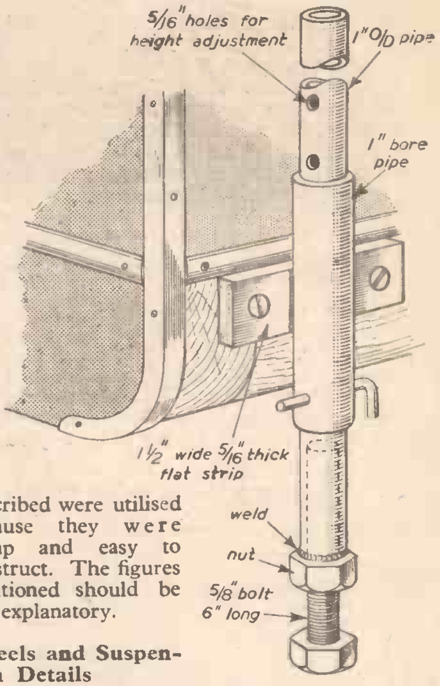
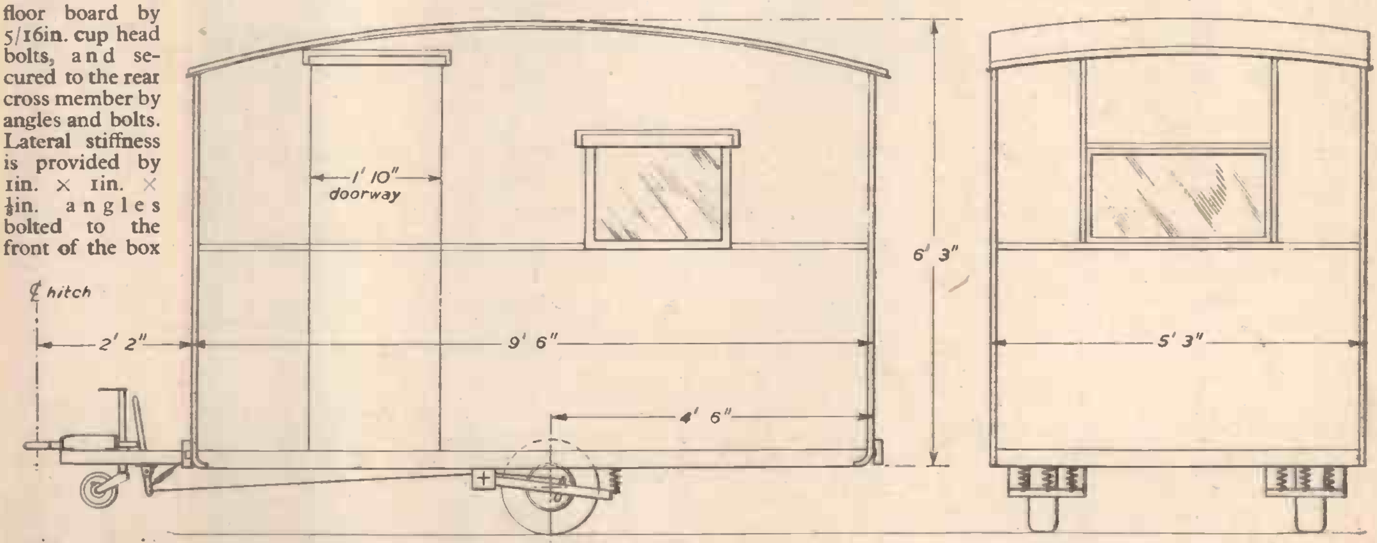


Fig. 5.—Rear jack.

Wheels and Suspension Details

A careful check on the estimated unladen weight showed that this could be expected to be in the region of 7 to 8 cwts., 1 cwt. of which would be on the tow bar. A total laden weight to be carried by the wheels was assumed to be 9 cwts., i.e. 4½ cwts. per tyre. During one trip the van was checked on a weighbridge and the weight was found to be 9 cwts. 2 qrs. total, with all the equipment carried for a two weeks' holiday.



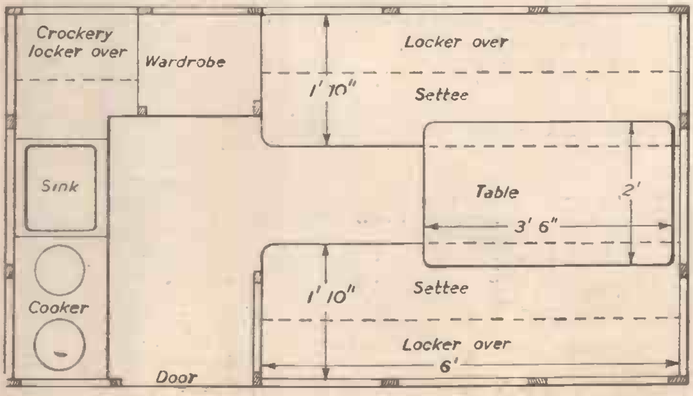


Fig. 7.—Overall dimensions and layout of interior.

Tyres of 16in. × 4in. section, 6-ply quality are used, inflated to 45lb. per sq. in., fitted on standard Dunlop split rims, and to date have given no trouble. These tyres and rims are capable of carrying 10 cwt. per tyre when inflated to 90lb. per sq. in., but speed of revolution must be kept low to prevent overheating. For this reason the maximum towing speed is never allowed to exceed 30 miles per hour, which is, of course, also the maximum legal limit.

The wheel frames are constructed from 1¼in. × 1¼in. × ¼in. angles welded up, and the suspension is by heavy-duty motor cycle saddle springs, three on each frame. Only half the weight is carried by the springs, the other being carried by the frame pivot shafts which are ⅝in. in diameter.

The wheel rims are bolted to second-hand motor cycle front wheel hubs, the actual ones used being 1936 B.S.A. These have ⅝in. diameter spindles, 6in. diameter brakes and the hubs run on taper roller bearings. The bolts for the rims are ⅜in. diameter high tensile steel, with the heads reduced to 3/16in. thick. They are welded inside the brake drums, remaining in place in the event of wheel removal. The brake levers are connected to the operating rope by large-headed bolts as shown in Fig. 6, the rope end being in the form of an eye.

The rope passes over a brass diverter pulley attached to the wheel frame on the pivoting centre. This obviates brake snatch, which would occur if the rope was attached directly, due to the rise and fall of the wheels, thus lengthening or shortening the lever to wheel centres, as well as ensuring a good rope lead.

The hub spindles are supported by separate pieces of 1½in. × 1½in. × ¼in. angles, 6in. long, bolted to the wheel frames. The wheels complete with hubs can be removed readily, without disturbing the wheel frames or springs. Constructional details and dimensions can be obtained from Fig. 6.

Bodywork

The body of the caravan is framed with 1½in × 1in. hardwood throughout with the exception of the roof curves which are 1in. × 1in. section. Details and dimensions are given in Fig. 7. The roof curves were bent in position without steaming as the camber is only 5in. in 10ft., and are supported by door and wardrobe corner pillars. They have been quite satisfactory. Walls and roof are covered with hardboard, the roof also being covered with good quality cotton duck, stuck down with paint in the usual way, afterwards finished with four coats of white lead paint with a final coat of aluminium paint. The usual aluminium guttering is fitted to the edges.

The front and rear windows are of the fixed variety, the two side windows being arranged to open. Rain flaps are fitted over the opening windows, as well as over the door, which is of the stable type, each half hinged separately.

Ventilating louvres are provided at each end, and also to the food cupboard which has six 1¼in. diameter holes in the floor to promote good air circulation. All openings in the larder are covered with gauze to prevent entry of insects.

Furniture

This is, of course, a matter for individual choice, but the arrangement shown has proved very convenient and workable. The layout as shown sleeps two adults on the settee berths, and a child of 11 is accommodated on a canvas stretcher bunk at the rear of the van resting in brackets on a level with the lower edge of the windows.

As described the van is single skinned, no lining being fitted. Condensation has been slight as it is only used in the spring and summer months. If desired, the interior could be lined and the interior finish would be improved by so doing. The framing would be out of sight, and the van could be used in colder weather without discomfort.

The cost of all materials used in the construction has been carefully recorded, and the total has worked out at £40.

A Simple Weather Glass

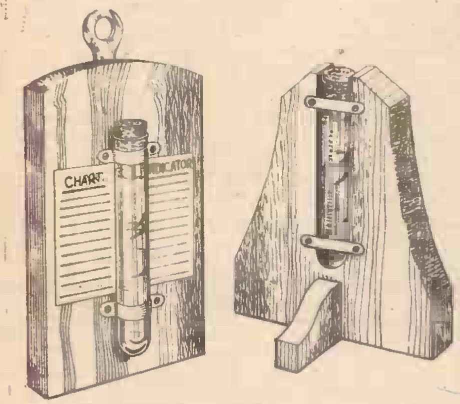


Fig. 1.—Two versions of the weather glass.

THERE are many instruments constructed to determine weather forecasts, and some of them are very expensive and intricate in their working and adjustment. Here you have a very simple yet reliable weather glass, requiring neither great skill nor delicate adjustment in the making, yet surprisingly accurate in its forecast when used in conjunction with its indicator or chart.

The Weather Chart	
When glass shows	*Indication*
Clear	Bright weather
Crystals at bottom	Thick air, frost in winter
Dim liquid ...	Rain
Dim liquid with small stars ...	Thunderstorms
Large flakes ...	Heavy air, overcast
Threads in upper portion... ...	Windy weather
Small dots	Damp weather, fog
Rising flakes which remain high ...	Wind in upper air regions
Small stars in winter on bright, sunny days ...	Snow in 1 or 2 days

Materials Required

Few parts are required; they are a test tube or its equivalent, a cork to fit, some sealing wax or candle wax and two easily-made solutions.

The weather glass can be made to serve either as a hanging model as in Fig. 1 (left), or as a desk model as shown on the right. Further details of the desk model are given in Fig. 2.

It must be remembered that the fittings are dependent upon the size of the tube; it is, therefore, important that this should be procured first.

Next, you require the following solutions. Solution No. 1: 1 drm. of camphor in 1oz. of alcohol absolute; Solution No. 2: ¼ drm. potassium nitrate and ¼ drm. ammonium chloride in 1oz. distilled water. When these two solutions are dissolved, pour them into a cup or beaker, and place the beaker in a bowl of hot water. When cool, pour off the clear liquid into the test tube and seal up with candle wax or sealing wax. When reading the weather glass, the accompanying chart is necessary.

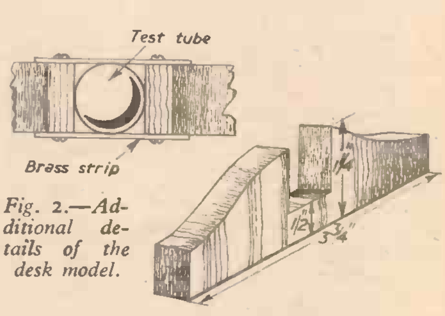


Fig. 2.—Additional details of the desk model.

Microfilm Equipment

WE have received from the Recordak Division of Messrs. Kodak, Limited, 1 and 2, Beech Street, London, E.C.1, details of the microfilm equipment which they supply. The numerous advantages of photographic microfilm recording are now well known to business men: the accuracy of the photographic method, saving of filing space, increased efficiency of business routine, saving of time and labour.

The Recordak Micro-File Camera

This is a general-purpose camera for use on an ordinary table or desk, and is capable of dealing with a wide range of subjects of different sizes. In office and library it can be used to copy a variety of documents, such as ledgers, invoices, deeds, books, newspapers, etc. Reductions of subjects as large as 17in. × 25½in. are possible. On a 100 ft. length of 35 mm. film 800 originals can be recorded full frame size, or 1,600 originals half frame size.

A fixed aperture 2in. Dallmeyer lens is used and exposure is controlled by varying the light intensity. Also incorporated is an exposure meter, an exposure counter, and a footage indicator.

The Recordak Microfilmer Desk Model

This aids the solving of accounting and record-keeping problems which concern such documents as cheques, drafts, warrants, invoices, receipts, insurance policies, correspondence, etc. It is a dual-purpose instrument; a combined 16 mm. camera and film reading machine.

For use as a projector for 16 mm. microfilm records, a viewing screen is lowered into position over the area previously used for microfilming purposes. A 100ft. roll of microfilm is loaded into the projector head and is then passed through the projector. An image, 24 times the size of the film frame, appears on the viewing screen.

The Recordak Library Reader

This is an easily operated piece of apparatus which can be used as a companion-unit to a microfilm camera or for ordinary microfilm viewing. Thirty-five-millimetre film is accommodated and the reading screen is 18in. square. Two lenses can be fitted, a 1in. and 2in., the former giving 24× magnification and the latter 12×. The 2in. lens enables the whole of the frame to appear on the screen. A scanning device is also incorporated.

A special slow panchromatic film, "Micro-file," is also supplied by Kodak for this work. It is of extremely fine grain and is eminently suitable for making greatly reduced copies of finely printed documents.

All inquiries regarding this equipment or the undertaking of microfilming work should be sent to the above address.

THE PM Meteorite

A Power-driven Model Aeroplane for the Small Diesel Engine

By C. E. BOWDEN

(Concluded from the September issue)

The P.M. Meteorite, a stable, robust model of 45½in. span.

I NOW build in the wing-tip slots as shown in Fig. 12. These wing-tip slots are well worth while for super stability, and are really quite simple to make. The only thing to watch is that each slot opening has the same gap, or there may be more drag on one wing than the other in flight, which will cause yawing. Fig. 12 shows a slot from the top.

The Dihedral Angle

When each wing half has been completed with dowels, reinforced with plastic wood, the two halves should be joined together, with jigs placed under the tips as seen in the small sketch (Fig. 13) so that each wing-tip is raised 4¼in. above the table building board. Cement the wing halves together, allow to set, then cover top and bottom centre-section with 1/16in. sheet balsa, reinforcing at the vee join with plastic wood filleting (see Fig. 14).

Fig. 12.—Wing-tip slots.

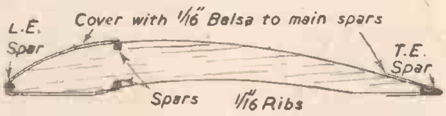


Fig. 11.—Stiffening up the wing by covering L.E. and T.E. with sheet balsa.

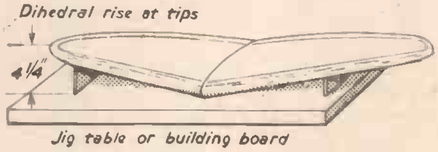


Fig. 13.—The dihedral angle.

Allow all to set hard, with the jigs again in position to ensure the correct dihedral angle, and finally cover the whole wing with silk as already described for the tailplane, the only difference being that the undercamber in the wing necessitates sewing the fabric to each rib *after covering the bottom first.* Thin white cotton is sewn through the covering when dry before water shrinking, around each rib, with wide stitches. This will keep the silk to the ribs when it is later shrunk by water and dope. Now cover the top of the wing without any stitches in the normal way. Water spray, dry, and then dope with the full strength dope. Watch for warping as it sets and, just before setting, weight each wing half down to a flat board to harden off. Should a wing or other doped unit warp, this can be heated in front of a radiator and the warp twisted out by hand. The unit is then taken away from the heat, and as the dope hardens again it sets in the new position whilst being held in that position. Be careful not to do this in front of a naked flame for dope is highly inflammable! Warped surfaces will ruin good flying.

Flying Instructions

We now arrive at the reason for all this work, the flying of the model. It is the first few trimming flights that are the dangerous ones. Assemble the whole aeroplane with the engine in position, but with propeller removed, and check the balance by balancing the aeroplane below the fuselage on the fingers. It should balance at about the centre of gravity position shown on the plan, or very near this. If the balance is out owing to building differences, it is possible to make minor adjustments to suit different weight engines, etc., by adding small pieces of lead to the tail or nose as required. Only a little lead is permissible. If there is much at the tail end it upsets the machine on turns, because the main weights should be grouped. If there is any radical alteration to be made, it is possible on all my designs to make a longer or shorter engine nose piece, for this is detachable. It takes only a short time to make another nose piece, and this can also be done if the owner decides to fit another engine of a different weight.

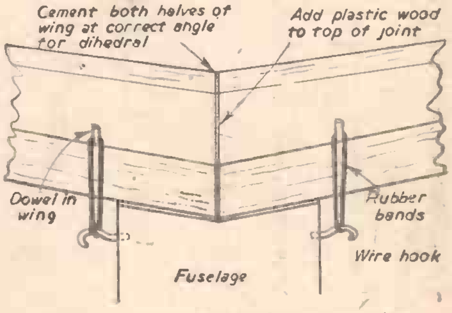


Fig. 14.—The method of wing retention.

Having got the point of balance correct, take the model out on a nice day with a slight wind blowing, and glide it by throwing the aircraft dead into the wind, like a dart, that is to say, you have to throw it at its flying speed in a forward and very slightly downward direction, just as you used to throw a paper dart in your school days. If the balance is correct and the wing and tail angles correct, the model should glide with a long, flat flight path in a floating glide. It is a good plan to carry out the first glides over long grass just

Fig. 15.—(Left) An alternative engine mount for engines with a circular backplate, such as the early Frog 1 c.c. diesel.

Fig. 16 (Right).—The nosepiece is made up of laminations of balsa wood for the circular backplate type of motor.

in case you have got things incorrect, or you throw the model too slowly and it stalls or dives.

The important thing is to get the glide correct, and then keep the settings, before you fly under power. *This glide setting must never be altered when flying under power, because it is vital that when the motor cuts, the the model shall glide properly down to a good landing.* Power trim is done by altering thrust line.

During the gliding tests, if the model dives after a good dart like throw dead into the wind, put a 1/16in. packing under the rear of the tailplane. If this does not suffice, a further sixteenth packing may be used. If this is not satisfactory you have either made a mistake in the C.G. position of balance, or your wing is set on the fuselage at too low an angle and not as the drawing shows. Should the model balloon up, put a 1/16in. packing under the leading edge of the tail-plane. Never more than a total of 1/8in. packing either way must be used, or the longitudinal vee for stability will be upset. The fault will be in bad balance or the wing at the wrong angle of attack, not in accordance with the plan.

First Power Flight

Now check up for the first power flight that there is a little side thrust, to the right looking from the top forward, to absorb the engine's torque reaction. If much is ultimately found to be necessary, it means you are employing an unsuitable propeller of too great pitch, or badly made with thick blades which offer too great resistance or drag. Also check up that the engine has some down thrust, by putting a safety 1/8in. packing to tilt the motor down. If the model climbs too steeply near the stall on its first flight you have not got sufficient down thrust. If it loses height on being hand launched under power like a dart, you must take off a little down thrust. All adjustments must be done a little at a time. The model should turn very gently in left-hand circles, controlled by side thrust. The engine torque tends to turn it left, and the right side packing resists this. Never let any model turn violently left or right under power. Right turns are more dangerous than left turns with torque. A violent turn will stop the model climbing, and in extreme cases will cause a spiral dive to destruction. The correct thing is to control the power flying by the correct side and down thrust so that the model flies in easy left-hand circles and climbs steadily like a real aeroplane. Under no circumstances control the model by tailplane packing or fin packing under power. *You must not alter those glide settings, ready for a good glide when the engine cuts.*

If you see a model fly well under power, and then go into a phugoid switch back path when the engine cuts, you will know that the operator has not carried out these directions. He has trimmed his model by tail packing under power, or the design of the model is fundamentally bad with thrust line too low in relation to the centre of lift of the wing. In the case of the "Meteorite" the thrust line design is correct, and it will be your fault! Once you have trimmed for glide and then got good power flight by engine thrust packings, you can cement in the packings and cover them for keeps with doped silk. You will have an exceptionally stable model that will fly in almost any weather. Never be satisfied with a model that careers wildly about the sky, as is so often seen at competitions with overpowered models having the thrust line too far below the wing. A sport model should have a realistic and stable flight path followed by a good landing.

MAKING A XYLOPHONE

A Simple and Easily-made Version of a Popular Musical Instrument

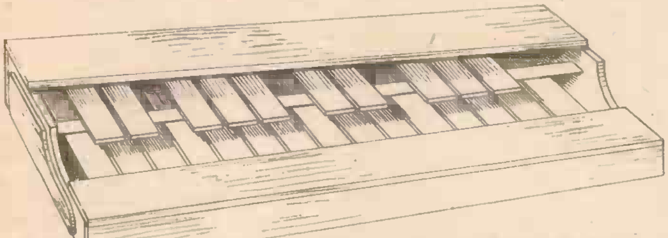


Fig. 1.—The completed xylophone.

THESE instruments are made up in various ways as regards the arrangement of the notes. That illustrated is as good as any, and has the advantage that the notes are grouped on the same plan as those of the piano.

Fig. 1 shows the complete instrument in perspective, as seen from the front. It will be noted that the wooden slips are in two series, those corresponding to the black notes on the piano being on the upper level (see also Fig. 2).

The Case

Before making the case it is well to determine the lengths of the slips. The instrument shown has a compass of two octaves, starting and ending with the note C. The slips may have

Fig. 2.—The upper and lower series of notes.

Fig. 5 (Left).—The playing hammer.

the same section throughout, say, 1¼in. by ¼in. Cut the longest to give the note C when struck, its two ends being supported. This, of course, is a matter of trial. Now construct a diagram as shown in Fig. 3, making C2 half the length of C1, and C3 half the length of C2. Join the ends of C1, C2 and C3 with a smooth curve, which will then give the lengths for all the other notes.

It will be noted that twelve slips go to the octave. Those starred will be the slips for the upper series.

Marking Out the Notes

Cut on this plan the notes will be approximately correct throughout the scale, but may need adjustment to exact tune, which means shortening to sharpen, and if too sharp, substituting a longer slip.

The case may next be taken in hand. Its construction is made clear by Figs. 1 and 2, the latter being a cross-section. It may be made of ½in. stuff throughout, glued and pinned.

Slots must be cut in the ends for the tapes on which the slips are to rest. The positions of these tapes are shown in Fig. 2. Fig. 4 is an end view showing how the tapes are brought through the slots and glued down, after which an ¼in. cover board may be glued over them as shown.

The Tapes

The tapes should be of linen, say, ¾in. wide, and they must be stretched quite taut.

Various methods are employed to fix the slips to the tapes. A simple and quite effective one is to drive a fine gramophone needle through each end of the slip, so that its blunt end is flush with the upper surface of the slip, and then it is a simple matter to space the slips by pressing the needles through the tape. Another method is to use an adhesive to hold the slips in place.

How the Xylophone is Played

Fig. 5 shows the hammer with which the xylophone is played. Two of these will be required. The head is built up from three layers of sole leather, glued together. It is then pared to shape with a sharp knife and finished with glasspaper. A central hole is drilled and

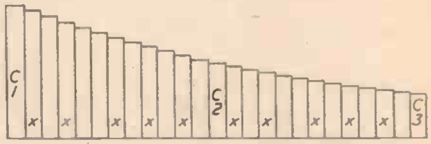


Fig. 3.—Details of the various sizes for the notes.

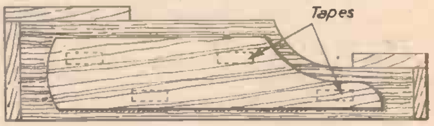
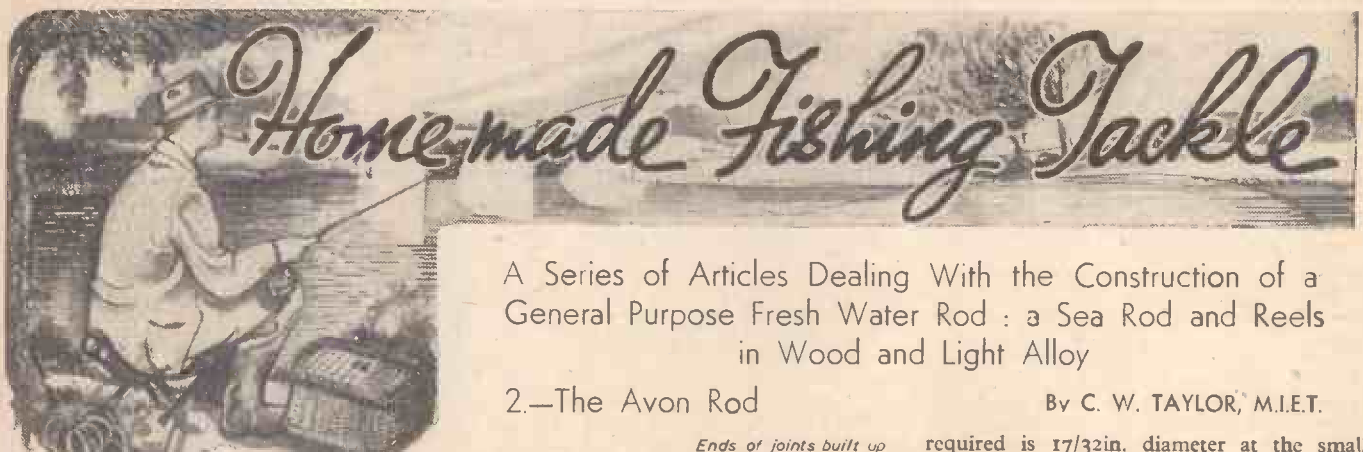


Fig. 4.—How the tapes are secured and the cover board.

the handle—a piece of ⅜in. dowel rod—glued into it.

Almost any kind of wood will serve for the notes, but a better tone is obtainable from the harder and denser woods, like rosewood. Good results, however, may be had with pitch pine, and quite a passable tone from ordinary deal.

Home-made Fishing Tackle



A Series of Articles Dealing With the Construction of a General Purpose Fresh Water Rod : a Sea Rod and Reels in Wood and Light Alloy

2.—The Avon Rod

By C. W. TAYLOR, M.I.E.T.

THE general purpose fresh water rod which is to be described in this article is often referred to as the Avon type. This is because the rod was designed to meet the special requirements of the expert fishing on that notable river. It is an excellent type of rod for general coarse fishing and is 11ft. long, in three joints, with a 20in. cork handle.

The top and middle joints are of built cane, which can be bought in standard tapered lengths, or made by the process described in the first of these articles. The butt or bottom joint is of whole tonkin bamboo.

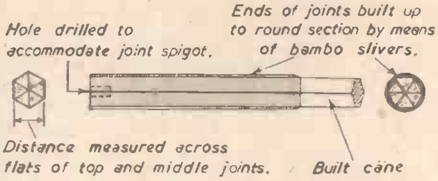


Fig. 1.—Measuring across the flats and building up the ends of the joints.

of the rod. The sizes for the flats must therefore be strictly adhered to if the rod design is not to be affected.

It should be mentioned at this point that the above joints *must not* be made over size, and reduced to the correct size, after the strips have been glued together, by filing or scraping the joint. This would remove the tough outer skin layers of the bamboo, and the toughness and resilience of the joints would be destroyed! Only the very lightest scraping to remove glue and a light sandpapering, using a fine grade, is permissible to clean up the joints.

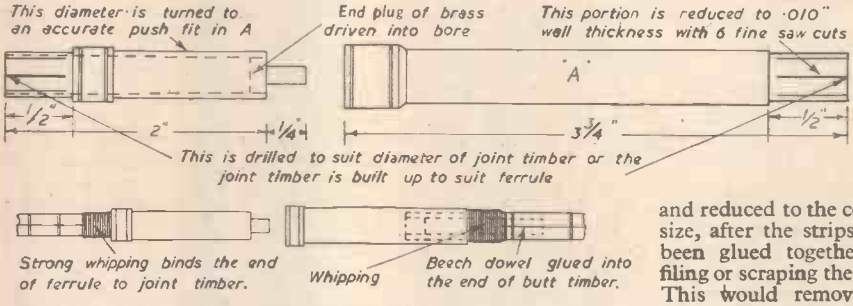


Fig. 3.—The hard drawn brass joint ferrules and how they are bound to joint timber by whippings.

The Top Joint

This joint is 44in. long and measures slightly less than ⅛in. across the flats of the hexagon at the small end, and approximately ¼in. across the flats of the hexagon at the large end. (See Fig. 1.)

To produce this joint by means of the process described in the first article, the flat, which must be planed on the jig or former, tapers from 1/16in. wide to 9/64in., in a length of 44in., and this is a straight taper.

The Middle Joint

This joint is also 44in. long, and measures approximately 9/32in. across the flats of the hexagon at the small end, and 13/32in. across the flats at the large end.

To make this joint a flat must be planed on the former which, in a length of 44in., tapers from 5/32in. wide to 7/32in. and this also is a straight taper.

These two joints are important, and the sizes given impart the correct flexing action

The Butt Joint

The butt or bottom joint is made from good quality tonkin bamboo, which is obtainable from many tackle stockists and sometimes from horticultural sundriesmen. The size required is 17/32in. diameter at the small end and 44in. long.

The bamboo can be simultaneously straightened and toughened by warming over a gas ring at the places where it needs straightening; this makes the timber pliable, which can then be pulled over straight. All the bends in the bamboo can be straightened by local heating and, having straightened a bend, the hot portion should be cooled at once with a wet rag.

Heat should not be applied to bamboo already in a very damp condition. Steam generated will cause splitting and only seasoned bamboo should be used.

The knots on the straightened bamboo should be filed off flush and the timber should be scraped and cleaned up with a penknife and sandpaper.

Built-up Ends of the Joints

Eighteen thin strips or slivers of bamboo 2in. long, are next split from short pieces of ½in. diameter bamboo. Six pieces are glued to each end of the middle joint and six pieces to the large end of the top joint. The slivers are made the same width as the hexagon flats where they are to be glued, and are temporarily bound on with thread while the glue dries. These slivers are used to build up the diameters of the joints where the ferrules are to go. They also add strength where it is most required. (See Fig. 1.)

The Joint Ferrules

For those who have a lathe, first-class joint ferrules should be made from high-tensile brass tubing. The bore of the largest piece of tube should be 17/32in. diameter, so that the ferrule made from this tube can be warmed and shrunk on to the small end of the butt joint bamboo.

The two pieces of brass of each complete joint are turned and go together with an

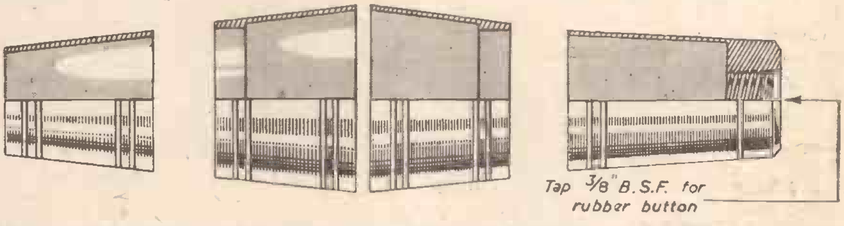


Fig. 4.—Half-sectioned collar, winch rings and butt cap, made from duralumin or tinted brass.

Fig. 2.—A drawing of a three-joint Avon fresh water rod of the author's own make.

accurate push fit. The ferrules should be made light; the walls of the tubes need not finish thicker than 1/32in.

The ends of the ferrules which go on the wood are turned down to about .010in. thickness for about ½in. length, and on this reduced portion six equidistant saw cuts are made. When the ferrules are in position on the joint timber, the reduced portion of the ferrule is bound tightly to the rod timber by a whipping of strong thread. (See Fig. 3.)

When the top and middle joints have been cleaned up, the ends of the joints (where the slivers are glued) should be warmed several times, and at intervals, to dry out the bamboo and shrink it to a more stable condition. The binding is best kept on the slivers while this is carried out. The slivers are next carefully filed round, so that the ends of the joints are a tight fit in the ferrules. The ferrules are driven on the joints with a block of wood, and the reduced portion is whipped down with thread.

The fit of the timber in the ferrules must be very accurate, and the final alignment of the three joints will depend on how straight the ferrules are mounted!

The Handle and Fittings

The handle is built up by glueing into position on the butt timber short lengths of solid cork which can be bought at many tackle shops. The corks should be a good, firm fit on the bamboo, and are glued into position with "Casco" cold water glue. A few of the corks near the bottom of the handle should not be glued, for obvious reasons, until the handle has been shaped and the winch rings are in position on the handle. The corks are reduced with a file and sandpaper to the desired shape. One of the usual shapes is shown in Fig. 5.

Fittings for the handle consist of a collar, winch rings and a butt cap (to which can be fitted a standard rubber button), as shown in Fig. 4. All of these can be bought at tackle shops as standard fittings in coloured brass or duralumin. The mechanic will prefer to turn his own high-class fittings.

The collar and butt cap are glued in position after the cork has been correctly tapered off to form a tight fit in the bores of the collar and butt cap.

The Rings

The line rings or runners should be of the type that stand away from the rod timber. On all good rods the tip ring and the butt ring are lined with agate, agate substitute or

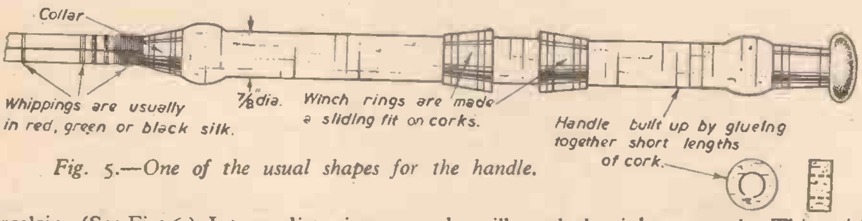
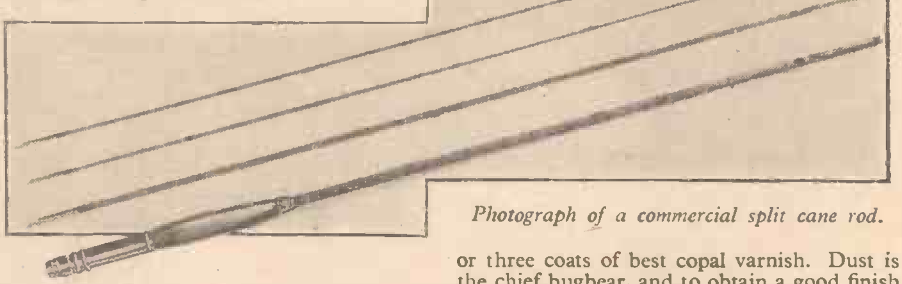


Fig. 5.—One of the usual shapes for the handle.

porcelain. (See Fig. 6.) Intermediate rings are plain wire.

The rings can be bought in complete sets on a card and individually. The intermediate rings should always be very light and rings lined with agate or porcelain should only be used at the tip and the butt to assist the free running of the line.



Photograph of a commercial split cane rod.

Whipping

The rings are whipped on to the joints with a fine gauge silk, or "Sylko" No. 40 gauge, and the method of whipping is shown in Fig. 7. Regularly spaced whippings (about 1½in. apart and 1/16in. wide) should be put on both built cane joints, while a few ornamental whippings, in perhaps two colours, just above the collar will enhance the appearance of the rod.

Neat whippings can be achieved with a little patience; the coils of silk should butt closely and not be allowed to cross. When the loose end has been pulled under the coils to finish the whipping, it should be cut off closely with a sharp knife. Each ring can be temporarily held in the correct position on the timber by a band of sticky tape and in this manner perfect alignment of the rings is easily achieved.

The fine hairs of silk should be laid, and the whipping made smooth, by applying a little french polish to the silk, which, of course, will deepen the colour, or clear cellulose varnish may be used. After this has been applied, the finger should be held on the silk and the joint rotated. This sticks down the fine hairs. The spacing of the rings is shown in Fig. 8.

The rod should be finished by applying two or three coats of best copal varnish. Dust is the chief bugbear, and to obtain a good finish a room which is seldom used and in which the windows are closed is a necessity. Absolutely clean brushes and a thorough wiping down of the joints goes a long way towards effecting a good finish.

The next article will detail the construction of a sea rod.

(*To be continued.*)

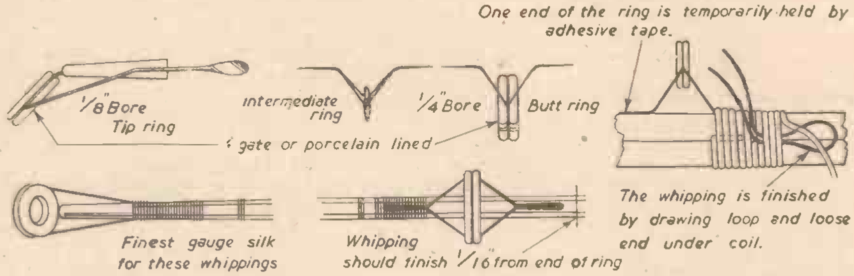


Fig. 6.—The line rings or runners, and Fig. 7.—How they are whipped on to the joints.

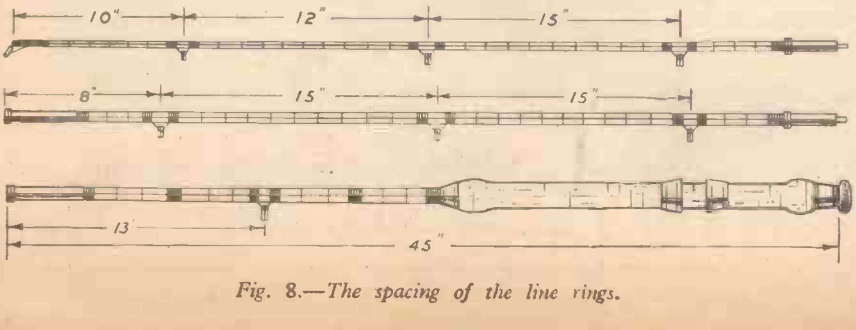


Fig. 8.—The spacing of the line rings.

Mobile Blast Cleaning Equipment

A METHOD of blast cleaning metal, concrete, brick, stone or woodwork surfaces in which the round shot used to clean the surface is removed, along with the débris, has been developed by Vacu-Blast, Ltd., 4, Golden Square, London, W.1.

The process, which has been used in America and Australia and is now available in this country, depends on the use of a combined system of three units—a blast gun, a vacuum pump and dust collector, and a pressure-type generator and reclaimer.

Steel Abrasive

The steel abrasive is fired from the gun which is in effect a miniature blast cabinet. The wide circular nozzle of the gun, which has an outer ring of bristles, acts as a shield and prevents the abrasive from flying out and escaping. Immediately after the completion of the abrasive blast, both the abrasive and the débris are sucked back into a chamber formed by the outermost portion of the nozzle and enter the reclaimer. Here the abrasive steel and the débris are separated and the former is airwashed and returned to the supply chamber for reuse.

Because of this constant reclaiming of the abrasive shot the amount of abrasive material which need be used in treating even the largest surfaces is said to be remarkably small—little more than a handful for a day's work.

The equipment can be operated off the mains supply and can be wheeled to any part of a factory, and can be used without the need for special safety precautions, since the abrasive does not escape from the nozzle and the débris-laden air is filtered before being released. Operation of the machine is controlled by a switch located on the gun.

MAKING MANUFACTURERS' PROTOTYPE MODELS

Model Locomotives : Railway Coaches : Ships and Cars

By "MODELMAKER"

THE speculative mind often wonders, in looking at a finished model which has been purchased over the counter, a model of which one could buy an exact duplicate if one wanted it, how much brainwork, scheming, organisation and machinery went into its production. The preliminary work involved before a model is put on the market is often enormous and the cost correspondingly high. The number of types and kinds of models which are mass-produced is so great that it would be hopeless to attempt to deal with them all in a single article, besides which many models are produced in different sizes and each size frequently calls for different methods of producing their component parts and the assembling of those parts.

The title which heads this article implies that it is the making of the master model, or prototype model, with which we are concerned, and although this is so one has, in designing the prototype, to bear in mind the limits of possibility set by the machine tools, the presses, stamping machines, dies and lathes which compose the plant which is available.

Preparation of Prototype

But the preparation of the prototype is a matter for hand making only; no machinery is wanted except a lathe or lathes. To some extent the hand-made prototype is an experiment to test out the ideas of the designer as regards the methods of manufacture, very largely the appearance of the model, and to weigh up the chances of the mass product making a remunerative appeal to the public.

The first thing which one does when a new production is contemplated is to prepare full size drawings of the model: side elevation, elevations of both ends and sometimes a plan view. Then, if it is to be a working model, the motor must be plotted in, full size on the drawing and the attachments to hold it, be it clockwork, electric or steam, arranged in convenient positions.

It is of the utmost importance, if the model is to be a reproduction in miniature of some particular full-size machine, that the scale copy shall follow the proportions of the original and be as nearly as possible true to scale, otherwise that it purports to be a copy of an original will not be recognised. In the case of ships this applies not so much to the lines of the hull as to the amount of sheer and to the height and proportions of tophamper and funnels, etc. In locomotives it applies to the diameters and spacing of the wheels, the diameter and height of the boiler, and particularly to the shapes and proportions of the chimney and boiler mountings.

Model Locomotives

In connection with this matter of proportion in model locomotives, a badly designed

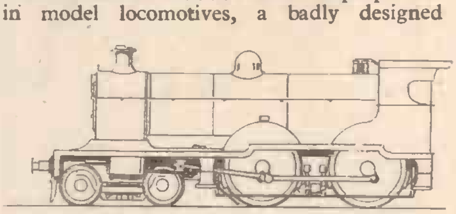


Fig. 1.—The British Railways prototype.

feature to the writer, in Model "O" gauge, is the smallness of the bogie wheels and the fact that one can see daylight all along under the front end of the engine, over the bogie, clearly showing that the bogie carries nothing beyond its own weight. In spite of the fact that these engines have to negotiate small

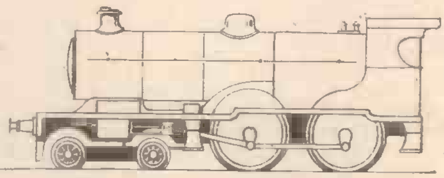


Fig. 2.—The production model.

radius curves it is obvious that the enormous clearances, equal to one-half of the wheel diameter, are not necessary. The daylight could be blocked out by a single black tinplate brought down on the centre line of the engine or perhaps better still, a plate rising from the centre of the bogie.

Fig. 1 is a scale drawing of a British Railways (London Midland Region) compound engine showing how it should be reproduced in correct proportion and Fig. 2 shows how it is produced.

In preparing a hand-made sample, it is advisable to cut out all pieces of platework in duplicate, making tracings from the drawing for the purpose, in order to get size and shape correct; such tracings should include the depth of flanges overlaps, etc. One set of plates is bent where bends are called for, and if slight modifications are found to be needed when building up, such modifications are made in the duplicate unbent plates. By this method we have by the time the sample model is completed a set of plates from which the dies can be made for stamping. The duplicates must not only be cut to outline but must be drilled and pierced exactly where holes come in the hand-made sample. The mass-produced model may have its sheet metal parts stamped from colour-lithographed tinplate, but the hand-made sample will be hand-painted and lined. For the use of the lithographers either coloured drawings or hand-painted plates are usually supplied.

Certain portions of a model will be diecast: for instance, the chimney and boiler mountings and the smokebox front, but in the case of these the dies can be made from the drawings and castings used for the sample and afterwards be produced in quantities for the production line. The same thing applies to bogie wheels which, unless they are of cast-iron, will also call for dies. If like the driving wheels they are of iron they will be foundry-cast from a wooden or metal pattern. The chimney, dome and safety valve will be cast with a central, downwardly projecting pin which will pass through holes drilled and stamped in the top of the boiler and be secured by riveting over.

Railway Coaches

Railway coaches will follow the same line

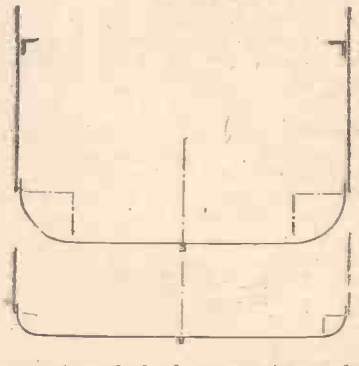
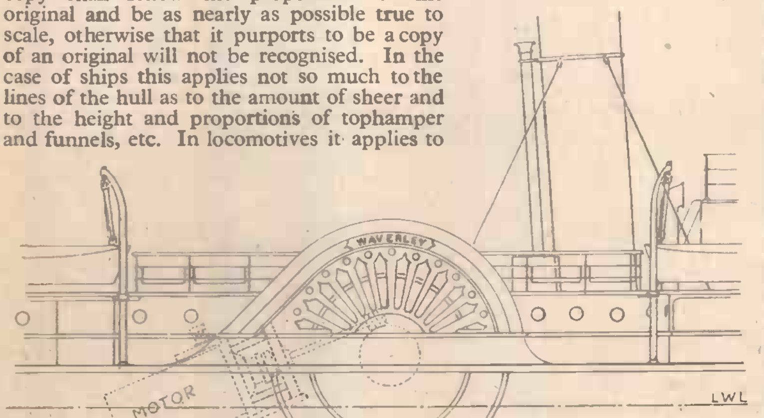


Fig. 3.—A method of constructing models of ship's hulls.

of procedure. If a corridor and seats are fitted these will be all of tinplate and will have to be erected either before the sides are in place or before the roof is put on, and if the windows



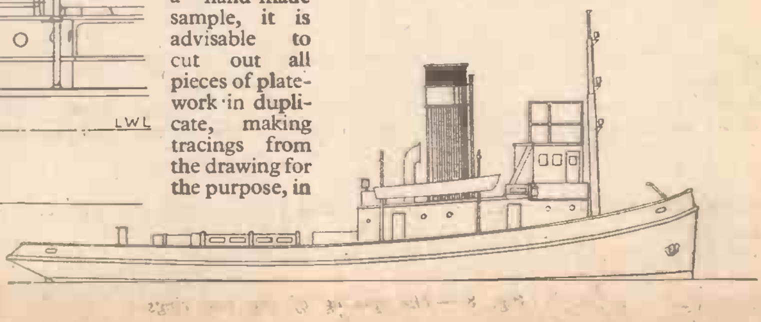


Fig. 4.—(Right) A model of a tug. Fig. 5.—(Above) A paddle steamer and its motor drive.

are to be glazed this, too, will have to be provided for by arranging for turnover clips in the metal stampings. Either glass can be used for the glazing or Perspex, and it can be in separate pieces for each window or in one long strip for all the windows on one side of the coach. The latter is the easier because fewer clips will be necessary, but much depends upon the scale of the model.

In a general way, the ends of coaches have more projecting detail than other parts of the body, therefore it is a good plan to make dies and cast these complete with vestibule couplers. Provision can be made on the inside for fixing by casting on lugs through which screws can pass into the floor, which floor is a wooden board. To the underside of this board all the parts, including the bogies, can be attached with small wood screws. Using wood as a foundation renders the fixing of the sides, ends and interior fittings a simple matter.

Wagons and vans are comparatively easy to deal with and call for no special comment beyond remarking that these are, even in "O" gauge and "H.O." gauge, frequently made, as regards the bodies, entirely of wood and with all diecast running gear. The making in wood on a quantity production basis is just as simple as in metal except for the fact that in wood the painting has to be done by hand or by spraying, but the lettering must be done either by hand or by transfers, whereas in metal all colour work, including the lettering, etc., can be lithographed.

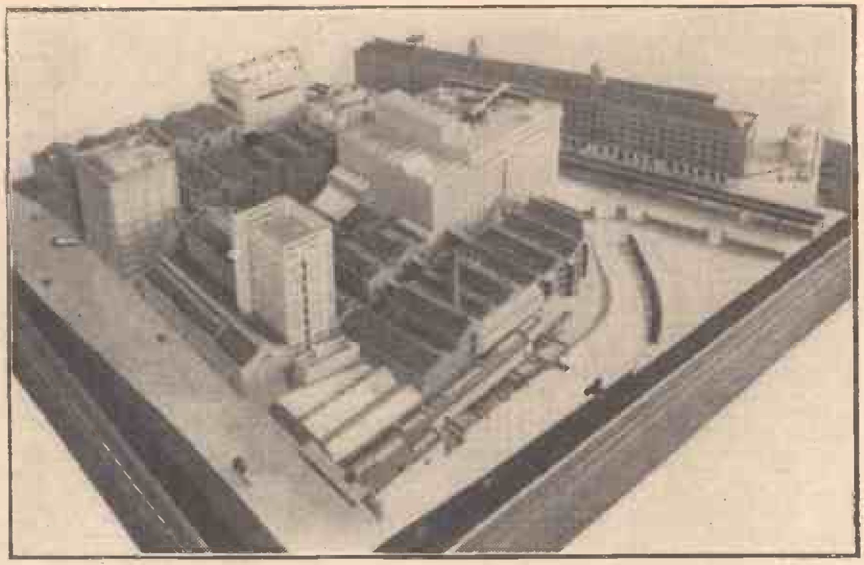


Fig. 6.—A model of a factory, showing the road frontage, with the administration offices at the extreme left.

Ships

The number of types of vessels in all sizes is so great that it is impossible to write more than a few general remarks about them.

Apart from yachts and other sailing craft, which come in a class of models which must be differently treated on a production basis because they are made of wood, the model ship is mostly built of metal and can be made up in the master model of either thin sheet brass or copper, three pieces being used. In the mass-made product tinned steel plate can be employed, but in the hand-made first model the bottom of the hull should be of copper so that it can be beaten on a hardwood former, with rounded corners at the bilge so that you get a cross-section amidships as shown in Fig. 3; such a section for the bottom would be stamped or pressed for the production line. The deck can be of tinplate for steam-driven vessels and, if preferred, of wood for electric or clockwork propulsion. The same applies to the top hamper, the deck houses, skylights, etc. The funnel will obviously be a metal tube and the masts, if any, of wood. Fig. 4 shows a simplified drawing of a model steam tug which forms a popular and very pretty model. Two boats are shown hung from the davits; these can be little diecastings in production models.

Fig. 7.—A K.L.M. "Skymaster" 'plane model, to a scale of $\frac{3}{4}$in. to 1ft. One side of the model is cut away to show the interior.

Apparently, no one seems to have thought of producing a model of a paddle steamer: it would be ideal for electric propulsion. The motor could very well drive the paddle shaft through a worm and tangent gear in the manner shown in Fig. 5. The paddle-driven vessel is old, but is by no means obsolete and there are very many around our coast working in deep as well as shallow draught waters. They are beautiful in appearance, and in the model form have the advantage that the friction and consequent loss of power inseparable from the propeller shaft—set up by propeller thrust and packing in the stuffing-box—is absent. Of the two the friction from the packing is greater than that from thrust because the packing must be tight enough to keep out water. With the use of paddles the only friction is in the paddle shaft bearings; no packing is required because the shaft is above the water-line even when fully loaded.

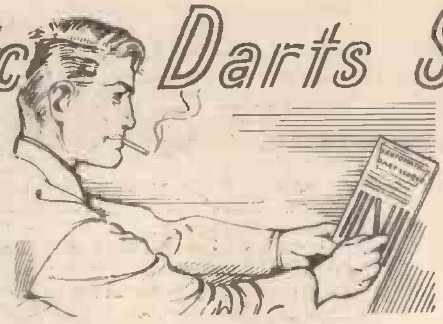
Cars

The treatment in modelling motor-cars would be much the same as that of railway coaches, especially if the model is small and clockwork is to be installed as a motive power, But if they are large—of the racing type and powered with little diesel type engines, although the master model may be hand-shaped and beaten in copper—the bodies in the production line will have to be moulded and pressure diecast, either in type metal alloy or in an aluminium alloy or possibly moulded in plastic. Of these the type metal is the best on the score of weight, though it is very fragile and easily fractures. If aluminium or plastic is employed and the adhesion at the driving wheels is insufficient, it is an easy matter to add a cast weight at some point under the car or else make the transmission heavier than it needs to be.

The mass production of model steam and other engines is a comparatively simple matter. It resolves itself into a question of deciding upon the type: whether it shall be horizontal or vertical and, if vertical, whether it shall have one or two cylinders. Then preparing a complete set of drawings and from these of making a set of foundry patterns. From these patterns a set of castings are obtained, machined and made up by hand and the engine tested under steam. After that it becomes purely a matter of organisation of how the castings are distributed for machining to gauges, boring, planing, milling, shaping, turning, assembling, painting and packing.

Fig. 8.—Model of the French Line ship, s.s. Colombie. *Scale, $\frac{1}{8}$in. to 1ft.*

An Automatic Darts Scorer



A Simple but Useful Device that Can be Made by the Handyman

By H. E. De R. BERRY

THE game of darts has gradually acquired an air of respectability becoming to a game of so much skill, which has lifted it from the tap-room into our own homes. The only thing that has prevented some of us from throwing open the door to it is the system of keeping score, whereby we have to subtract our score from the previous total to know how we stand in the game—say subtracting 47 from 301.

Because of this, I developed the automatic score board.

The device can be made in metal, plastic, wood or cardboard, but for simplicity of manufacture the latter will be described—leaving those who work in other mediums to make what modifications they wish to secure greater compactness and durability.

The completed score board measures 12⅛in. by 4½in. and requires for its manufacture a sheet of stiff white cardboard about three times that size. The tools—a sharp knife, a pair of scissors, a leather worker's punch, a pencil and rule, pen and ink, and a stapling machine, if available. The latter is not essential as a few stitches with needle and thread can be substituted for the wire staples keeping the parts together.

Apart from the ability to shape a few pieces of cardboard, all that is needed is a little skill in marking out some numbers and you will have a device that will do all the subtraction necessary in a game of darts and

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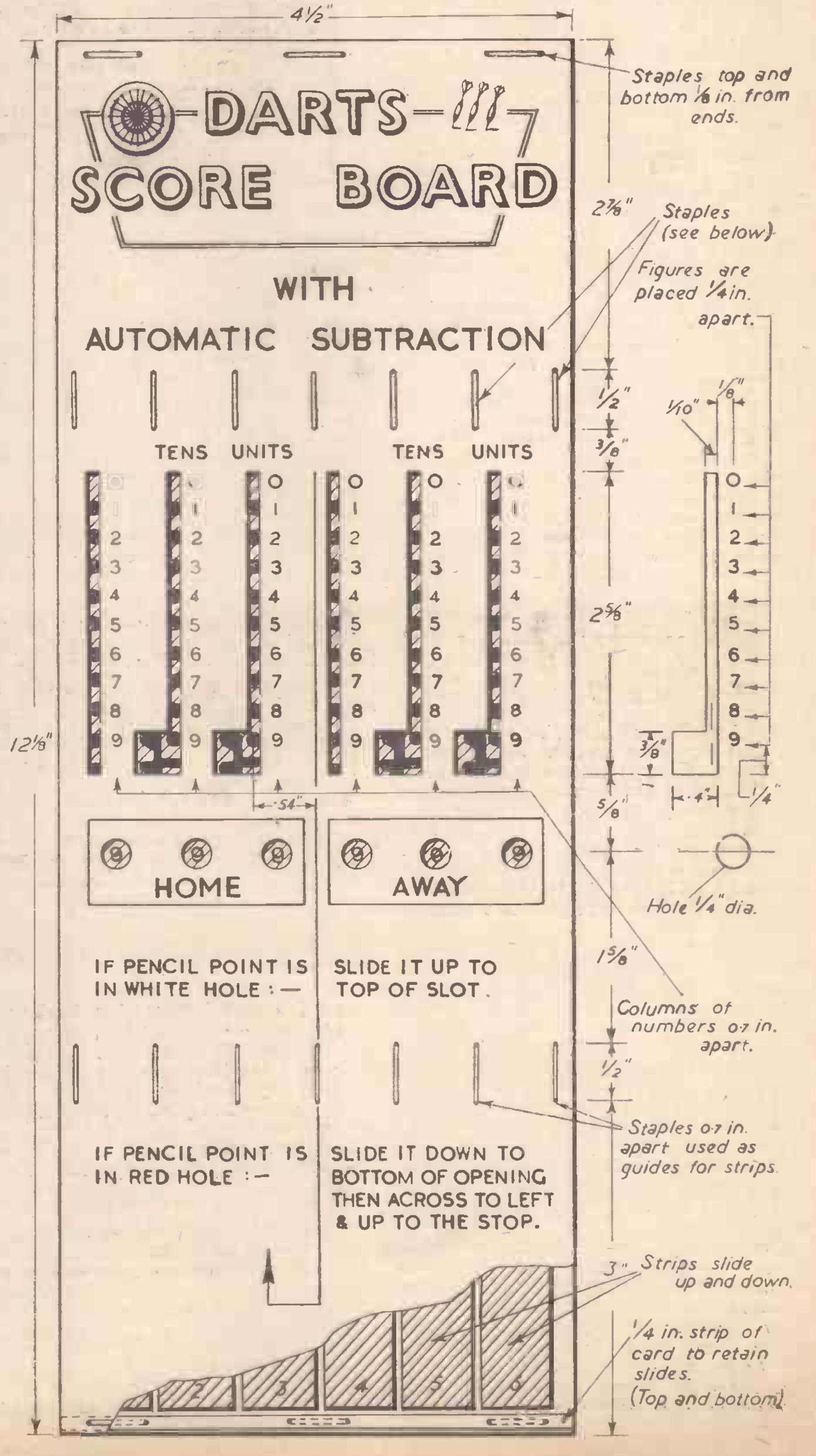


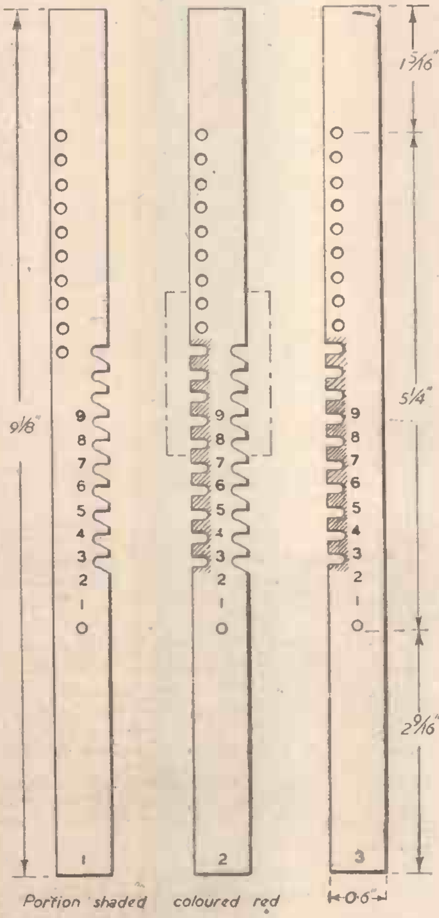


Fig. 1 (Right).—Details and dimensions of the front.

Fig. 2 (Above).—Details of the strips.

SCIENCE —notes—

Element 100

THE discovery of element 100, the eighth man-made one, has recently been mentioned, very soon after the announcement of the production of element 99, by the same group of investigators at the University of California.

It has been made by bombarding element 98 (californium) by high-velocity uncharged particles (neutrons). Only a minute quantity of it has been prepared, and extremely delicate techniques have been evolved to detect its existence, for it is short lived, having a half-life period of approximately three hours. The particular variety of this element that has been detected is an isotope of atomic weight 253.

Californium

It will be recalled that in "Man-made Elements" (July 1954) the production of californium by a step-wise process of neutron capture by an isotope of the element plutonium, viz., plutonium 239, was described. The steps leading to the formation of element 100 are summarised below:

ELEMENT 92	URANIUM	(naturally occurring) bombardment with neutrons
	↓	
ELEMENT 94	PLUTONIUM	bombardment with helium nuclei
	↓	
ELEMENT 96	CURIUM	bombardment with helium nuclei
	↓	
ELEMENT 98	CALIFORNIUM	bombardment with neutrons
	↓	
ELEMENT 100	eka-ERBIUM	

Novel methods of separation of these new elements have been devised. Since most of them are so unstable, separation must be quickly effected and ion exchange techniques and chemical precipitation are usually employed.

Element 100 has similar chemical characteristics to a rare-earth element, erbium, and if a method of naming similar to that used for element 99 is adopted, it should be tentatively called eka-erbium.

As previously pointed out this is not the last new element that will be discovered, for it is becoming increasingly apparent that, provided particles of sufficiently high energy can be generated, these will attach themselves to the nuclei of existing elements. The continuing improvements in the design of particle-accelerating machines, such as cyclotrons and synchrotrons, mean that higher velocities should be attained.

Unfortunately, most of the new elements are only short lived, the nucleus emitting particles within a short time of its creation and thus reverting to one or more of the simpler and stable elements.

Some investigators think that this nuclear instability will continue to increase as the size of the nucleus of the new elements grows and suggest that the total number of elements that can exist will be 110. On the other hand it is possible that amongst the elements yet to be discovered there may be some that are abnormally long lived and these could very well be starting points for whole series of elements, some of which may never have existed before.

An Automatic Darts Scorer

(*Continued from page 19*)

will show, at any time in the game, the points remaining to be scored for you or your opponent to win.

Method of Manufacture

First, cut two pieces of cardboard 12½in. by 4½in. One of these forms the back and remains plain. The other is marked out and lettered up as shown in Fig. 1. If you are not fond of printing, all but the vertical columns of numbers may be omitted. It is important, however, to place these exactly in the positions shown, and to adhere strictly to the dimensions of the areas which have to be cut out.

Next, cut six strips of cardboard 9½in. by 0.6in. to form slides. Mark out three of these as shown in Figs. 2 and 3, punch the holes and cut slots. Print in the figures and colour the shaded areas red. This completes slides Nos. 1, 2 and 3. Repeat for slides Nos. 4, 5 and 6.

Now secure the front of the score board to the back by two rows of staples in the positions shown in Fig. 1. These staples also provide vertical guides between which the slides move up and down. They must accordingly be placed accurately.

The slides should now be inserted in their respective slots with No. 1 on the left and No. 6 on the right (Fig. 1). The slides should be capable of being moved freely up and down, but should not be so loose as to move without effort. If a thin ruler is inserted in the slots before fitting the slides it will open them up sufficiently to provide this smooth, sliding fit.

To complete the score board, a cardboard strip ¼in. wide is inserted between back and front along the top and bottom edges and stapled in position. The one along the bottom edge is shown in Fig. 1, and is fitted after the slides have been pushed right home in their slots.

Instructions for Use

Hold score board in palm of left hand or rest it on a table, steadying it at the edges so as to avoid any pressure between the front and back which would prevent the slides moving freely.

Set the winning total, say 301, so that it appears in the windows above "Home" and "Away." This is done by inserting a pencil in each slot in turn so that the point engages in a hole in the slide, then move it up or down in the slot until the required number (301) appears in the windows.

Now to register a score of, say, 47. Insert the pencil point in the hole opposite 4 in the "tens" column, move it right down to the bottom of the opening, then across to the left and up to the stop. Repeat, using the hole opposite 7 in the "units" column. The number in the windows will now be 254, which is the total remaining to be scored after 47 has been taken from 301.

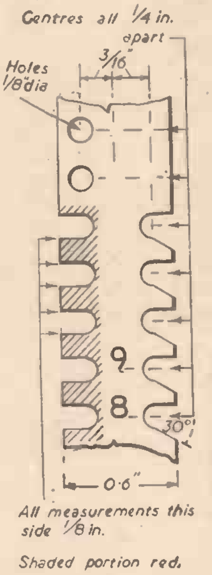


Fig. 3.—Measurements of the slots and holes.

Suppose now that 39 is scored at the next turn—insert the pencil point in the hole opposite 3 in the "tens" column and move it *up* to the top of the slot. Then put the pencil in hole 9 of the "units" column and move it down to the bottom of the opening, then across to the left and up to the stop. The number now appearing in the windows will be 215—the result of taking 39 from 254.

The subtraction of the score from the previous total is entirely automatic.

It will be noticed that the movement of the pencil is either:

(a) Down to the bottom of the opening, then across to the left and up to the stop, or

(b) Up to the top of the slot.

The rule to follow is that if the pencil is inserted in a red hole the movement is as described at (a). If it is inserted in a white hole, the movement is as described at (b).

The score necessary to win is clearly shown at any stage of the game by a glance at the windows. The "Home" and "Away" teams use the left-hand and right-hand half of the board respectively.

Should a blank appear in a window during the course of play, it may be cleared to show the outstanding total by inserting the pencil in hole "0" at the top of the corresponding slot and moving it as described at (a).

Remember to hold the board lightly to allow the slides to move freely, and keep the pencil upright. Do not move the board violently, such as by throwing it down on the table, as this will cause the slides to alter position and thus give a false reading.

Club Reports

Beaufoy Model Engineering Society

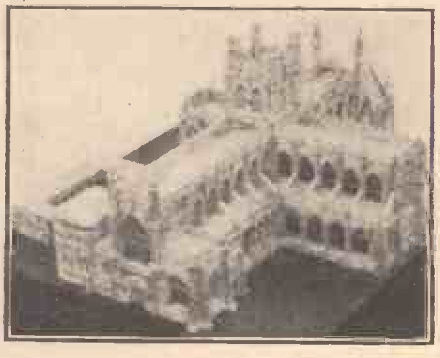
THIS society re-opened its workshops on Monday, September 27th. These well-equipped shops have every facility required by the keen modeller, including lathes, shapers, millers and grinders, both horizontal and cylindrical.

The Hon. Sec. is: S. T. HUNT, Beaufoy Model Engineering Society, 39, Black Prince Road, S.E.11.

Ramsgate and District Model Club

THE annual exhibition held from August 16th-21st was the most successful ever held by the club. A record number of people came to see the show, and without exception praised the high standard of workmanship and the varied interests of the many exhibits.

The presentation of the cups and trophies to the winners took place at the annual general meeting on September 22nd. A large number of new members enrolled during the show. Hon. Sec., E. CHURCH, 14, St. Mildreds Avenue, Ramsgate, Kent.



Some 13,500 matches were used in the construction of this fine model of Chester Cathedral. It measures 24in. long x 19in. wide and 10in. to the top of the tower. There are 121 coloured plastic windows, which are illuminated by four bulbs, powered by a concealed battery. Inside there is the high high altar, choir stalls and pews.

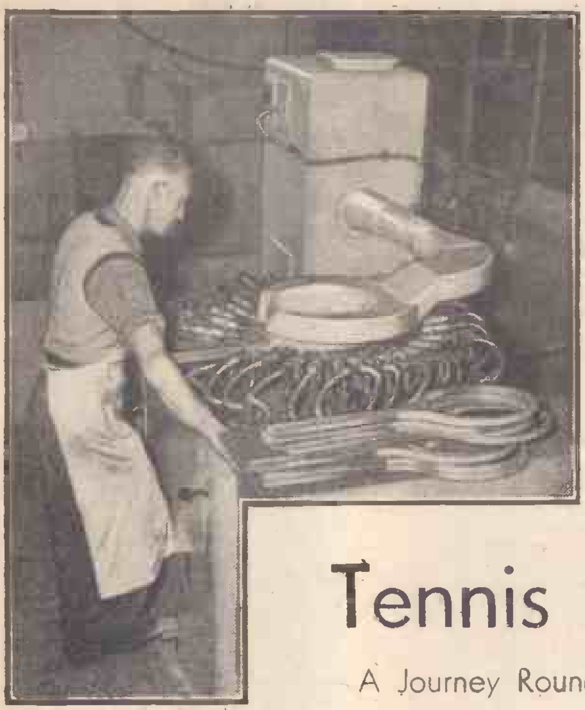


Fig. 2.—The drilling machine.

Tennis Racket Manufacture

A Journey Round a Well-known Tennis Racket Factory. Details of a New Man-made String

MOST people have at one time or another owned or used a tennis racket, but how many realise the work and skill entailed in its production ? The following is a brief account of the stage by stage production of a racket as it is carried on at the famous Dunlop factory at Waltham Abbey.

The basic frame or bow and the handle are of laminated construction and several types of wood are used in each racket. The timbers, which are kept in a wet timber store until required, are listed below in the order of their importance.

	Country	Where used	Remarks
Ash Birch	England Canada	Bow Bow	The strongest and toughest timbers for their weight in the world.
Hickory	U.S.A.	Bow	The world's toughest timber, but rather heavy.
Beech	S.E. Europe	Bow	A strong, tough timber with characteristic colours.
Sycamore Mahogany	England W. Africa	Wedges Wedges	Clean looking, moderately strong but medium weight timber.
Obechi Gaboon	Africa Africa	Handles Handles	Light, straight grained, attractively coloured timbers.

Cutting and Drying Veneer

The roughly trimmed logs are cut into lengths of approximately 5ft. and are placed in a steaming tank for 36 hours. The steam penetrates the centre of the log, softening the timber, giving a smoother cut, and making the bark easier to remove. The log is then placed on the rotary peeling machine where it is rotated against a knife moving at a fixed speed. Working on a similar process to a lathe, the machine converts the log into one continuous sheet of veneer. Veneers can be cut from .005in. to 3/16in. thick. By this method the sawdust waste in normal sawing methods is completely eliminated.

After peeling, the damp veneer is passed through the drying machine—a number of steam-heated platens alternatively gripping and releasing the veneer as it is fed through by rollers. This drying operation takes between five and ten minutes, depending on the thickness of the veneer, and the speed of the machine can be controlled to give a final moisture content of 10 per cent. To prevent stresses when the components are assembled into tennis frames, it is important that all timber is dried to this figure.

Another machine is employed to scarf-joint small pieces of veneer or plywood into larger units, the joints formed being just as strong as the original timber, so avoiding the waste of material merely because it may be undersized.

The various woods are next cut into the necessary lengths, planed and trimmed ready to form the frame laminations. This work is carried on in the component mill by various special machines, designed to deal with large quantities of wood daily. Here also is the Crescent Bending machine which deals with piece number 7, Fig. 1.

Battens of ash are steamed for one hour before bending in this machine. The bends are sliced on a circular saw to form crescents for the rackets.

The strips of the various woods are then glued together to form one long laminated piece, then bent into shape, the centre of the piece forming the bow and the two ends being brought round and pressed together to form the central foundation of the handle.

After being roughly smoothed, the shape is passed to the drilling machine.

This machine drills a large number of holes simultaneously and replaced the machine which drilled each hole individually. The tennis racket drilling machines are operated entirely by air pressure and drill a frame in four movements. See Fig. 2.

The outer parts of the handle are next glued into place and this is done by high frequency glueing, a method of setting glue joints which is coming into increasing use to-day. The heat is generated by high frequency power oscillating at 18,000,000 cycles per second, which results in uniform heating in a matter of minutes. Other methods of heating are much slower, for the heating depends upon conduction through the wood. After laboratory research Dunlop have adopted a new glue of their own, based on synthetic resins.

The frame assembly is now complete and it is next passed through a long series of trimming and sanding operations which convert the frame to the shape that we know. The better quality rackets are hand finished by skilled craftsmen, some of whom were at

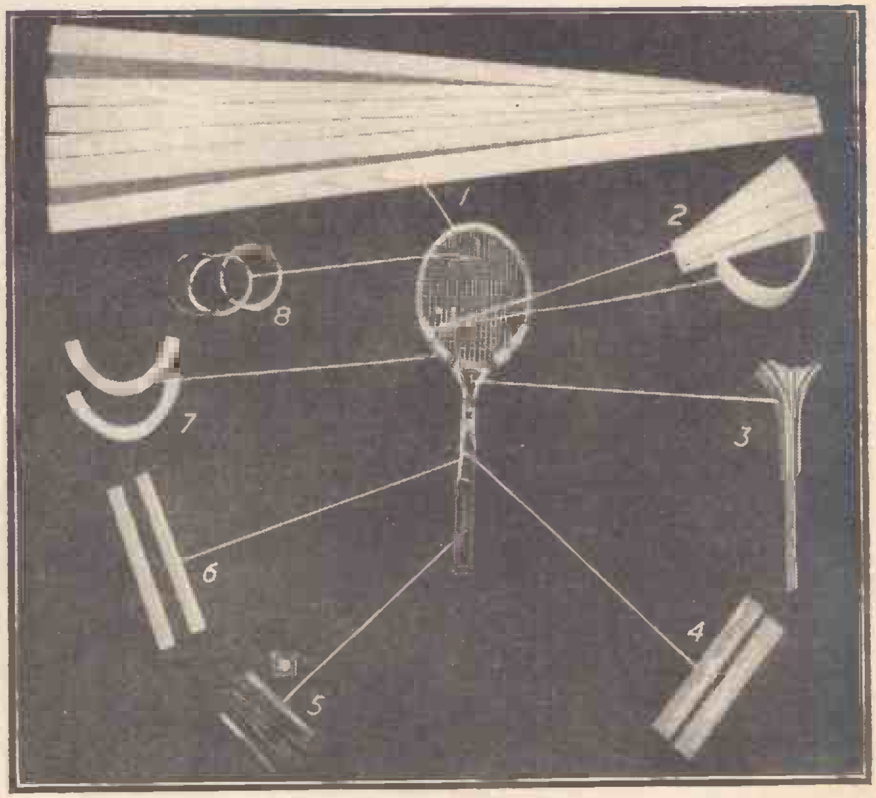


Fig. 1.—(1) Veneers of hickory, ash and beech. Two strips of fibre are also shown. (2)—Laminated insertion consisting of ash veneers and one strip of white fibre. (3)—Ash centre slip, wedges and strips of fibre. (4)—Handle faces of sycamore and mahogany. (5)—Leather grip, knobbing leather and end leather. (6)—Handle side pieces also sycamore and mahogany. (7)—Crescent made from steam-bent ash. (8)—Coils of natural gut and one coil of silk trebling.

one time responsible for making the entire frame. These operators also make their own tools.

Polishing Department

A conveyor in the polishing department carries the frames through the strip-fitting and transfer-fitting operations into the electrostatic spray plant where the final coats of clear lacquer are applied. A great advantage of the conveyor is that it keeps the frames from touching each other at a time when the decorations are particularly delicate.

The electrostatic spray plant recently installed is one of the few in this country. It makes use of a revolutionary spraying technique. Instead of using conventional spray guns, the lacquer is forced through tubes into revolving bells which discharge the lacquer by centrifugal force, atomisation being achieved by supplying an electrostatic voltage of 100,000 volts direct to the metal bell. This results in a stationary cloud of positively charged lacquer particles through which the earthed frames pass on the conveyor. The lacquered particles are attracted to the frames, and about 95 per cent. of the lacquer is actually deposited upon the frames.

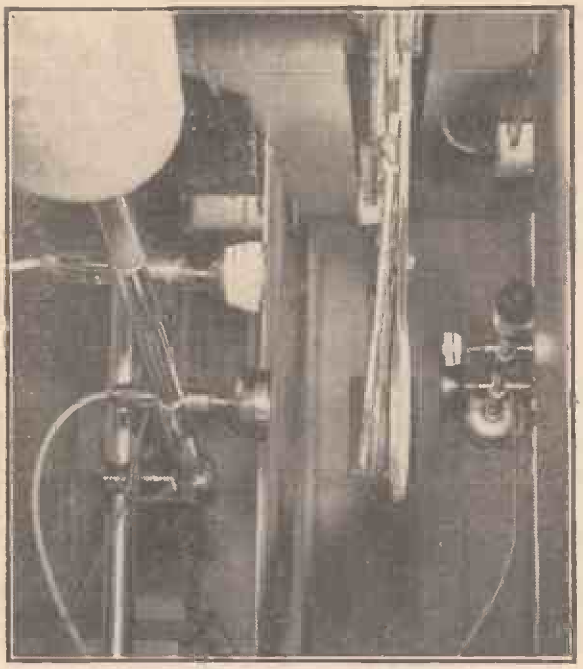


Fig. 3.—Electrostatic spraying of rackets.

Those with some knowledge of electricity may regard wood as a non-conductor, which, at ordinary voltages, it virtually is. At the high voltages (100,000 volts) at which this plant operates, however, there is sufficient moisture in the timber for it to act as a conductor. The frame therefore attracts the lacquer particles from all directions; under ordinary hand-spraying conditions, much of the lacquer deposited on the tennis frames in the electrostatic plant would have passed by the frames, up through the extraction plant, and been wasted.

Stringing

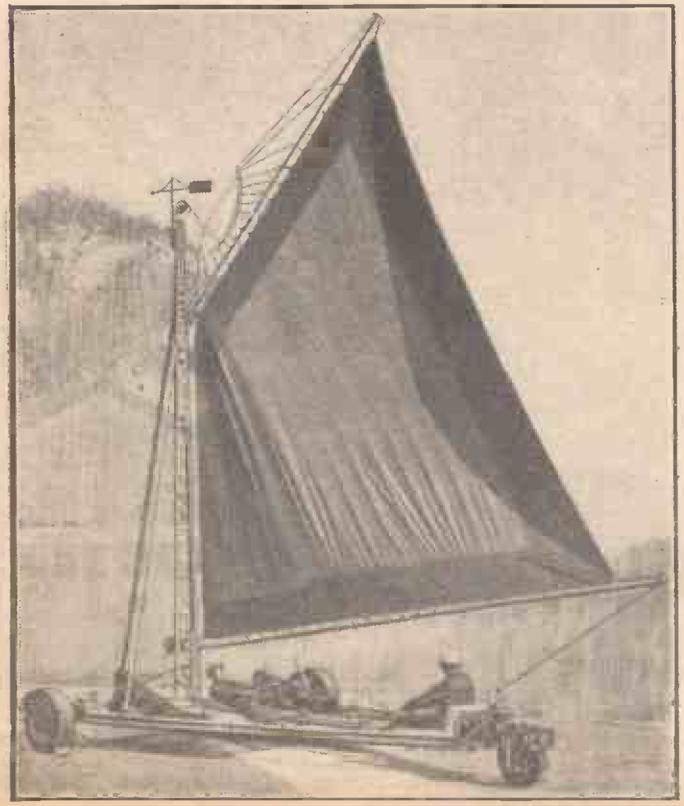
Hand stringing which, in inexpert hands, can seriously damage a frame, has not yet been replaced entirely by machine stringing. The racket head is held securely to prevent distortion during this operation and tension is applied by air cylinder, the air pressure in which can be adjusted to give any desired tension up to 85 lbs., but the actual weaving operation is still carried out by hand.

A Synthetic Gut

Natural gut is variable in quality; the intestines of about five sheep are needed to produce one set of strings for a racket and there may be a good deal of difference between the intestines of one sheep and another. To overcome this variation in natural gut, and at the same time to retain its good points, Dunlop set out 2½ years ago to build a string from man-made fibres. The result was "Durolastek," formed from spiral wrappings of nylon or terylene wound round a central nylon core.

This new string has been subjected to exhaustive tests in the laboratory, with the result that it was found to be as strong as the strongest natural gut; it is slightly more "stretchy," and it is completely unaffected by prolonged soaking in water. A racket with natural gut can be ruined on one damp afternoon. The new string is also unaffected by bacterial or fungal attack. Tests for wear showed that the new string should last from five to ten times as long as natural gut under normal playing and storing conditions. Many other ingenious tests have also been carried out, the apparatus used even including a cathode-ray oscillograph to measure the time the ball is in contact with the racket. In appearance the new fibre resembles the natural produce so closely that some 4,000 people have been using it in Dunlop rackets without knowing. These strings are cheaper than natural gut and will probably lower the price of tennis rackets. They should, owing to their great advantages become very popular with tennis enthusiasts.

Britain's Largest Sand Yacht



The "Coronation Year," Mark II.

BRITAIN'S largest sand yacht, whose attempt to establish the first British native speed record over the flying mile at Lytham St. Annes will be history by the time this issue is published, has been constructed mainly in light alloys, including duralumin supplied by James Booth & Co., Ltd., to meet the requirements of strength and lightness.

The yacht, known as the Coronation Year Mark II, was designed and built as a hobby by Mr. R. Millett Denning, a Hampstead man who became interested in the sport of sand yachting about 10 years ago. He designed the first yacht (Coronation Year Mark I) ever to be built of light alloys last year—it weighed 7 cwt. (unladen) with a sail area of 246 sq. ft. and reached a speed of 50 m.p.h.

The Mark II was developed from this. It has a sail area of 286 sq. ft., is 30ft. high, 26ft. long and 16ft. wide and weighs 9 cwt. unladen. It is expected to reach speeds of more than 75 m.p.h. and, while doing so, be able to turn in its own length.

At present there is a two-man crew—the mainsail operator and the tiller man—but subsequent developments will probably require a four-man crew as the installation of a port and starboard Genoa jib is under consideration.

The unique arrangement at the mast-head is designed to eliminate any undue stress in the duralumin gaff boom when the cotton mainsail is filled during racing. The entire yacht is assembled by a system of wing nuts and couplings and can be dismantled and transported on a Land Rover with ease.

It is interesting to note that the first known sand yachts in this country were at Southport in 1895; they were mainly of timber construction and fell into disuse owing to the advent of the motor car. There has been a revival of interest in the sport of latter years in other countries, and Mr. Millett Denning maintains that there are numerous stretches of sand around our own coast which would be more than suitable, particularly as they are not used to any great extent during the winter, spring and late autumn. The Fylde International Sand Yacht Club has now been formed at Lytham St. Annes to popularise the sport over here and attempts on speed records will be held under their rules.

2.—The Moon

By E. W. TWINING (*Illustrated with drawings by the author*)

THE Moon is a satellite of the Earth and revolves around our planet in an elliptical orbit at a mean distance of 239,000 miles. At times the distance reaches a maximum of 253,000 and is never less than 222,000 miles. Compared with the remoteness of the other planets and their satellites this space which separates us from the Moon is small and it is therefore not surprising that we know more of the physical appearance and formation of it than we do of certain parts of the Earth. That is to say, of the single pallid face that is ever turned towards us.

Powerful telescopes have been designed of late which are capable of bringing the Moon optically within a few miles of the Earth. Physicists have mathematically weighed it and found its mass to equal one-eightieth of that of the Earth, or seventy-three trillion tons. Its thousands of craters, mountain ranges and great dark plains have been studied, photographed and mapped in their entirety and in detail. The plains were, in ancient times, before the invention of the telescope, given the name of *maria*, or seas. For that is what the dark markings were thought to be, and each one was given a most inappropriate name, though for convenience these names are still retained by astronomers.

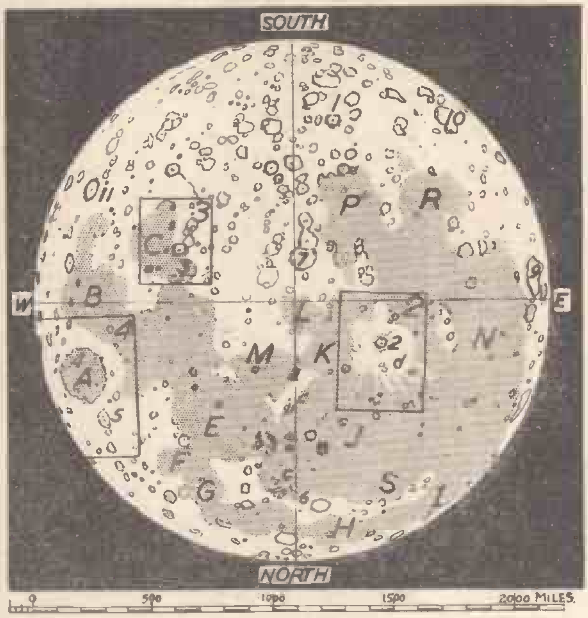


Fig. 1.— A map of the moon.

Moon Has No Water or Atmosphere

The origin of our Moon was explained in my previous article. It was formed, at the same time as the Earth, out of the planetary nebula of which the Sun was the nucleus. About fifty years, or more, ago it was thought that the Earth once revolved on its axis at a far higher revolutionary speed than it does to-day and that centrifugal force caused a great mass to be flung off, which mass became the Moon, but such flinging off was not necessary and it is much more reasonable to believe that a mass, or masses, were already there, in the nebula, which, by shrinkage, became respectively the Earth and the Moon.

Arising out of this shrinkage there is a very significant fact: we know that the Moon has no atmosphere surrounding it and no water on its surface. Much speculation and argument have been devoted to this. Some thinkers have put forward the idea that such water as once was on the surface has since gone into vast interior caverns. But what of the atmosphere? That cannot have gone to the interior, its bulk would be too great. Another hypothesis was that the water had gone to the face of the Moon which is always turned away from us, but this also is untenable: if water were present it would be much more likely to obey the attraction of the Earth and accumulate on our visible side of the satellite. The conclusion that we are forced to come to is, to believe the evidence of our eyes, that the Moon has no water and no atmosphere, that these were both drawn off—or the elements that make them—as the nebula cooled, by the larger body of the Earth. I venture to think that the same thing happened with the satellites of all the other planets: Mars, Jupiter and Saturn. Our Moon is the largest of all the satellites in proportion to the planet about which it revolves, so that it is difficult to find out, owing to their smallness and distance, whether any of the satellites of, say, Jupiter and Saturn have any trace of atmosphere surrounding them, but it would be most interesting, with the biggest telescopes in America, to investigate this.

The Moon's Orbit

The Moon rotates on its axis in the same time as it takes to revolve around the Earth, roughly in 27.3 days. That this is not a coincidence is proved by what is known as its libration: that is to say, its rotation, or rotary movement, is not uniform. Sometimes it becomes accelerated and then it appears to have a brake put upon it. Actually there is a brake, and that brake is gravity. The

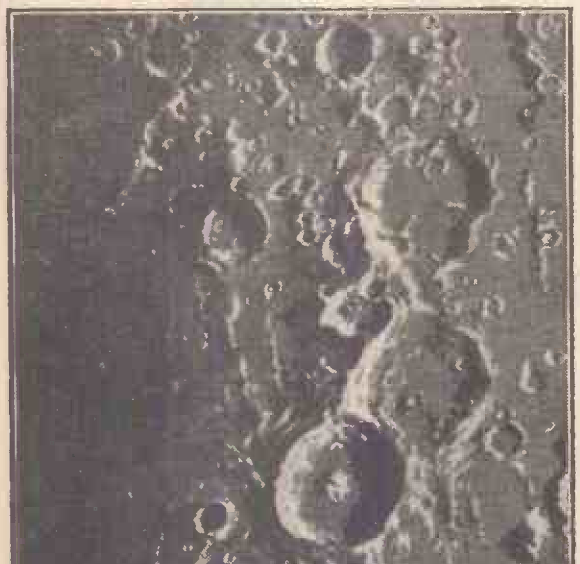


Fig. 2.—The crater Theophilus and surrounding region.

Fig. 3.—The crater Copernicus and surrounding region.

centre of gravity of the Moon is not in the centre of its mass; it is about thirty miles nearer to the Earth than the centre of its figure. This is not sufficient to keep it steady, but it is sufficient to keep always one side, more or less, turned towards us. The consequence is that its wobbling motion enables us to see, sometimes, a little more of its western side and at times more of its eastern limb. It is probable that if the centre of gravity coincided with the centre of its mass and figure we should see a slow procession of all the faces of the Moon's surface, although there is little doubt that the hidden portion does not differ much in appearance from the side with which we are familiar and, probably, not at all in character. There are, most probably, the same kind of dark plains and the same thickly pitted surface which we see on the side turned towards us. A map of this face is given in Fig. 1 and appended is a list of the chief features.

The so-called "Seas"		*Mountain Ranges*	
A	Mare Crisium	a	The Lunar Apennines
B	Mare Fecunditatis	b	The Caucasus
C	Mare Nectaris	c	The Lunar Alps
D	Mare Tranqilitatis	d	The Carpathians
E	Mare Serenitatis		
F	Lacus Somniorum		*Prominent Craters*
G	Lacus Mortis	1	Tycho
H	Mare Frigoris	2	Copernicus
I	Sinus Roris	3	Theophilus
J	Mare Imbrium	4	Mare Crisium
K	Sinus Aestiuum	5	Cleomedes
L	Sinus Medii	6	Plato
M	Mare Vaporum	7	Ptolemy
N	Oceanus Procellarum	8	Archimedes
P	Mare Nubium	9	Grimaldi
R	Mare Humorum	10	Schichard
S	Sinus Iridum	11	Petavius

Theories About Moon Crater Formation

To explain the cause and origin of the pitted surface of the Moon is my chief object in writing this article. There are, or were, three theories for accounting for the thousands of pits or craters which are visible—and doubtless there are thousands more which are too small to be resolved by the most powerful optical means. They vary in size from about 230 miles in diameter to only a few yards. The first and earliest theory is that the craters are the result of volcanic action. Now whilst such deep, circular and well-formed rings, averaging perhaps forty miles in diameter, might have the appearance of volcanoes, what explanation can there be for the many walled plains such as the prominent, dark-floored, Plato at the edge of the Mare Imbrium, having a diameter of about seventy miles, or the thousands of very small pits which are mere impressions in the comparatively smooth surface of the so-called "seas"? The volcanic theory is completely negatived when we remember that volcanoes give off water and carbonic acid gas. What has become of the water? Water cannot exist without air, and what has become of the vast quantities of gas which must have been expelled from such an enormous number of volcanoes? If there had been such an evacuation of gas the quantity of it expelled would have left the Moon as an almost hollow shell. Then again, in very many cases, craters are overlapping craters and in certain places all are thickly crowded together.

Another theory is that when the surface was in a plastic state, ebullition of steam and gas caused enormous bubbles to form and burst. Now this would yield exactly the sort of formations which we see on the Moon. I have myself watched porridge boiling in a saucepan and have seen steam bubbles forming and bursting and leaving, for a few moments, exact replicas of the craters in the Moon, but in the Moon we have nothing to cause ebullition; no water, steam or gas. In any case, boiling porridge yielded bubbles and craters all of the same size as would have ebullition in the Moon.

Meteorite Bombardment Theory

Finally we come to the third theory, and I should like to know who first propounded it so that I might honour him by giving his name. I have myself held the theory for the last sixty years though I have never threshed it out thoroughly until comparatively recent years. It is undoubtedly the right one for it satisfies all the conditions which we know to exist. The theory, which I have never seen expounded to the full, is that the Moon, as it cooled and its surface became in a plastic state was bombarded by thousands of bodies, large and small, from outer space. It is my belief that these bodies were either meteors and meteorites or, more probably, that between the Earth and Mars there was a belt of Asteroids similar to the Asteroids revolving between Mars and Jupiter. The latter are bodies which vary in size from perhaps 50 miles in diameter to others which may be no larger than good sized boulders. Their orbits are elliptical and some extend out nearly to the orbit of Jupiter whilst others actually enroach on the orbit of Mars. So far as we know, some of the shoals of meteors may be the remnants of a second and inner belt of Asteroids, the majority of the members of which, millions of years ago, may have been collected by the Earth and the Moon. It is certain that, whether they were Asteroids or meteoric bodies from outer space, the objects which bombarded our globe and the Moon varied in size similarly to the Asteroids. Our Earth had not then cooled sufficiently to retain any impressions of the impacts of the bodies as does the Moon and even on the Moon there are impressions which the surface was only just sufficiently solid to retain. Shown in Fig. 2, at the extreme bottom centre, there are two rings, each about forty miles in diameter, the right hand one of which is barely visible though both must have been formed by projectiles which struck thousands upon thousands of years before the missile which formed the giant crater Theophilus, which is the one nearly in the centre of my drawing. The two other craters adjoining Theophilus were both formed earlier than Theophilus and the third one, which is named Catharina, has another impact ring, within it, which is only a little later, and the missile which formed it partly destroyed the ring wall of Catharina.

Fig. 4.—The Mare Crisium and large crater Cleomedes.

Age of Craters

In Fig. 3, the principal object of which is the noble crater Copernicus, there is, near the bottom right-hand corner, some dark irregularly formed circles, without any trace of walls, which mark the earliest traces left of impacts. All that the missiles could do was to break through the liquid crust which was slowly forming and bring to the surface the dark material of which the "seas" are composed. This material was later to become, probably, a darkly coloured sandstone. Almost in a horizontal line with Copernicus, on the left-hand side of him, there is a well-defined crater whose walls are so shallow that they are only just visible; this was another very early impact and it must be of somewhat the same period as those at the foot of Fig. 2.

The largest circular walled plain which we see on the visible side of the Moon, so large is it that it was named as one of the "seas," is the Mare Crisium. This measures about 230 miles across and, in spite of its dimensions, one is forced to the conclusion that it is a crater, caused by the impact of a body of tremendous size. Near it is a much smaller, but still a great, crater, Cleomedes, of later period than the Mare Crisium. Both of these are illustrated in Fig. 4.

It will have been observed by those who have made a close telescopic study of the surface of the Moon that, in the vast majority of cases, the projectiles which crashed down upon it did so vertically, or nearly so, and so made perfectly annular craters, such as Copernicus and Theophilus. But not all of the missiles struck fair and square. Quite close to Copernicus there are two long irregular lines of small pits each line of which must have been made by single projectiles, which bounced and ricocheted for many miles before coming to rest. As the first hit in each line is little or no bigger than the last the evidence is that the points of first impact were about tangential to the curved surface of the Moon.

Many instances of angular striking can be found by looking for them, but I think that the most remarkable is one that took place after the great mountain ranges were formed. The reader who has a good telescope can see the result of this impact for himself when the Moon is at the first or last quarter. It is to be found in the Lunar Alps (C in the map, Fig. 1) not far from the great crater Plato. A tremendous furrow, perfectly straight and smooth and of gradually increasing depth, has been ploughed into and nearly through the Alps. The whole length of the furrow extends for at least fifty miles. In appearance it looks as though a gigantic gouge had, ignoring irregularities, made a straight cut into a piece of soft material, just as might a woodcarving tool in pine. I have never been able to see any trace of the missile; probably it is buried in the mountains where the furrow terminates.

Between the earliest visible record of bombardment and the last many millions of years must have elapsed. Such craters as Theophilus, Copernicus, Tycho and many others which I have not mentioned, must have been formed much later, when the Moon had reached such an age that the crust was solidifying, but the projectiles must still have been of great size and weight and have had tremendous velocities, for they broke through the more or less solid crust, raised mountain walls thousands of feet high, splashed outward crystallising material for great distances, and raised a cone, or conical mountain peak in the centre of the crater. I specially mention the crystallising material, which is possibly a form of spar, because of the bright streaks which radiate from several of the later craters, notably from Tycho; these last stretch for hundreds of miles in all directions. When illuminated obliquely they are invisible but shine brilliantly under direct rays of the sun at and about the period of full moon. Only ice or a crystalline material such as spar could give such an effect.

With regard to the central mountain peaks it must be noticed that the large walled plains, such as Plato, whose walls, by the way, are comparatively low, have no central peak; neither have any craters with low walls. These all belong to the middle and early periods of bombardment. It is only in the later craters with higher walls, rising in some cases to heights of 15,000 ft. and over, that we find central peaks, and these peaks are the result of the non-subsidence of the recoil splash of the soft material which the missile broke through. The floor of the crater is formed around the central peak by the flooding up of the nearly liquid interior and this accounts for the fact that, in all the late formed craters, the floor is always much below the level of the surface outside of the mountainous ring of the crater. It would be quite possible to reproduce one of these late craters by having a bath filled with some material whose viscosity gradually decreases from the surface downwards and dropping into it a missile of suitable size, weight and from a suitable height. Soft wax might be a suitable material, nearly cold at the surface and gradually increasing in temperature to the bottom, where it would be in a molten state.

I should like to point out that, apart from the bare theory that the craters of the Moon are the result of bombardment, all the arguments in support of the theory—the various periods of the formations of the craters, the effects produced by the impacts, the comments on the angle of striking, etc.—are original and have never been previously published.

A Small Workshop Forge

A Simply Made Piece of Equipment for the Handyman

By H. N. C. FIELDS

THE forge is based on a non-electric vacuum cleaner and the additional materials required are an old five-gallon drum, 3in. of ¾in. water pipe, one ¾in. pipe elbow, 9ft. of electrical conduit tubing, 5ft. or 6ft. of 1in. x ⅛in. iron strip and a few nuts and bolts.

Details of Construction

First of all take an old five- or ten-gallon oil drum and cut off the bottom, leaving a 4in.

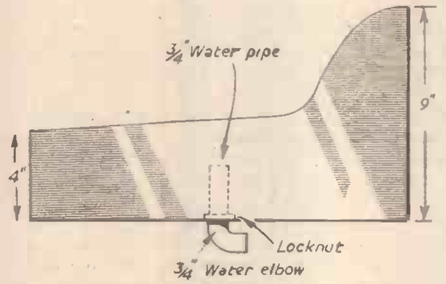


Fig. 1.—The converted oil drum.

wall for two-thirds of the circumference, the other third being 9in. high, as in Fig. 1, rounding off the corners as shown.

Drill or cut a hole in the centre of the bottom to admit the 3in. length of water pipe, which should have a thread cut for 1in. and a locknut fitted. This is now passed through the hole in the bottom of the drum and the pipe elbow screwed on and locked up tight with the open end towards the 9in. high part.

Next the blower unit from a "whirlwind" non-electric vacuum cleaner, or any other make, should be modified. First, remove the two large driving wheels and cut off the left-hand spindle flush with the bearing (looking from top of unit in working position). Remove the handle bracket and fit a hand crank on the right-hand spindle.

My crank was made by turning a bush to fit inside a cycle crank and over the spindle, and then drilling right through and pinning. Next cut off the crank 4in. from the spindle and drill and tap the sawn-off end ¼in. Whitworth and fit a wooden handle with a long bolt, see Fig. 3.

Remove the fan casing from the blower unit and secure the gearing behind the 9in. high portion of the forge bottom. This is done by drilling two holes in blower back plate and bolting through forge bottom, with two ¼in. bolts (Fig. 4), now make a clip from 1in. x ⅛in. strip and pass it round the gear housing, bolting to back of forge, Fig. 2.

The Fan Casing

This is made from the remainder of the five-gallon drum. First, cut a long strip wide enough to clear the depth of fan blades by ⅛in., the length will be determined by the diameter of the particular blower used. Fig. 5 shows the shape to be cut, which is bent up to form a square, tapered trough at the end, the long strip being bent round to the required diameter and riveted as shown in Fig. 6.

The top of the blower is made as in Fig. 7, and is a flat piece of metal ¼in. larger in diameter than the sides, Fig. 6, the small tabs and two long flanges are now bent at right angles and either riveted or soldered in position on to the fan casing, shown in Fig. 6. Now make a small clip from thin metal and fasten as shown in Fig. 2.

The complete casing can now be assembled on to the fan by passing the end of the casing spout over the pipe elbow and bolting on to the fan back plate with three bolts, as shown in Fig. 4.

Finally, the legs are made from electrical

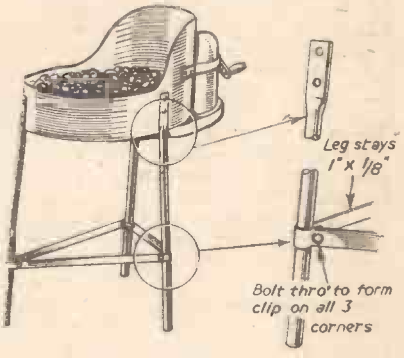


Fig. 8.—Details of the legs.

conduit. Three pieces 3ft. long are flattened for 4in. at the end and bolted through the sides of the forge. The legs are now stayed 9in. from the bottom by a length of 1in. x ⅛in. strip, passed round the legs and bolted, as shown in Fig. 8.

A 2in. layer of fire-clay is laid in the bottom, lining the sides is optional. My own forge has proved very satisfactory, but no doubt an electric model could be used as effectively.

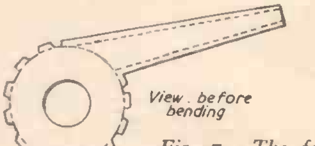


Fig. 7.—The fan cover.

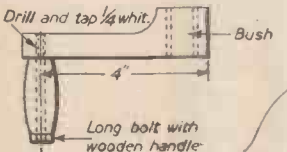


Fig. 3.—The hand crank.

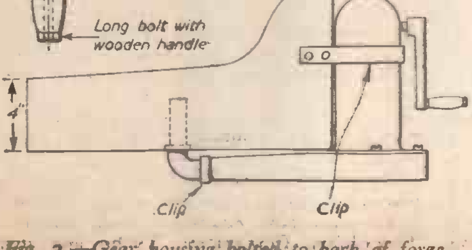


Fig. 2.—Gear housing bolted to back of forge.

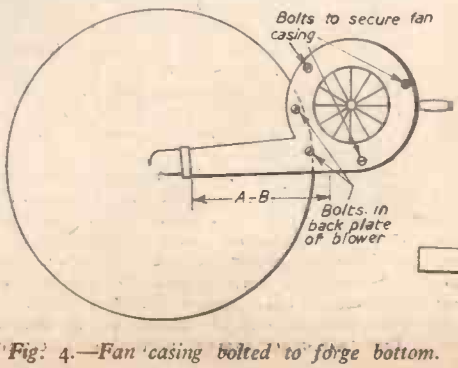


Fig. 4.—Fan casing bolted to forge bottom.

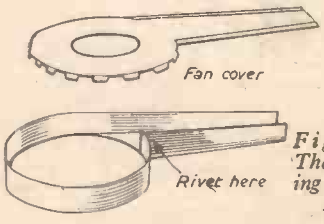


Fig. 6.—The fan casing bent to shape.

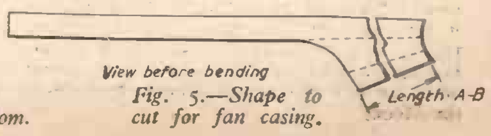


Fig. 5.—Shape to cut for fan casing.

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1933—A RETROSPECT

THIS 250th issue celebrates 21 years of continuous publication under my Editorship, with only one minor break due to the printing strike. It is the second of the series of journals which I have founded under the ægis of George Newnes, Ltd. to pass the 21st milestone, for our companion journal "Practical Wireless" celebrated its 21st birthday in October last year. As with that journal the occasion affords me an opportunity for nostalgic retrospect and to review the progress of the paper from 1933 to date.

I do so with justifiable pride, for it was a bold venture on the part of the publishers to enter a field in the periodical market which was something in the nature of an uncharted ocean. For some years I had given thought to the new journal. As one who has been connected with the technical press for a considerable number of years and who can thus fairly lay claim to a knowledge of public demand, I had observed the changing tastes of the British public in the matter of hobbies. The advance of technical education, the development of the aeroplane, radio and television, as well as scientific discoveries and inventions in many other fields, had caused a radical change in reader interest, and in the minds of those who formerly followed only one hobby. The practical crafts up to the early 'twenties were confined to woodworking, lathe work, model boats and elastic-driven model aircraft, but I was aware from readers' queries that the public interest had become greatly enlarged, and so had the number of hobbyists with inquiring minds. Miniature petrol engines and diesels of 1 c.c. and smaller were being developed; radio had opened up interest in set construction and radio-control of mechanisms. People were becoming more interested in chemistry and electricity, they wanted to understand their motor cars and their motor cycles and to carry out their own repairs.

These are but a few directions to which the public mind was turned, and I therefore prepared plans for a new journal which catered for this diverse public interest in science and mechanics. As when launching a new ship, no matter how skilful the design there are always some doubts when a new periodical runs down the slipways into the turbulent waters of Fleet Street, as to whether the ship is in trim, and whether alterations will be necessary. Even while these plans were reaching fruition I saw that a number of other journals would be necessary to cover the field I had in view. Thus "Practical Wireless," the first of the series of journals I founded for George Newnes, Limited, was launched exactly one year before PRACTICAL MECHANICS.

P.M., like P.W., was an instantaneous success and seemed fair set, as after 21 years has proved to be the case, for a long and successful career. It first saw the light of day on Friday, September 29th, 1933. It was out of print within a few hours and a heavy reprint was called for.

The first issue contained articles on the ray control of mechanism, building a televisor (Baird system), taking cinematograph pictures, astronomy, building a polariscope, engine-driven model aircraft, home broadcasting, microscopy, photography, building a three-valve receiver, wonders of the stratosphere, building a simple photo-electric cell, model railways, lathe work for amateurs, the fluid fly-wheel clutch, experiments in chemistry, electrical experiments, making accumulators, building an electronde, money-making ideas, patent advice, a review of the latest accessories, practical hints, to mention the main features only.

The launching was backed by our "First Number" commemoration offer of "Newnes Encyclopædia of Popular Mechanics," which I wrote specially for the purpose. Readers who had placed a regular order could obtain this 392-page book for a very nominal sum—a book which to-day would cost at least a guinea. It was a reference book covering all those subjects encompassed by the policy of the journal. Tens of thousands of readers availed themselves of this offer.

Readers were not slow to take advantage of our free advisory service and questions of the order of thousands a year steadily poured into our offices, covering such diverse subjects as astronomy and cycling, electricity and chemistry, house decoration and splitting the atom, caravan building and model making. In fact, to date our queries book shows that we have answered nearly 200,000 queries on a wide range of subjects.

Each issue reflected the energy and zeal with which my staff and I produced each issue. The circulation continued to rise issue by issue, as it still continues to do. Readers made valuable suggestions upon which we were not slow to act. Our suggestions file was drawn upon month by month to provide features which large numbers of readers required.

Some of the illustrations in these pages indicate the directions which the editorial policy followed. I produced designs on a number of subjects which hitherto had never been dealt with in the technical press, such as a small runabout car which could be built in those days for £20. It was built in its hundreds and rendered faithful service. All the readers will remember that we pioneered the home construction of light aeroplanes such as the Flying Flea and the Luton Minor, full-size motor boats and rowing boats, caravans, paint spraying plants, electronic brains,

...mes of Age!

...tes our 21st Birthday

...IVE REVIEW By F. J. CAMM — 1954

mechanical robots, to mention but a few. We set, maintained and improved a very high standard of editorial contents, each article being lavishly illustrated by special drawings and photographs taken during the course of construction. Many of the devices were built by me in the P.M. workshop, and I was thus able to take note of the snags likely to be encountered by amateurs and to modify designs to suit the skill and the equipment of the home mechanic.

It was obvious from our correspondence that we were performing a national service. Heads of colleges, universities and technical institutes wrote to congratulate us. The journal was taken by all the leading libraries throughout the country and thus had a readership greatly in excess of its sales, which had steadily spread to a large number of overseas countries.

Constant inquiries for books on particular subjects drew my attention to the paucity of instruction books written in a style suitable for the non-technical and semi-technical, so notwithstanding the pressure of work which two highly successful journals brought, I embarked upon the writing of a large number of technical handbooks, by shunning delights, eschewing holidays, and devoting myself entirely to the service of my readers. I enjoy work in large doses, and am fortunately able to work seven days a week spurred by an almost unquenchable enthusiasm and a desire to serve my readers. I find it very satisfying, and a reward in itself.

Year by year the number of books to my credit increases. I do not think that there are many authors living or dead who have written more books or more words than have I. To date my total of books greatly exceeds 200, and throughout those 21 years I have turned out regularly in the form of articles and books more than 20,000 words a week, making a total to date of over 21,000,000 words.

As I wrote in the Birthday Number of P.W., I suffer the penalty of versatility. Many have wondered how it is that one man could write with authority on so many topics. The answer of course, is that I am a trained engineer, and that my interests have always been wide, not only in academic study, but in practical applications. Visitors to exhibitions have seen examples of my work in the spheres of telescopy, radio, television, model-making, microscopy and invention. I have obtained patents for a large number of devices, all of which are on the market. One of my most recent was the automatic pump for inflating tyres whilst the vehicle was in motion. Three of my latest models are of the very first bicycle, the first motor cycle, and a working model of the lethal bed at the Ostrich Inn, Colnbrook, in which so many guests went to their doom. It is exhibited there to-day. What I write, therefore, is the result of personal experience; I do not employ ghost writers. Work bearing my name is my own.

I am encouraged to believe that part of my success is due to a natural gift for simplifying complicated matters, because so many readers tell me so.

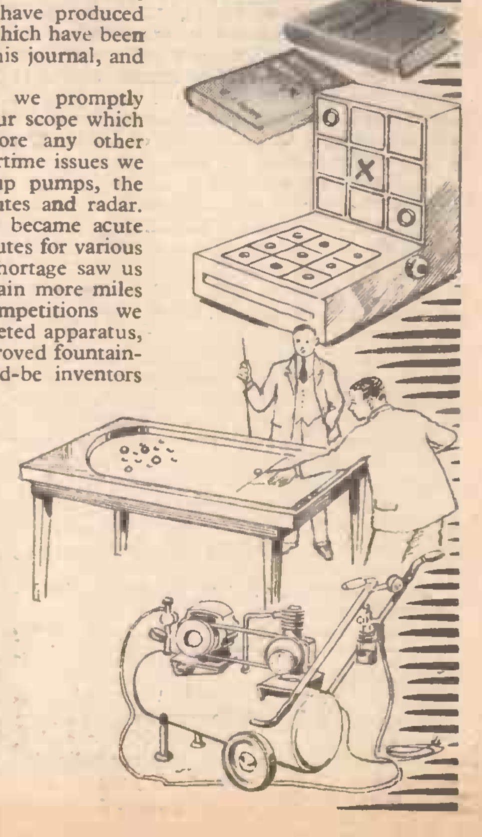
There is plenty of evidence, in the form of printed matter and constructed apparatus of my work during these past 21 years. As year succeeded year I developed the "Practical" series of journals in furtherance of our policy of catering for the amateur and handyman—the man who obtains joy from doing things himself and observing something come to life from raw material. In that space of time I have founded not only P.M. and P.W., but the "Practical Motorist," "The Cyclist," "Practical Television" and "Practical Engineering." I take pride in the fact that I was the only Editor to start a paper during the War ("Practical Engineering," January, 1940), and the first to start a new journal when paper rationing ceased ("Practical Television," April, 1950).

The "Practical Motorist" first appeared as a weekly in 1934, but suspended publication during the War for obvious reasons. It reappeared under the title of "Practical Motorist and Motor Cyclist" in April of this year as a monthly. I am glad to say that it has repeated the success of its stable companions. Apart from the launching of these periodicals I have produced in 21 years over 80 books, all of which have been published by the proprietors of this journal, and four others are on the way.

Older readers will know that we promptly deal with every subject within our scope which is of topical interest, often before any other journal. For example, in the wartime issues we dealt with the making of stirrup pumps, the principles of submarines, parachutes and radar. When shortages due to the War became acute we described how to make substitutes for various items of necessity. The petrol shortage saw us publishing articles on how to obtain more miles to a gallon. By means of competitions we endeavoured to improve on marketed apparatus, to wit, our competition for an improved fountain-pen. We have saved many would-be inventors from wasting their money, whilst others we have encouraged to go ahead. Some readers, indeed, have made fortunes as a result of our advice.

There are many to-day, occupying important positions both in industry and all of the Services, kind enough to say that they owe their success to the tuition they have received from my journal and books.

It is with pride and pleasure, justifiable I hope you will agree, that I look back on the past 21 years of creative work. I have said before that there has been no five-day week for me. Naturally, my large output could not



(*Continued on page 29*)

FLAPS FOR SWIMMING

Details and Dimensions of Flaps, and Some Aspects of Swimming Expressed in Figures

By C. W. TINSON

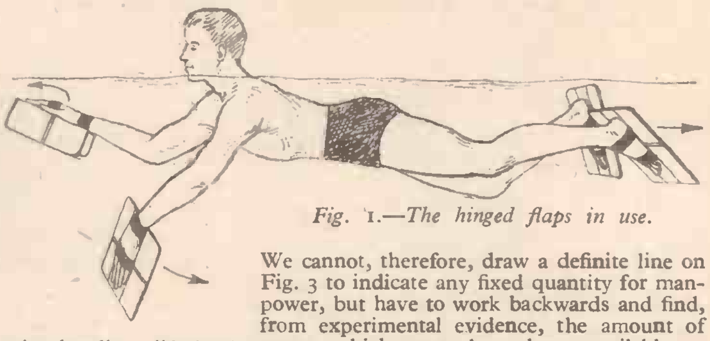


Fig. 1.—The hinged flaps in use.

IT is sometimes suggested that the addition of hinged flaps to a man's feet and hands, the general idea of which is shown in Fig. 1, would improve his performance when swimming, giving him the equivalent of the webbed feet of some aquatic animals. A study of this matter shows that a considerable improvement in acceleration and in manoeuvrability is certainly possible.

The kind of flap illustrated in Fig. 2 is very easily made: all that are required are a few square feet of plywood, some small brass butt hinges, a few rivets and washers, and some garter elastic. The drawing (Fig. 2) makes the construction clear. The middle piece, on to which the elastic loops are fixed to retain the flaps on the feet and hands respectively, is a piece of ply a little narrower than the foot or hands, and loops of wide elastic, previously sewn up to a suitable size, are attached by rivets and washers. To the middle-piece flaps are hinged, and a strip of narrow elastic is fixed across them to bias them statically into the spread position, for without this it is difficult to walk when entering or leaving the water. The tension in this piece of elastic should not be more than is just necessary to maintain the spread position against the weight of the articulated portions.

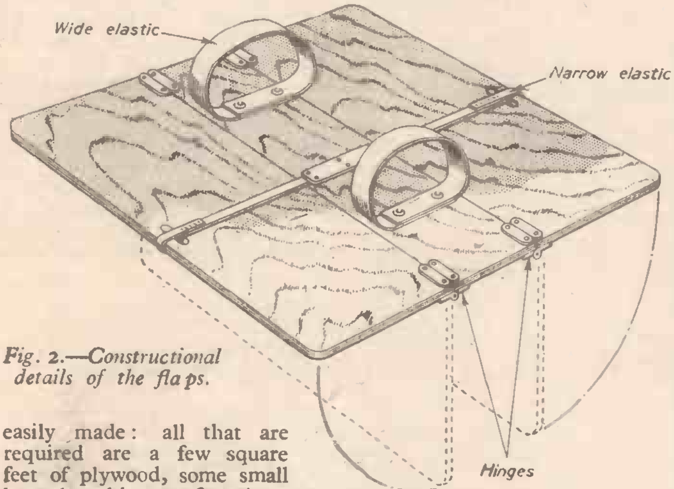


Fig. 2.—Constructional details of the flaps.

Using the Flaps

As Fig. 1 shows, during the thrusting stroke the water reaction opens out the flaps, while on the return stroke the back pressure folds them at right-angles so that they trail downstream and, to all intents and purposes, offer no more resistance during the return than do a swimmer's feet or hands when swimming without them. The left arm is shown moving backwards and is thrusting, the flaps being spread, while the right arm is shown recovering position for the next thrusting stroke and, as the movement is in the opposite direction, the flaps are folded. Both legs are shown moving backwards.

From the point of view of limiting the inconvenience of flaps, an overall opened size of 13in. by 8in. for the feet and 8in. by 7in. for the hands would be about the largest practicable size to wear.

As to their effect on the swimmer's performance, it is difficult to portray the position without the aid of graphs and Figs. 3 and 4, which will be discussed later on, are indicative of the results. Before examining these, however, it is necessary to say a word or two to explain their derivation.

Man-power Available

Human beings vary enormously in the amount of power they can produce and the length of time they can keep on producing it. Under the heading "Animal Power," reference books agree generally that an average man can develop and sustain for several hours about 1/10th h.p. and can develop a great deal more than this for a limited period. Now, 1 h.p. is the power required to move 550lb. through 1ft. in 1 sec., so 1/10th h.p. would lift an 11-stone man at the rate of 0.357ft. ($4\frac{1}{4}$in.) per sec. A man could do much better than this output for a short time. For example, you have only to run upstairs to find how much horse-power you can develop. There will be no difficulty in raising yourself 10ft. in $3\frac{1}{3}$ sec., which is at the rate of 3ft. per sec., and if you weigh 11 stone you will then be developing 0.84 of a horse-power for that period of time. By doing this several times in quick succession you will learn something of the deterioration or decay of your power, either in relation to time or to distance, and if you plot the results against time, the shape of the resulting curve will resemble the curve of the torque of a twisted skein of model aeroplane elastic when plotted on a timebase: a terrific burst of initial power is quickly followed by a gently descending output and this is followed by a rapid fall-away at the end of the run. The final bit corresponds to the point where a man reaches the limit of his exertion and gives up through sheer exhaustion.

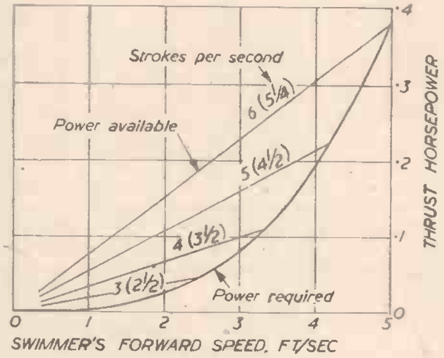


Fig. 3.—Graph showing thrust horsepower.

It is obvious that, unlike a motor, a man's power is a very variable quantity, depending on the type of operation, the length of time he is operating, and conditioned, of course, by other factors, such as the amount of practice he puts in on the particular operation. We cannot, therefore, draw a definite line on Fig. 3 to indicate any fixed quantity for man-power, but have to work backwards and find, from experimental evidence, the amount of power which must have been available as "thrust horse-power" to have made possible a particular achievement.

There is also the question of the efficiency of transmission, as it were. It is clear that in the case of swimming the efficiency is pretty low: there is a lot of power wasted in creating turbulence in the water and less of our effort actually appears as thrust horse-power. We must see, therefore, if we can get any idea of the useful power—the power which is labelled "Thrust horse-power" in Fig. 3.

In the recent Empire Games held at Vancouver, a speed of 4.72ft. per sec. was achieved in the Men's 440 yards Free-style swimming contest. The winner was an athlete apparently capable of developing so much power that there was actually about 0.3 thrust horse-power for $4\frac{1}{2}$ mins., and it is also evident that he must have been making a very rapid number of strokes to be able to do this. This brings us to the next point, the rate of muscular response of the limbs. The number of strokes per second you are able to make will set a limit on the speed you can achieve through the water, and until you have trained yourself sufficiently it may not be possible to convert into useful thrust all of the power of which you are capable: in other words, your efficiency of transmission is lower again. For these reasons, the power available in Fig. 3 is associated with various numbers of strokes per second, the numbers outside brackets referring to the normal swimmer without flaps, and the numbers in the brackets to the flapped condition. The example given later on will make this clearer.

Power Required

An article of this sort cannot go deeply into this matter of power required, which is involved, and it must suffice to say that the resistance to a swimmer depends mainly on the density of the water and to the square of the speed through it, or as $C\frac{W}{g}v^2$. There is little experimental data to go on, but for a

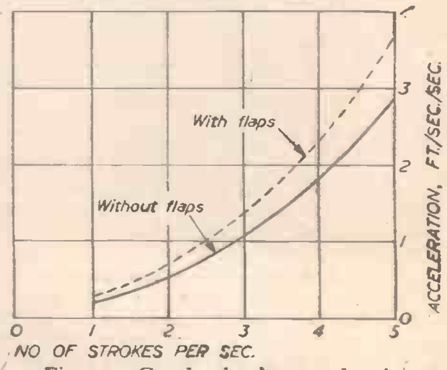


Fig. 4.—Graph showing acceleration.

man in a prone position the value of C may be taken to be 0.85. Simplifying the expression we find that the resistance, in sea water, is equal to 1.69 v^2 (pounds), v being in feet per second. The horse-power required is found by multiplying this by v and dividing by 550, so that the horse-power required curve for a man swimming will be given, to a fair degree of accuracy, by the formula $\text{T.H.P.} = \frac{1.69\,v^3}{550}$.

The curved line of Fig. 3, gives this on a base of the speed v. The intersection of this curve with any of the power available lines will show, for a particular number of strokes per second, the maximum speed one is likely to reach. The numbers in brackets are for the flapped condition.

Acceleration

The space between the lines of power required and power available represents the amount of power which is available to accelerate from a low speed to a higher one and Fig. 4 shows the value of acceleration, with and without flaps, at various numbers of strokes per sec. The values shown do not represent the amount of acceleration to be obtained, instantaneously, by exerting oneself momentarily to the maximum extent, but rather the amount of acceleration which could be kept up over a period sufficient to enable the swimmer to reach his maximum speed.

We can now see the picture more clearly. Take as an example a man who knows he can do four strokes per sec. when swimming normally, i.e., without flaps. Fig. 3 shows, at the intersection with the power required line, that he is unlikely to be able to exceed a speed of 3.3ft. per sec. The figure in brackets also shows that he would require to make only 3½ strokes per sec., when wearing flaps, to produce that speed, and the inference is that he will tire less rapidly with the flaps and so be able to extend his range.

At any point to the left of the maximum speed there is power in reserve and it is fair to assume that if he can make four strokes per sec. without flaps, he can do the same when using them. Fig. 4 shows us that if this assumption be correct, he is able to increase his acceleration from 1.8 to 2.3ft. per sec. per sec. by using the flaps ; this is an increase of about 27½ per cent. It is clear, therefore, that his acceleration and manoeuvrability will benefit noticeably by their use.

While it is true that, for a given case, the maximum speed can only be increased by reducing the resistance of the swimmer, which flaps will not do, a certain amount of improvement in the efficiency of transmission might be reasonably expected as compared to propelling oneself with the bare hands and feet, in which case there would be a small increase in maximum speed also when using flaps. In addition, they will increase the tempo of aquatic amusements and bring a correspondingly satisfactory increase in the excitement to be derived. For want of a better definition, flaps have an "amusement value" even though they may not get you anywhere appreciably faster. A spring-board or diving stage are also in this category, yet these certainly have considerable amusement value and are popular.

The Average Man

For those who are keen on swimming the following additional data regarding an average man may be of interest.

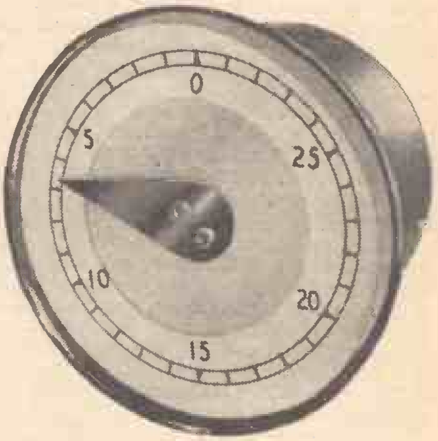
Height 5ft. 8½in. Weight 11 stone

Component	%	Cubic ft.	Weight lb.
Head ...	6.0	.155	9.240
Neck ...	0.9	.023	1.386
Torso ...	57.9	1.499	89.166
Arms (2)	8.3	.215	12.782
Legs (2)	26.9	.698	41.426

The average density of a human being is about 60½lb. per cubic foot, so that when swimming normally the head will not be submerged. On diving beneath the surface there is, therefore, a force of approximately 9lb. upward, which produces an upward acceleration of about 1.9ft. per sec. per sec. with or without flaps. By swimming towards the surface with flaps this acceleration can be increased quite considerably, enabling the swimmer, who has been able to descend further by means of the flaps, to surface smartly.

A DARKROOM INTERVAL TIMER

A Handy Accessory for the Photographer



The completed darkroom timer.

THIS timer is a simple adaptation of an ex-service clockwork mechanism, the Master Contactor, Type 2, which is readily obtainable at low cost from advertisers in PRACTICAL MECHANICS. It consists of a high-class clock-type movement which opens and closes a pair of contacts twice each second. For the purpose in view, these contacts are not required and the associated electrical connections, etc., may be removed. This leaves a mechanism, with metal case, with a centre winder which revolves once in 30 minutes, and which can be started and stopped at will by means of the small knob provided.

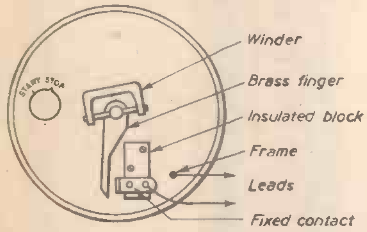


Fig. 1.—Contactor arrangement.

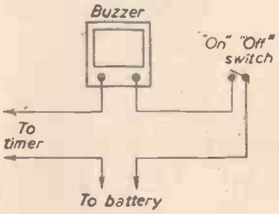


Fig. 2.—Circuit connections.

Since all normal developing processes lie within the 30-minute period, a hand may be fitted directly to the winding spindle, as shown in the illustration. This may most readily be done by soldering two short 6 B.A. bolts to the gear which is fitted to prevent over-winding. A circular piece of wood or ebonite, or a canister lid of suitable diameter, is then bolted to the clock mechanism. The card dial is marked out in indian ink, divided into 30 equal sections, and glued in position. The hand, cut from any thin metal and suitably drilled, can then be fitted to the two bolts and held by small nuts. Further nuts under the hand space it slightly from the dial. Markings and hand should be of bold type so that they are readily visible in dim light.

In order that a warning buzzer may be operated, a brass finger is soldered to the winder at the back of the clock, as shown in Fig. 1. A small insulated block is bolted to the case, and a fixed contact bracket fitted to this so that there is no electrical contact between bracket and clock case. The brass finger is so positioned that when the hand reaches zero on the dial, the finger bears upon the bracket, thus completing the circuit and stopping the clock from unwinding further.

Electrical connections are very simple, and are shown in Fig. 2. If circumstances permit, a warning lamp may be used instead of the buzzer. Operation of bell, buzzer or lamp may also be from the secondary of a mains transformer, but the contactor arrangement is not suitable for mains voltages.

In use, the required period for development is found by reference to the usual time and temperature tables issued by the developer manufacturer. The clock winder is then turned so that the hand indicates the required number of minutes. The developer is poured into the tank, and the timer started. When the required period has elapsed the hand will have reached the zero position, the buzzer will operate, and the developer is then poured from the tank.

P.M. COMES OF AGE

(*Continued from page 27*)

be achieved by handwriting alone. I dictate most of my copy and it is typed as I talk. Some of it is taken down in shorthand, some recorded on tape, and a small amount, such as mathematical matter, which is beyond the abilities of shorthand typists and outside the gramalogues of Mr. Pitman, is written in longhand.

I have acknowledged in P.W. and I hereby repeat that acknowledgment, the great encouragement I have always received from the publishers, George Newnes, Ltd., who share and back my enthusiasm, and I also gratefully acknowledge the assistance I receive from an able staff, most of whom have been with me for the whole of the 21 years.

We are on the eve of great discoveries and great inventions, and this journal has an even greater duty to perform in keeping its readers abreast of these new developments. In thanking those tens of thousands of readers, many of whom can claim readership from No. 1, may I say that we enter our 22nd year rededicated to their service.

Gas From the Ground

Natural Gas in America and the Possibility of its Use in Britain

By BERNARD DIX

SIX months ago the Gas Council, faced with the ever-rising price of coal, the increasing scarcity of good carbonising coal, and the ultimate prospect of cheaper electricity produced by atomic energy, decided to launch a research and exploration programme to discover to what extent, if at all, there existed deposits of natural gas suitable for commercial exploitation in Great Britain. Preliminary surveys were carried out in Scotland, Lincolnshire, Yorkshire and Sussex with a view to test drillings being made in an effort to tap any potential sources of underground gas, and drillings were eventually made near Edinburgh and in a field between the chalk hills of Kent and Sussex on the outskirts of Ashdown Forest. The results in Edinburgh have not, so far, been encouraging; but the Gas Council has recently announced that after drilling to a depth of some 700ft. a source of natural gas has been initially located at the Sussex site.

The commercial use of natural gas is not new and for many years it has been successfully carried out in various parts of the world. This is nowhere more true than in the U.S.A., where at present natural gas accounts for more than 90 per cent. of the thermal gas sales of the American gas industry. This represents approximately one-quarter of the total energy derived from mineral fuels and water power in the United States and amounts to a yearly marketed production of nearly 7½ million cubic feet of gas, supplied to 16 million consumers in almost every State.

There are 27 States producing natural gas but by far the greater portion of the total is produced in Texas which accounts for 50 per cent. of the total output, and where the known reserves amount to some 54 per cent. of the total estimated reserves of the entire country; the other principal States producing natural gas are Louisiana, Kansas, California and Oklahoma.

The composition of natural gas varies slightly according to the different fields in which it is produced, a fairly typical analysis of the gas produced in America is as follows:

	per cent.
Carbon dioxide	0.8
Methane	91.0
Ethane	3.1
Propane	1.7
Butane	0.7
Nitrogen	2.7

Calorific value: 1,047 B.Th.U. per cubic foot. Specific gravity: 0.61.

Most of the natural gas, unlike coal gas, does not possess a characteristic odour and as a consequence the detection of leaks is rendered rather difficult; in order to assist such detection the normal practice is to add some easily distinguishable odorant. It will be noted that natural gas does not contain carbon monoxide and, therefore, the danger of gas poisoning from that source is non-existent—although carbon monoxide can be formed if complete combustion does not take place in the actual appliance which is burning the gas.

The distribution of natural gas from the actual source to the consumer creates considerable problems; particularly in a country which covers such a vast area as does America. With coal gas the producing point is built as close as possible to the immediate area of demand, but with natural gas it is necessary to convey the gas from the place where it is found to the place where it is required, very often these two points are many miles apart. This is the case in the United States where some 149,000 miles of gas mains are used to facilitate the collection and long-distance transmission of natural gas supplies. The city of New York, for instance, is supplied with gas which is tapped in the Texas-Louisiana Gulf Coast, the world's greatest area of natural gas reserves, and which is piped through 1,840 miles of 30in. bore gas mains in order to reach New York; a further 500 miles of branch pipes of varying diameters are required in order to complete the distribution to the consumers.

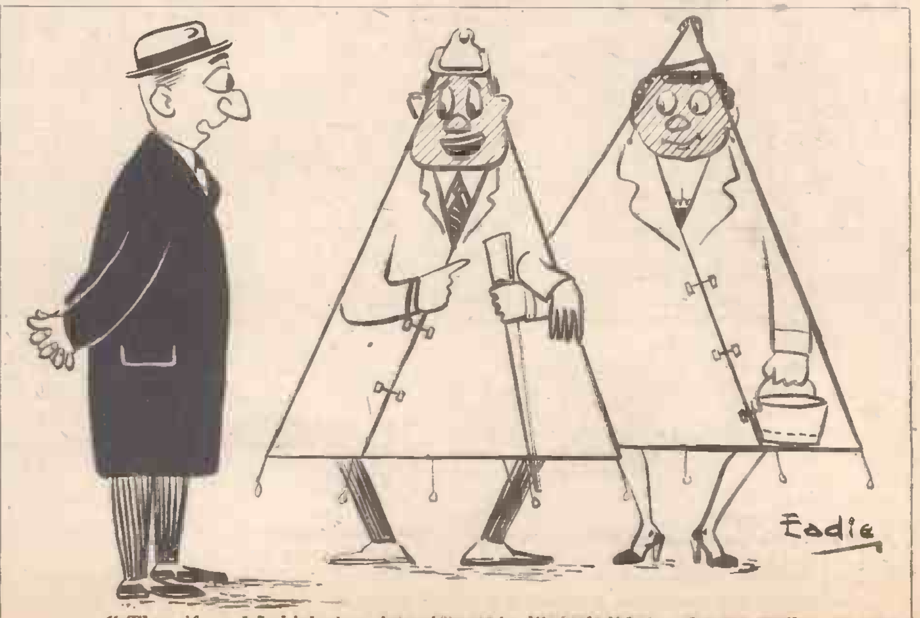
The pipes in this pipe line are of high-carbon steel, electrically butt welded, and hydrostatically expanded in order to increase their hardness. The pipes are assembled by electric welding on site and are given a protective covering of hot coal tar and fibre glass. The company operating this pipe line, the Trans-Continental Gas Pipe Line Corporation, has 19 compressor stations, mainly using gas-fuelled reciprocating engine compressors, installed at various points along the pipe line. These stations are in constant communication with the company's headquarters in Texas by means of the company's own micro-wave system on high frequency radio and each hour they report to the headquarters the gas pressure at the station.

The whole of the pipe line is patrolled by air regularly twice each week and, in addition, periodic inspections are carried out by 27 skilled maintenance crews who are stationed at intervals along the pipe line. These maintenance crews are of a specialist character and are equipped with all the necessary appliances to deal with any situation which is likely to arise. The efficiency of these maintenance crews is such that the amount of gas unaccounted for between Texas and New York is said to be "of no consequence," for a gas main of 1,840 miles this is no mean feat.

One of the more recent developments which has taken place in the American natural gas industry is the extensive use of underground storage. As the original gas fields become exhausted it is necessary to seek further supplies elsewhere—as a consequence a continual movement is taking place in the location of the supply points and they are moving farther away from the area of demand. In order to maintain an improved load factor on the long-distance pipe lines and to provide adequate reserves during the periods of peak demand increasing use is being made of the already exhausted underground chambers. By pumping gas into these chambers it is possible to store gas for use during the peak periods and during the winter months when the demand increases; some 100 exhausted gas fields, containing nearly 5 million cubic feet of gas, are now being used for this purpose.

The future of the industry is, of course, dependent upon the reserves of gas available. The position of the known-reserves is continually changing as the result of fresh fields being discovered and by extended knowledge of existing fields, but it is estimated, at the present rate of consumption, that the known reserves will be sufficient for the next 25 years, but this can possibly be extended by further developments in the utilisation of the gas. American authorities estimate that the total supply of natural gas, both known and unknown, will be sufficient for a further 50 years at the present rate of consumption, after this time the supplies will begin to decline.

It is too much to hope that natural gas will be discovered beneath the soil of Britain to the extent which it exists in America—in fact, geological considerations make this almost an impossibility—but if it is found even on a smaller scale it could cause considerable changes in the economic and industrial patterns of the country. The Gas Council plans to continue its research and exploration for a period of five years and anticipates spending at least £1 million in the process and, while Sir Harold Smith, the Chairman of the Gas Council, has stated that hopes are not being built on an early success, it is hoped that within the five years some satisfactory results will be achieved. Perhaps, in the not-too-distant future, there will be 30in. bore gas mains carrying natural gas from beneath the Downs of Sussex to the factories of the industrial Midlands.



" The wife and I think there is nothing quite like a holiday under canvas."

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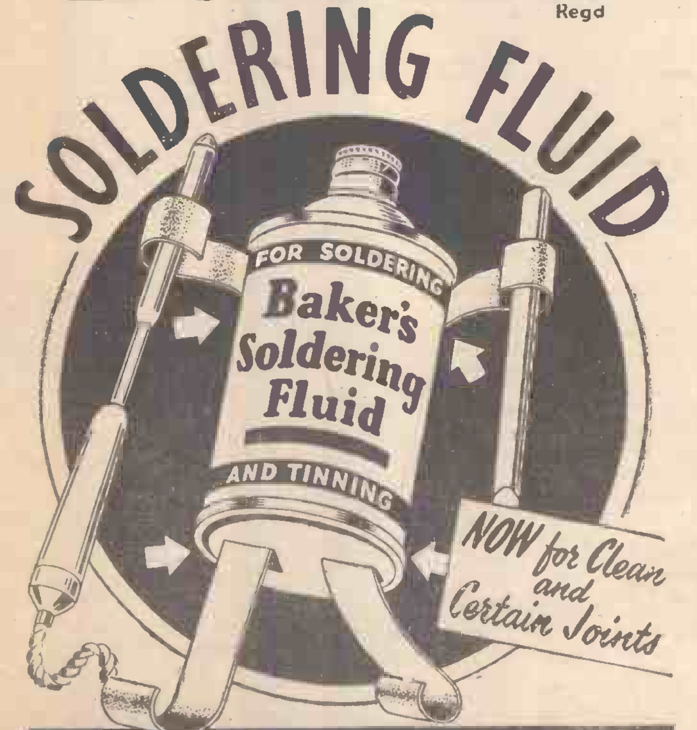

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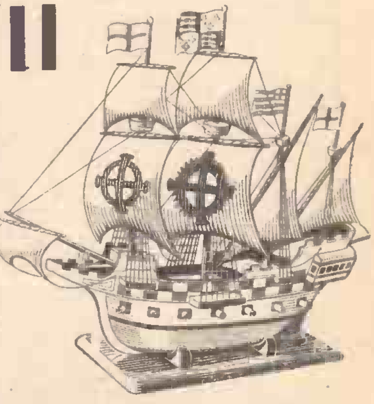

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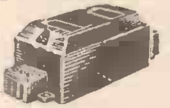

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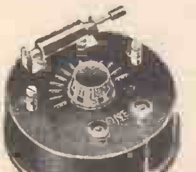

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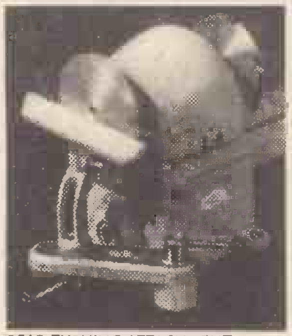

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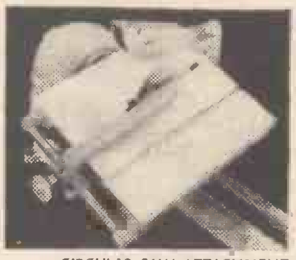

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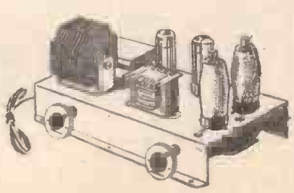

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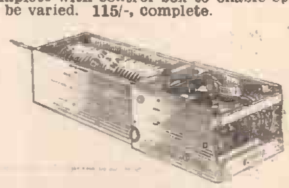

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Thermostats and Their Application

Various Ways in Which These Handy Devices May be Used

By F. G. RAYER

THERMOSTATS are usually devices whereby a change in temperature causes an electrical circuit to be made or interrupted, and they have quite a large range of applications. Possibly the best known is found in the "thermostatically controlled" heater for domestic hot water supply, tropical fish tank, electric iron or other appliance where an equable temperature has to be maintained. There are, however, other uses—such as the interruption of "fairy light" or decorative lighting circuits, or the control of buzzer, bell and indicator light circuits of all kinds. A flashing indicator or signal lamp commands attention more readily than one steadily illuminated.

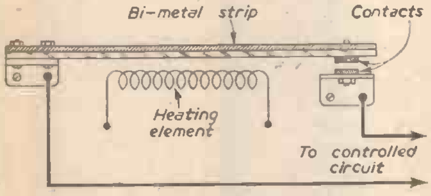


Fig. 1.—The simplest type of thermostat.

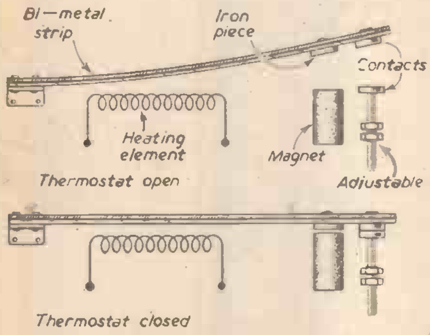


Fig. 2.—Thermostat with snap action.

The manner in which electrical thermostats operate will become clear from Fig. 1, and their construction is quite feasible. The bi-metal strip consists of two thin strips of dissimilar metals which expand to different amounts for a given rise in temperature. As these strips are closely fixed together, such expansion causes the free end of the bi-metal strip, carrying a contact, to move appreciably, due to curvature of the metal (illustrated in Fig. 2). According to the method in which the thermostat is arranged, this movement may open or close the circuit, a fixed contact being provided for this purpose. Usually the contacts are closed when the bi-metal strip is cold, opening when a certain temperature is reached. It will thus be seen that the heating element will be operating whenever the temperature of the thermostat is below the required temperature, or switched off whenever the temperature is above that required. In the case of a water heater the water will thus be maintained at a stable temperature, irrespective of external conditions. If hot water is drawn off, and cold water replaces it, the heater will operate until the water again reaches its original temperature.

In practice a thermostat will maintain a temperature only within a given range; for example, 100 deg. C. plus or minus 5 deg. This is sufficient for many purposes. In industrial or other applications where more exact control is required sensitive thermostats of suitable type are used.

The arrangement shown in Fig. 1 is most suitable for the interruption of low-voltage circuits. With high voltages, severe sparking can arise as the contacts slowly open or close. This is overcome in some units by the addition of a bar, horseshoe, or electric magnet as illustrated in Fig. 2. Here the iron piece is outside the effective field of the magnet when the contacts are open. As they slowly approach, due to cooling of the strip, a point will be reached where the iron piece is abruptly attracted, thus closing the contacts. Similarly, when heating takes place the strip, now in the "Closed" position, will slowly increase its tension in the "Opening" direction, until the attraction of the magnet is overcome and the contacts abruptly open. This gives a quick snap action in both directions.

When very rapid action is required, the heating element may be wound round the bi-metal strip (but insulated from it) as shown in Fig. 3. Such a thermostat may act within a few seconds of the application of current. In the cases shown in Figs. 1 and 2, the heating element may be a coil especially provided for this purpose. Alternatively, the required heat may be provided from the main heating element (e.g., tank immersion heater), the bi-metal strip being enclosed in a tube immersed in the water, and thereby sensitive to changes in its temperature. For controlling the temperature of water, etc., where a heater is present, no additional heater is usual. A special heater, especially of the type shown in Fig. 3, is mostly used when the thermostat has an application other than temperature control—e.g., lamp flashing, buzzer circuit interruption, etc.

Construction

In order to obtain a sufficient degree of movement the bi-metal strip should be fairly long. About ¼in. wide and 2 to 3 in. long is suitable, though much shorter strips can be used with success. The metal should be of thin gauge, anything stouter than about

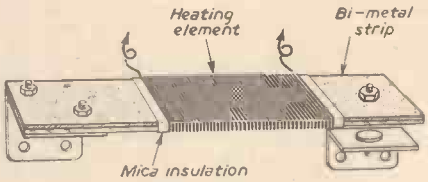


Fig. 3.—Rapid-acting thermostat.

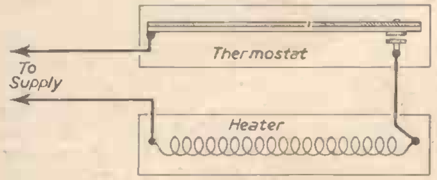


Fig. 4.—Circuit for thermostatic control.

30 s.w.g. being insufficiently flexible. Any metals with dissimilar coefficients of expansion will operate, but maximum movement arises when the metals are as dissimilar as possible in this respect. Copper and iron are the metals most easily to hand, and may be soldered readily. Zinc and iron are also usable together. Bi-metal strips may also be purchased from some sources, and will be of more rare metals giving additional sensitivity.

The strips must be absolutely flat and in contact throughout the whole of their length; they may be joined by soldering. Due to the manner in which curving of the strip arises from undue expansion, a satisfactory movement is not particularly difficult to achieve.

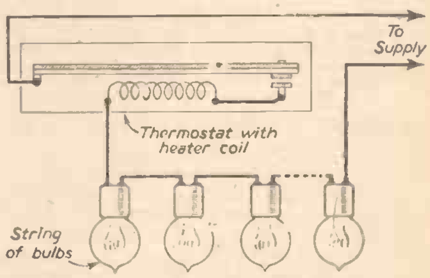


Fig. 5.—Flasher for lights.

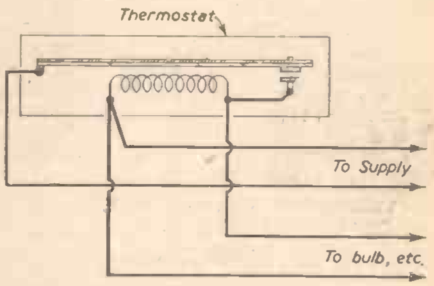


Fig. 6.—Parallel operation of heater.

Contacts taken from disused relays, or otherwise intended for continuous use, are most suitable. Failing these, brass contact screws are satisfactory for decorative "flashers" or other units not intended for continuous use over long periods. Suitable contacts may also be purchased or taken from ex-service equipment of many kinds.

When a separate heating element is required, it can best take the form shown in Fig. 3. The insulation should be thin, heat resistant and reliable, expecially if a fairly large potential will exist between strip and winding, due to the method of use. For the winding itself, thin iron wire or any resistance wire is suitable. The gauge is such that the wire does not burn out even when the current passes for a long period. If the operating current is not known, a few trials with different wires can be made. Copper wire is best avoided as it fuses so readily.

Control Circuits

The simplest application, with a separate heater, is shown in Fig. 4. Here both heater and thermostat may be assumed to be enclosed in tubes and immersed in a water tank. The thermostat element should not be very near the heating element, or directly heated by it, or rapid making and breaking of the circuit will arise, without regard for the actual temperature of the water itself. The thermostat should be so placed that its operation depends upon the temperature of the water itself, which will thus need to reach the required temperature throughout before the heater circuit is interrupted.

One or two points arise when using mains-voltage units, such as fitting a thermostatically controlled "topping up" heater in a domestic water boiler. With mains-operated devices, switches should be in the live or "Line" conductor, but this is not applicable to thermostats, where the method of installation may result in the contacts themselves being in the "Neutral" conductor. However, where "Line" and "Neutral" terminals are indicated on the appliance, these should be connected appropriately to the "Line" and "Neutral" poles of the house supply. Earthing is also usually required, to render the equipment safe in the event of a breakdown. The earth wire of the cable should be soundly connected to the mains earthing point of the socket-outlet or power point used. In addition, provision should exist for the disconnection of the appliance. This is easily arranged by operating it from a plug inserted in a socket-outlet fitted at a convenient point. The leads from the thermostat or heater should not be connected permanently into the house wiring.

A typical "Flasher" circuit is shown in Fig. 5. Here, the contacts are closed when the bi-metal strip is cold, and the heating element is of the rapid-acting style, as explained. Upon connecting to the supply the bulbs light until heating of the strip interrupts the circuit. The bulbs are then extinguished and the strip cools, thereby restoring the circuit so that the sequence is repeated. Various thermal flashers of this type may be purchased ready-made, both for mains voltages and low voltage operation. Some may be adjusted for cycles of operation as brief as one second, and are very compact, suitable for addition to any kind of indicator or signal lamp or similar device or circuit.

In Fig. 5 heater and bulbs are connected in series, so that the heater is operated by the *current* flowing. With very low voltages parallel connection may be necessary, so that the heater is *voltage* operated at the potential used. This type of circuit is shown in Fig. 6, and most thermostats may be used in either way, according to operating conditions.

An Electric Bedwarmer

A Useful Device for the Winter

By B. G. PALMER

THE following description is of an appliance which is both efficient and safe, although perhaps a little cumbersome, but if the bed is to be completely warmed, then it must be large enough for the purpose. The apparatus has the advantage that it will stand in any odd corner out of sight. It can be made for the cost of five batten-type lampholders, five electric lamp bulbs, two 1 lb. coils of 12 s.w.g. galvanised iron wire, a few yards of flat twin lighting cable, about 100 staples and 20ft. of 1½in. ⅝in. timber. This timber should be selected for its freedom from resinous knots, as these knots would discharge a sticky substance under the action of heat and be most objectionable.

Construction

The appliance will appear as shown in Fig. 1. In actual fact, this is the outer framework only; for clarity the interior is illustrated separately in Fig. 3. From the 1½in. × ⅝in. timber cut 4 battens 3ft. 7in. long and smooth and round off the corners, which will be on the outside when the job is finished. On the inside mark off the whole length of the battens into 2in. divisions, commencing ½in. from one end. This will leave ½in. to spare at each end for a staple which will be driven in at this point. Take special note of Fig. 2, as the markings will have to be staggered to allow for the spiral shape of the wire frame. Next take the galvanised wire and wind it neatly round a saucepan or other similar object about 6in. or 7in. in diameter. When removed, the coil will spring out to about 9in. diameter, which will be the size of the heater frame.

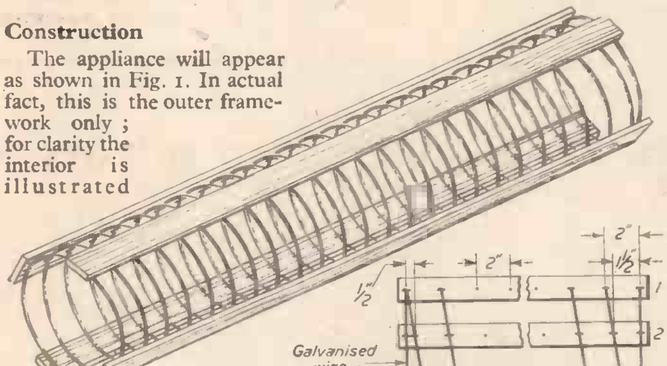


Fig. 1 (Above).—The outer spiral wire framework.

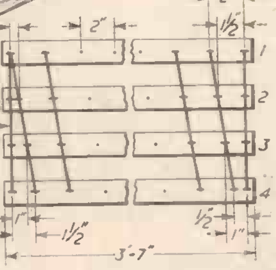


Fig. 2 (Right).—The spacing of the coils.

Now commence fixing the spiral to one batten. Do not start with the end of the wire, but fix it so that there will be about 2 turns to spare at the outer end. Do not drive the staples home. When the end of the spiral is reached, cut off the wire back to the batten and firmly fix the wire to the batten with one or two staples and commence the second coil of wire where the first ended. If enough wire can be purchased in one length one continuous spiral can be made. Now take the opposite batten and fix on the opposite side of the spiral, leaving the wire loose in the staples. Make sure it is the right batten. Nos. 1 and 3 are opposites (Fig. 2). The frame should now begin to take shape. Fix the other two battens loosely. It may now be required to work some of the wire round in order to obtain a parallel frame, but if all the staples are loose this should not be difficult. When the spiral is the same diameter both ends and the battens equally spaced round the circumference, hammer the staples home. A small hammer will easily go between the turns of wire. The two end turns must be at right angles with the axis in order to finish off the spiral. It will be found that the completed frame is quite rigid.

Next cut and fix the lampholder battens; the positions of these are illustrated in Fig. 3. Screw on the lampholder bases, before fixing the battens in the frame with two screws at each end, well countersunk on the outside. The spacing of these battens is unequal, but this is in order to get the lamp filaments equally spaced along the heater. The filaments would be approximately in the centre of the frame if the lamps were all fixed on one batten along the whole length of the inside of the frame, but the method used was chosen because it adds strength to the construction.

Wiring

Wiring is carried out with the flat twin cable and reference to Fig. 3 should make clear how this is done. However, for those who are not familiar with parallel circuits, a diagram is given in Fig. 4. The lamp numbers correspond with the lamp numbers in Fig. 3. A light wood batten is fixed between the wiring and the frame, as shown at A, B and C, Fig. 3, in order to keep the cable from touching the wire frame, a few turns of which are shown. A piece of rubber tubing, fixed where the mains lead enters the appliance, will prevent the lead being bent too sharply at this point.

Dimensions are not given, as these will depend on the size of the batten lampholders and the diameter the wire coil springs out to. This diameter should not be less than 8½in. to 9in., otherwise the bed linen will come too close to the lamps.

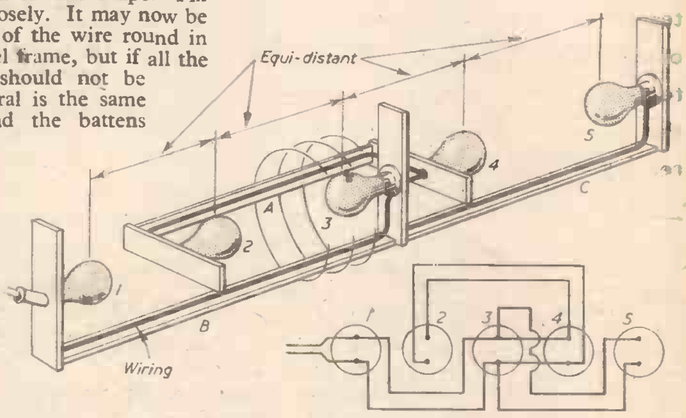


Fig. 3.—The position of the bulbs and, Fig. 4.—The wiring circuit.

The Appliance in Use

From the curves in Fig. 5 information regarding its performance can be obtained. The hottest spot was found to be directly over the centre lamp with the thermometer bulb in contact with the linen. The thermometer was used in this position for the tests.

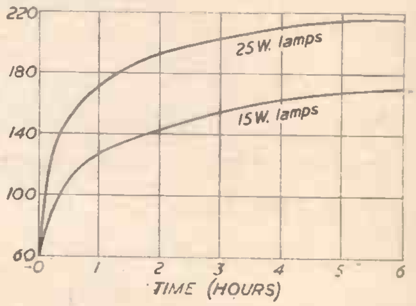
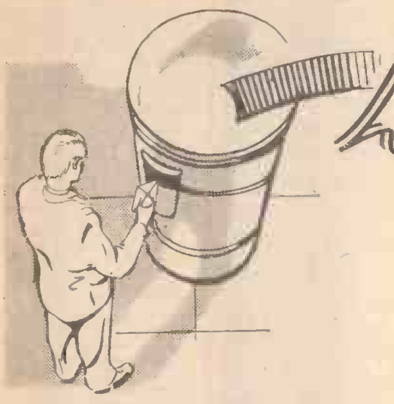
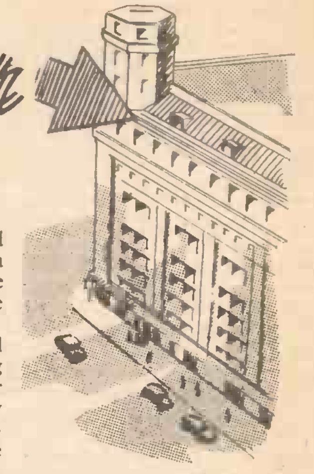


Fig. 5.—The performance of the appliance.

With 25-watt lamps the curve flattened out after four hours at about boiling point. Fifteen-watt lamps would be suitable for ordinary warming and airing purposes. Do not use lamps larger than 25 watts. As an experiment all lamps were removed and one 40-watt lamp put in the centre lampholder; the appliance was switched off when the temperature was 225 deg. F., and still slowly rising.



Letters to the Editor



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

Flying Saucers

SIR,—May I comment on your Editorial in the August issue of PRACTICAL MECHANICS? Your comment on the Labrador sighting was fair, but Lord Dowding as Air Chief Marshal and Air Chief Officer in charge of Fighter Command would be in a position to know facts that were unknown to the general public. Neither the Air Ministry nor the Americans have released their secret information, so what he said may be true.

Regarding your statement about the absence of photographs other than Adamski's, you have not produced or commented on the saucer photograph taken near the slopes of Coniston Old Man. This has been proved by photographic experts to be identical to Adamski's saucers. There are numerous other photographs in *Flying Saucers on the Moon*, by Mr. H. J. Wilkins, also in a recently released film. The fact that things are going on behind locked doors does not alter certain facts. Namely: (1) Canadian experts have stated that the "Avro Saucer" has nothing to do with "Flying Saucers"; (2) American experts would hardly allow one of their pilots to lose his life chasing one of their own secret weapons; (3) No country on earth would waste millions of pounds on jets that were obsolete—saucers have been recorded doing 25,000 m.p.h. Experts have stated that these saucers are at least 200 years ahead of anything existing on earth. May I suggest that readers should read the book *Flying Saucers From Outer Space*, by Major Donald Keyhoe, who was Chief of Information for the Aeronautics Branch, Department of Commerce, who has the backing of the American Air Force Intelligence. Evidence in this book shows that there are numerous photographs not yet released by the Air Force. No evidence has been produced or exists to disprove either "Flying Saucers" or Adamski's story.—R. ANSTEE (Bristol, 2).

SIR,—I have been reading PRACTICAL MECHANICS regularly and have found the letters of other readers about "Flying Saucers" of particular interest. The following information may prove of interest to some readers. It is taken from *Voyages in Cloudland*, by T. C. Hepworth, a paper appearing in *Science For All*, published by Cassell and Co. in 1890.

"The first suggested flying machine worthy of note was the idea of a Jesuit, Francis Lana, in 1670. This machine, which was to be built on large spheres, apparently was not made. Note: 1619 seems to be the earliest recorded appearance of flying objects. In 1782 the Montgolfier brothers of Annoray built the first recorded successful machine, which measured 40ft. in diameter and weighed 400 lbs. This machine was a balloon-like affair of linen and paper, and was made to ascend by hot air, which was supplied from a furnace of burning straw placed beneath a wide orifice in the bottom of the balloon. Mr. Hepworth states he witnessed two ascents of a large machine of this type in London in 1864. The capacity of the balloon was half a million cubic feet.

In the same year (1782) Cavendish, Cavallo and Dr. Black were experimenting with hydrogen-filled balloons. From this time onwards ballooning was extensively carried on in England, France and America." Whether "Flying Saucers" are of our world or another, I don't think from such pictures as I have seen of them that it needs much imagination to convert the outline of a balloon to that of a "Flying Saucer."—F. COSGRAVE (Dublin).

Making Holes in Rubber Corks

SIR,—I was interested in your advice to a correspondent on how to bore holes in rubber rollers. Some years ago, whilst a research student at Oxford, I was confronted with the same problem, as must very many chemists have been. Curiously enough, all the advice one finds in the literature on this topic appears to be about of the same order of usefulness as the old chestnut about cutting glass under water with scissors. Anyway, we were unable to make any of them work, even with the resources of a very well-equipped machine shop at hand.

In the end I solved the problem in the following way: The rubber bung is simply frozen in a freezing mixture of solid CO_2 (Drikold, Cardice) and acetone. When thoroughly frozen, it can be drilled with an ordinary twist drill using a power drill. The speed can be such that the swarf comes off in a continuous strip (which makes an intriguing object when thawed out!). When the rubber begins to thaw, the drill sticks, but no harm is done if one is proceeding cautiously, and one merely refreezes the cork and goes on. Afterwards, the rubber thaws out and is unaffected.

In this way we were able to drill holes in the largest sizes of bung (3½in. diameter, 2½in. thick), using drills up to ⅝in. The main thing was that these holes were *perfectly smooth* inside—this was the only method we found which gave this smoothness.

Of course, the method depends on the low thermal conductivity of frozen rubber. With a small size drill one can go right through a large cork in one go without refreezing! Incidentally, everyone said the method would not work, however, *experientia docet*! Which is *why* one experiments after all. If one were to use liquid air, I believe it would be possible to work a frozen rubber block on a lathe. CO_2 is not cold enough, and it heats up too quickly.—D. P. H. TUDOR WILLIAMS (Teddington).

Soft Soldering, Silver Soldering and Brazing

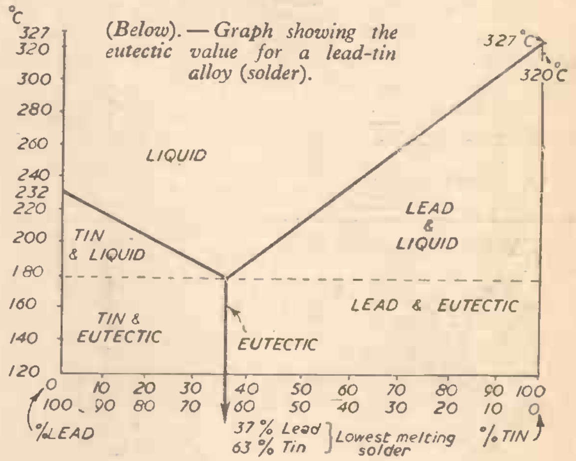
SIR,—I would like to correct a statement made by E. W. Twining in his excellent article "Soft Soldering, Silver Soldering and Brazing," in the August issue.

The statement was that lead has a fusing point of 620 deg. F. and tin 446 deg. F., so that solder will melt at a temperature between these two.

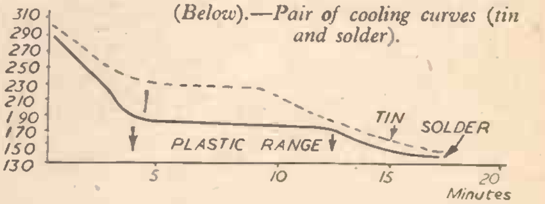
In actual fact, the fusing point of solder is well below these temperatures, as will be seen from the graph, which shows the eutectic value for a lead-tin alloy (solder).

Another important fact is that by mixing these two metals you greatly lengthen the "plastic range" of the alloy. This is of great help to plumbers when wiping a joint. I also enclose a graph showing a comparison between the plastic ranges of tin and solder.—M. H. FERRY (Lancs).

(Below).—Graph showing the eutectic value for a lead-tin alloy (solder).



(Below).—Pair of cooling curves (tin and solder).



Ancient Egyptians' Tools

SIR,—The paragraph in "Fair Comment" in August PRACTICAL MECHANICS, dealing with our lack of knowledge of the Ancient Egyptians' tools and their use of them, was of great interest to me.

Whilst in the Middle East during the war, being of an inquiring frame of mind, I purposely sought evidence of their skill and knowledge of tools on the monuments, etc.

One difficulty for the layman to overcome is the vast periods of time represented in Egyptian history—some equivalent to the period between Alfred the Great and ourselves. How could Canute visualise the Boulder Dam or Nile Barrage?

There are many inexplicable contrasts evident. I enclose a postcard illustrating two. (*Unfortunately we cannot reproduce this.*—ED.) At the extreme left of the upper panel can be seen part of a familiar motif in this theme of design. Consisting of two uprights—presumably of wood, bound together with a wooden lever passed through the binding and weighted at the end by a hanging weight. This was a vice for sawing large planks. A perfect use of the lever and fulcrum in practice—but where is the knowledge that would have produced the screw and later the vice that we know ?

Again, on the right is the still familiar bow drill—exactly as one might see it to-day in Cairo—yet where was the lathe in those far-off days ? I cannot recall seeing any example illustrated in these wall decorations.

The skills that could sculpt colossi in granite, still with a glasslike finish, yet hewed their obelisks in the quarry itself with all the attendant risks of fracture and damage in the hundreds of miles travel to their destinations, are difficult for us to understand.

The lack of knowledge of the screw did not prevent the Egyptians using a clever double wedge to seal their pyramids—an inclined plane lock on an inclined plane !

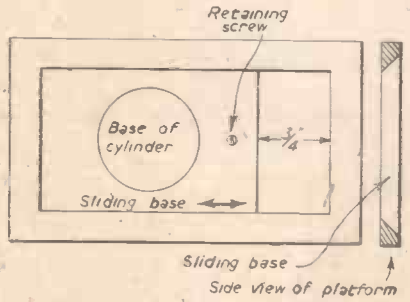
I think that perhaps the reason for these seeming contradictions lies in a fact pointed out by H. G. Wells in his *History of the World*, in words similar to these : "There was in Egypt a difference between the artist and artisan. The philosophers and designers, mathematicians and scientists did not work . . . the worker in stone, wood and metal did not meet the knowledge that was available ; so the impulse that Egypt had, faltered, stagnated and died out. . . ." The skill was there, the knowledge was there, but they did not meet.

I think a series of articles on the history of some of our skills, knowledge, crafts and tools would prove of great interest.—J. WARD (E.12).

Parallax Corrector

SIR,—Mr. Bensusan's interesting article in this month's PRACTICAL MECHANICS on a parallax corrector induced me to make one for my son, who is the possessor of a Paxette camera. This camera, however, is provided with two viewfinders, the additional one being required for a second lens. It is fixed to the side of the camera and somewhat lower than the other, which is in the centre at the top. If the corrector was to be of any value for the two viewfinders I had to provide something additional to meet this need.

This I did by mounting the cylinder on a sliding base with bevelled edges, working on a platform into which the tripod is secured. This is similar to the sliding arrangement on most sewing machines to allow access to the shuttle. See sketch. The side viewfinder is ¾in. from the centre of the lens and accordingly the base has a lateral movement of ¾in. It can be secured by a retaining screw. To enable the camera to be adjusted to move

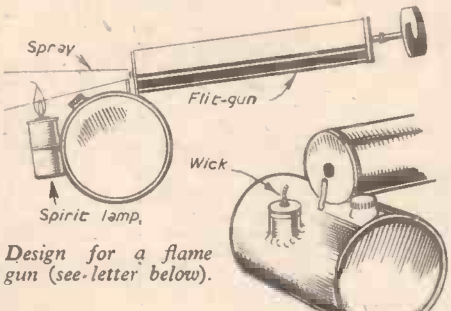


Mr. E. Gilfillan's modification.

parallel to the front of the platform I have constructed its base at the top of the inner tube to move with the camera. It is kept in position by a retaining screw.

I, of course, had, as far as the second viewfinder was concerned, to arrange for the vertical raising of the camera to a height corresponding to the parallel distance between the lens and the second viewfinder. This I did by making a mark (actually 1⅛in. from the bottom) at the required altitude on the outer cylinder, at which point rigidity can be secured by tightening the winged nut.

Mr Bensusan suggests a diameter of 2in. for the outer cylinder. I, however, found 1in. to be more suitable.—E. GILFILLAN (Belfast).



Design for a flame gun (see letter below).

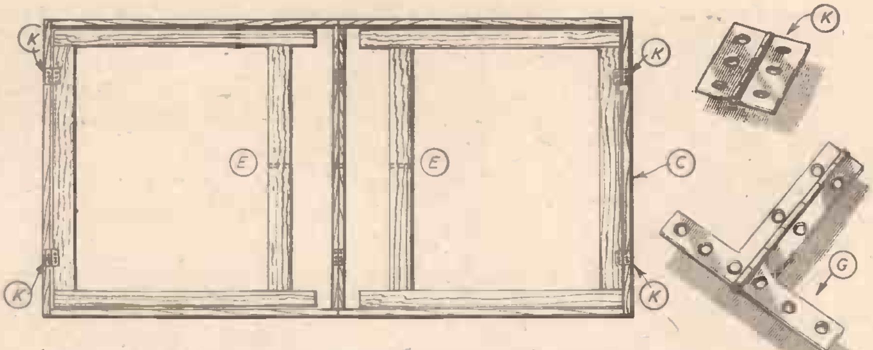
A Flame Gun

SIR, Regarding a query from Mr. S. Scott on page 412 of your June, 1954, issue, about constructing a flame gun for dealing with weeds, here is one that can be constructed in less than an hour.

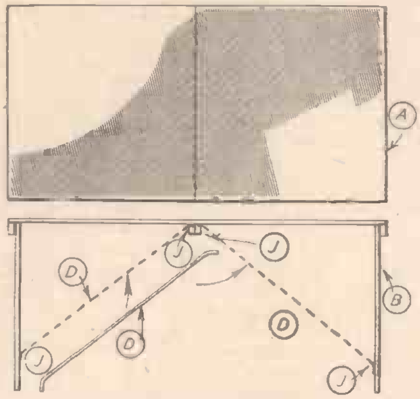
Any insecticide spray—such as the old Flit-spray—is used as a sprayer. A small spirit lamp is either strapped or soldered to the tank of the Flit-spray so that its wick will come up to an inch or so ahead of the spray hole and slightly (½in.) below its level. The tank is three-quarters filled with kerosene (*not* petrol) and the spirit lamp is lighted. When the spray-gun is worked a 3ft. atomised column of burning fuel issues and is found most effective for killing weeds. The flame is smokeless and no oil residue is left on the target. For permanent use, the lamp could be formed from the tank itself, as shown in the sketches above.—MAJOR H. S. APTE (Poona, 4).

A Table Tennis Table

SIR,—*Re* the request of Mr. Louden ("Information Sought," August issue) for particulars of a table tennis table, the following may be useful.



(Above and below).—Sketches showing construction of table tennis table.



Two frames are constructed, 4ft. by 4ft., made of planed batten 2in. by ⅞in. The joints at the corners are half cut and screwed as shown at (C). The two sections of the top are covered in suitable hardboard and fastened with panel pins, see (A). These sections could be hinged in the centre with either "butt" hinges (K), say 2½in., or double H.L. hinges as pattern (G).

For the supports, two frames are made from 2in. by ⅞in. batten, with a cross-bar as top sketch ; these should lay inside the table-top frame and be hinged as shown at (H) and suitable height for legs. In centre of cross-bar (E) drill a hole and another (J) in frame of table to take two iron bars 7/16in. or ½in. to keep table rigid, bar to be bent as at (D). Insert at points marked (J) and (E). The table-top should be painted matt green and lines set off in white as required to represent a court.

The remainder could be either painted or stained as preferred.

The whole is designed to be folded for storage purposes.—R. B. GARNISH (Ilfracombe).

Drying Cupboard

SIR,—*Re* Mr. Hart, of Derbyshire (July "Information Sought"), who was planning to build a drying cupboard, there is a special four-tray electric oven designed by Messrs. May and Baker for drying laboratory apparatus. This was mentioned in No. 2 of "M. and B Laboratory Bulletin," on page 18, and I wrote for a drawing from Dr. B. J. Heywood, Chemical Research Division C, May and Baker, Ltd., Dagenham, Essex.

The blueprint is No. 6334 and should be easily converted to a drying cupboard in a house if only the smaller elements are used. These elements are supplied by Mr. McLelland of Mc. and B. Control, Ltd., Heaton Works, Potter Street, Essex.

I suggest that Mr. Hart writes for a drawing, mentioning the Bulletin, and he will probably have no difficulty in converting it to household use.—JOHN WRIGLEY (London, N.10).

READERS' SALES AND WANTS

The pre-paid charge for small advertisements is 6d. per word, with box number 1/6 extra (minimum order 6/-). Advertisements, together with remittance, should be sent to the Advertisement Director, PRACTICAL MECHANICS, Tower House, Southampton Street, London, W.C.2, for insertion in the next available issue.

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STARLON PLASTIC ENAMEL PAINT in tubes, 1/- each, covering approximately 8 sq. ft., or complete cycle frame; suitable all paintable surfaces. Colours: rich brown, bright red, pink, bright blue, maroon, turquoise, cream, yellow, black, deep green, bright green, mid-grey, white and clear; home trade and export. Obtainable from Handicraft, Hobbies and other shops, or send 1/3 for sample tube and colour card, post free, to sole manufacturers: Starline, Southend, Essex.

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COMPRESSORS for sale, $2\frac{1}{4}$ CFM, 180lbs. sq. in., on metal base, with driving wheel and receiver, price £3; $\frac{1}{4}$ h.p. Heavy Duty Motors, price £3; carriage forward. Wheelhouse, 1, The Grove, Isleworth. (Phone: Hounslow 7558.)

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SWISS MUSICAL MOVEMENTS for use in cigarette boxes, soft toys, etc.; direct from the importer; s.a.e. for price and tune list. Mulco Manufacturing & Trading Co. Ltd., 72, Greyhound Hill, Hendon, N.W.4. Trade supplied.

COWL GILL MOTORS. The Motor with a hundred uses; works on 24 or 12 volt D.C.; contains magnetic brake and 4-stage epicyclic reduction-gear 625/1 reduction and reversing switch gear (removable if required); 26/9, c.p. Below:—

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NEW TIMBER. Imported Softwood, Quarterings, Boards, Battens, Weatherboards, Greenhouse Bar, etc.; cheapest in trade; all sizes stocked. Cannon's (Forest Gate), Dept. P.M., 383, 395, Romford Road, London, E.7.

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AMAZING BATTERY OFFER! Very large purchase of all-dry H.T.-L.T. Batteries enables us to make this special offer: 2 Batteries, 72v. H.T., plus $1\frac{1}{2}$v. L.T., for 5/-, post and packing 1/8. All of recent manufacture and are tested by us for full voltage before despatch. Note—These Batteries are layer built and will last for several years if properly stored. Apply now. Walton's Wireless Stores, 48, Stafford Street, Wolverhampton.

"NEWFORM" BEAM COMPASS SETS, including 6in. and 12in. duralumin beams with fine adjustment, 12in. duralumin extension, pencil lead collet, and stainless steel pen, complete with case for 27/6, post free. ALLSOPP, 33, Chandos Road, Luton, Beds.

LENSES BY THE THOUSANDS! Send $2\frac{1}{2}$d. for lists of lenses, prisms, etc. Achromatic from 2/6. Special Offer:—Kodak Bromide Paper, soft grade, in rolls 10ft. x $9\frac{1}{2}$in., add 6d. per roll postage. Fenner Vee belts, 46in. long x $\frac{1}{2}$in. section, 2/6 each. Photo Electric Cells, type GS18 (new) £1 each. Burgess Lane & Co., Sunleigh Works, Sunleigh Rd., Wembley. WEM 2378.

CANOE/DINGHY DESIGNS, Kits, New Craft, Paddles and Accessories. Canoe Services, West Coker, Yeovil, Somerset.

AIR RECEIVERS, 24in. x 6in. x 200lbs., 25/-; Safety Valves, 8/6; Moisture Filters, 7/6. C. G. Nelson, 118, Anchorway Road, Coventry.

GLORIOUS, Health-giving Sunshine. Bathe in the wonderfully luxurious Ultra-Violet Infra-Red rays of the Scientific Supertonic Sunlamp and get a marvellous tan. A £7 Sunlamp for only 60/-; s.a.e. brochure. Scientific Products, Shipley, Yorks.

46 CONSEC. PRAC. MECHANICS, August, '50-May, '54. What offers? Shute, 35, Honiton Cresc., Birmingham, 31.

WINDCHARGER BUILDING UNITS and Plants. S.A.E. for booklet. Jamielite, Midtaphouse, Liskeard, Cornwall.

EX-R.A.F. Compressors; also Vacuum Pumps; secondhand; 12/6 each, plus 2/- postage. 38, Histon Road, Cambridge.

ARE YOU STUCK ON ELECTRICAL OR RADIO CONTROL? Large stock of Transformers, Rectifiers, Lamps, Rotary Converters, Motors, Technical Books. S.A.E. for bargain lists. Lawrence, 134, Cranley Gardens, N.10. (CLI. 6641.)

MYFORD "M" $3\frac{1}{2}$in. s/c centre Lathe on stand, with c'shaft and SP motor; 8 collets; new lead screw and nut; good condition. Offers. Box No. 120.

CENTEC No. 2 HORIZONTAL MILL. 1in. Arbor with vertical lead modified for high-speed milling; SP motor and c'shaft. Offers. Box No. 121.

PHOTOGRAPHY

HAVE YOUR NEGATIVES ENLARGED BY EXPERTS. Postcards, 6d.; $6\frac{1}{2}$in. x $4\frac{3}{4}$, 10d.; $6\frac{1}{2}$in. x $8\frac{1}{2}$in., 1/3; 10in. x 8in., 1/8; 10in. x 12in., 2/6; money back guarantee. Raeburn Photo Service (P.M.), 113, Manchester Road, Burnley, Lancs.

ENLARGER and Camera Bellows supplied; also fitted. Beers, St. Cuthbert's Road, Derby.

MODEL DEALERS

HOBBIES LTD. have over 50 years' experience of catering for the needs of modellers, handymen and home craftsmen. Branches at 78a, New Oxford Street, London, and in Birmingham, Glasgow, Manchester, Leeds, Sheffield, Hull, Southampton and Bristol. Head Office, Dereham, Norfolk.

ELECTRICAL

BARGAINS FOR ELECTRICIANS.—Brand new Cables in 25-100yd. coils: T.R.S. twin 1/.044, 42/-; 3/.029, 55/6; 3/.029 and Earth, 63/3; 7/.029 and Earth, 112/6; P.V.C. twin 1/.044, 35/-; 3/.029, 52/-; Transparent Flex, 14/36, twin, 15/9; all per 100yds.; Lampholders, 6/6; Switches, 1-way, 16/3; 2-way, 19/- doz. Requests lists. Jaylow Supplies Ltd., 93, Fairholt Road, London, N.16.

BRAND NEW Brooks $\frac{3}{4}$ h.p. Motors, ball-bearing, 230v., A.C., single phase, 50 cycles, 2,800 r.p.m.; ideal for driving woodworking machines, grinders, etc.; latest type in maker's sealed box; £8/15/-; also Capacitor Type, £9/15/-; carriage paid. P. Blood & Co., Wolseley Bridge, near Stafford.

THERE'S SUBTLE MAGIC in good lighting. It gives your home a new glow of cheerfulness . . . new loveliness. It adds sparkle, beauty and charm to your furnishings. It helps make your home truly a happier, more pleasant place in which to live. Good lighting and lighting design add immeasurably to family comfort—guard precious eyesight. Think of Good Lighting and you naturally think of Dynalite fluorescent and the wonderful new 'de luxe' tubes. A card to 38, Stevedale Road, Welling, Kent will bring you full illustrated details of the 'instant starting' 1955 range of Dynalite equipment for home lighting. Good Lighting means Good Living!

WATCHMAKERS

WATCH REPAIRERS, Hobbyists, etc. Send s.a.e. for list of watches, movements, etc., priced from 9d. each. Loader Bros., Dept. P.M., 36, Milestone Rd., Carterton, Oxford.

LET US SOLVE your repair problems; none too small, none too difficult. If your Watch or Clock can be repaired, we can repair it. Hereford Watch Co., 42, Broad Street, Hereford.

INVENTIONS

INVENTORS.—Send s.a.e. for particulars of our Service for profitably developing and marketing your Invention. Kelsey & Partners, Woodlands, Stroud, Glos.

WANTED

WANTED, surplus stocks of Twist Drills, Milling Cutters, Hacksaw Blades, Reamers, Chasers and all kinds of Hand and Cutting Tools. Send details to B. Draper & Son, Kingston Hall Road, Kingston-on-Thames. Cash on delivery.

WANTED LATHE, ML7 or similar; state condition and price. Davis, 9, Hugh Villas, Birmingham, 10.

DUMPEY, or similar level, or theodolite; good order; reasonable price. Full particulars. Box No. 119.

CAN ANY READER SUPPLY following back numbers of PRACTICAL MECHANICS — October, November, December (1948); June (1949); May (1950); November (1951)? Reply, stating price, etc., to J. W. Easson, Tayport Road, Newport, Fife.

HOBBIES

SHIPS IN BOTTLES.—The constructional kit that tells you how to make them; build for pleasure or for profits; kits 6/- ea. from Hobbies Ltd., and model shops, Cooper-Craft, Ltd., The Bridewell, Norwich.

HANDICRAFTS

CRAFTWORKERS (either sex)! Soft toy assembling; the ideal profitable pastime; details s.a.e. Cuddlycraft Supplies, East Road, London, N.1.

MUSICAL MECHANISMS. Swiss made, for fitting in cigarette boxes, etc., 21/- each. Send s.a.e. for complete list of handicraft materials. Metwood Accessories, 65, Church Street, Wolverton, Bucks.

MAKE YOUR OWN HANDWEAVING LOOM. Plan for 9in. to 20in. looms; complete instructions, price 2/9, post free. Dane John Press Ltd., 1, Dane John Oast, Canterbury.

MAKE YOUR OWN MUSICAL BOX. Swiss-made Movements, 22/6; s.a.e. list of tunes: largest stockist in the country. Albert's Music Shop, 45, Heath Road, Twickenham.

WOODWORKING

PLYWOOD, 24 x 12 x 3/16, 9/6 doz.; 12 x 10 x 3/16, 5/- doz.; 8 x 6 x 3/16, 3/2 doz.; carr. pd. Parmount, Burnley Rd., Rawtenstall.

WOOD LATHES, Attachments, Motors and Control Gear, Circular Saw Blades, Spindles or Benches, Turning Tools, etc.; interested? Then send 6d. for illustrated literature, price list and H.P. terms. D. Arundel & Co., Mills Drive, Farndon Road, Newark, Notts.

XLL-ALL 6-in. Bench Planer; special offer, £8/10/-; guaranteed. Speedwell Works, Lightwater, Surrey.

EDUCATIONAL

I.P.R.E. TECHNICAL PUBLICATIONS. 5,500 Alignment Peaks for superheterodynes, 5/9; Data for constructing TV aerial strength meter, 7/6; sample copy "The Practical Radio Engineer," quarterly publication of the Institute, 2/-; membership and examination data, 1/-. Syllabus of 7 postal courses free and post free. Sec., I.P.R.E., 20, Fairfield Road, London, N.8.

HANDICRAFT TEACHERS wanted urgently; craftsmen, wood, or metal, prepared by correspondence coaching; success certain. Write for particulars: Director, Marriott's Charnwood, Leslie, Fife, or Regional Secretary, Bushby, Leicestershire.

BOOKS

NEW AND USED Correspondence Courses, Educational Books, bought, sold. Catalogue. Courses. 28, Dean Road, London, N.W.2.

RADIO

CAN YOU SOLDER? That's all you need to make a really good radio from guaranteed Osmor Components. Send 5d. (stamps) to-day for free circuits and lists. Dept. P.M. Osmor Radio Products Ltd., 418, Brighton Road, South Croydon, Surrey. (Croydon 5148/9.)

10/6 CRYSTAL RADIO KIT. Build with a screwdriver and pliers. Send P.O. 10/6 plus 6d. postage. Wiring diagrams and illustrated parts list for 6 experimental sets. 1/- post free. Blanchard's, 13, Gainford Gardens Manchester, 10.

WORK WANTED

IS THERE A METAL PART YOU WANT MAKING, a Spindle Turned, a Thread Cut? We do Turnings, Milling, Drilling, Press Work, etc.; 1 off or quantity; send drawing with stamped, addressed envelope for free estimate to T. A. Winter, Electrical & Mechanical Engineers, 66, Stonhouse Street, London, S.W.4.

MISCELLANEOUS

BOOKLETS, "How to use ex-Gov. Lenses and Prisms." Nos. 1 and 2, price 2/6 ea.; ex-Gov. Optical lists free for s.a.e. H. English, Rayleigh Road, Hutton, Brentwood, Essex.

BUILD YOUR OWN REFRIGERATOR, all components available at reasonable prices. Frigidaire flowing cold units, £5; small units, Kelvinator, etc., £4; $\frac{1}{4}$ h.p. heavy duty Motors, £3; Chrome Cabinet fittings, new, £1; money back guarantee; s.a.e. for list and schematic diagram. Wheelhouse, 1, The Grove, Isleworth, Middx. (Phone: Hounslow 7558.)

"FORTUNES IN FORMULAS." 900 pages of American formulæ, American technical books and magazines covering every interest; stamp for lists. Herga Ltd. (Dept. PI), Hastings.

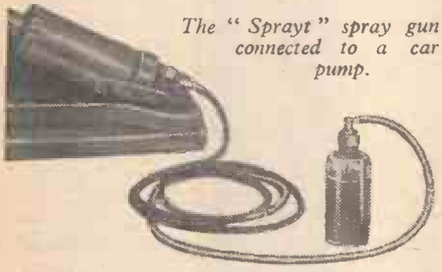
ELECTRIC HAWAIIAN GUITAR. Full constructional data, 7/6. C. Cragg, 48, High Street, Oakham, Rutland.

WE GUARANTEE that you, too, can make Christmas Crackers. All colours, crêpe, tissue, metallic and fancy papers. Snaps (bangers), picture scraps, mottoes and 40 types of novelty fillings, photographically illustrated. All listed and priced in our 1954 issue now available. Free instructions and easy to follow plan for beginners sent with every list. Sample Packs are also available for beginners, and if you are not delighted double your money back by return. Send 6d. in stamps for lists and full details to M.P. Plastics Ltd., 67, Barking Road, London, E.6.

Trade Notes

The Sprayt Spraying Outfit

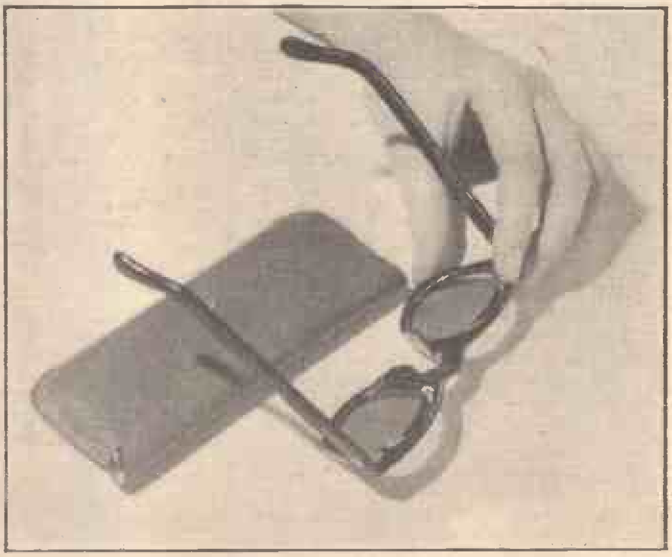
A RANGE of small, inexpensive spraying outfits is being marketed by The Munster Developments Co. (Fulham), Ltd., 226, Munster Road, London, S.W.6. They are designed to suit the needs of the car or motor-cycle owner and the home handyman. The "Car kit" consists of the "Sprayt" spray gun, designed to work off a tyre pump, black high gloss finish, anti-rust primer surfacer, thinners stopper and polish; the price is 30s. The "Motor Cycle Kit" contains the same items in smaller sizes, and retails at £1. The "Handyman Kit," containing spray gun, black finish, primer and thinners, costs 14s. 6d. A "Chrome Preservation Kit," containing "water white" lacquer, special thinners, chrome cleaner and brush, costs 5s. 6d. Kits are supplied with black finish, but at a slightly extra cost most of the standard car colours may be supplied. The "Sprayt" finishes are special combination lacquers for use in the "Sprayt" spray guns and the chrome preservation lacquer is impervious to all weather conditions, being applied either by brush or spray. All the individual items may be purchased separately and if they are not available at one of the local accessory stores, readers should apply direct to the makers' address, above.



The "Sprayt" spray gun connected to a car pump.

3D-2D Polarising Spectacles

A USEFUL and ingenious pair of spectacles has been invented by Mr. Dennis Searle, 626, Brighton Road, Croydon, Surrey. They have the appearance of sunglasses, a function which they perform efficiently, and may in addition be used as 3D viewing spectacles or for viewing 3D films in 2D. Each lens, consisting of a polarising filter, cemented between two glasses, is rotatable, and it is by this means that the spectacles are adapted for their various purposes. In one position the spectacles are suitable for 3D viewing; by rotating one of the glasses through 90 deg. the same picture is seen by both eyes, thereby losing the 3D effect. Thus, if eyestrain is experienced due to a 3D film, the viewer can switch to 2D for relief, without missing any of the film. Rotating both the lenses through 45 deg. from the 3D position converts the glasses to ordinary polarising sunglasses, with the additional advantage that they may be adjusted, according to the position of the sun, for maximum glare elimination. For television viewing the lenses are set as for flat film viewing. The price of the spectacles is 40s.



Multi-purpose polarised spectacles.

Ever Ready Penlight

THIS is a new streamlined "pocket-model" torch, which is now being produced by The Ever Ready Co. (Great Britain), Ltd.

The Penlight is under 5in. in length, weighs 1¼ oz., complete with batteries, and is styled and finished like a fountain pen. It clips easily to the breast-pocket or fits comfortably into a handbag. Apart from more general use for which it is so handy, it could prove invaluable for medical, dental and veterinary purposes.

This flashlight is a smooth brass tube, either chrome plated or gilt lacquered with a high polish. The bulb housing is made of threaded metal on to which is spun a translucent plastic top cap, modern in design and ridged for finger-tip grip.

The switch is the sliding, positive action type incorporated into the clip. A Lens End Bulb fits snugly into the plastic top cap housing, voltage 2.2 and amperage 0.25; and the Penlight operates on two Ever Ready U.16 batteries in series, giving three volts. Retail price, including bulb and battery, is 5/-.

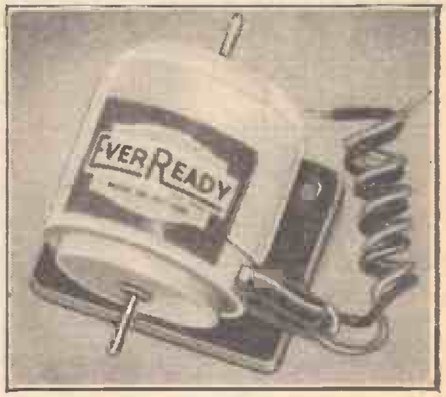
The Ever Ready penlight.

Ever Ready Miniature Motor

A NEW-STYLE, redesigned and improved miniature Electric Motor for models and toys is being marketed by The Ever Ready Co. (Gt. Britain), Ltd.

This efficient little motor is completely self-starting and has been designed to operate primarily from a six-volt Ever Ready dry battery, but will, in fact, run satisfactorily on any Ever Ready dry battery from three to six volts. The choice of battery depends on the load and on the desired length of battery life. B.H.P. of the motor at maximum efficiency is .001 at 6,000 r.p.m.

Bearings are bronze and self-lubricating. The retail price is 9/11.



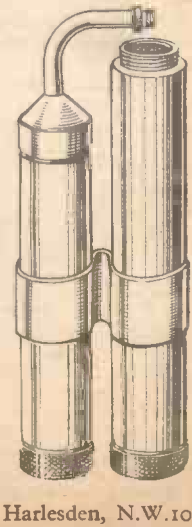
Every Ready miniature electric motor.

Drawing of the Royal Yacht

FROM Messrs. Bassett-Lowke, Ltd., 18-25, Kingswell Street, Northampton, comes the news that they have produced for sale an accurate drawing of the Royal Yacht *Britannia* for a waterline model to a scale 25ft. : 1in. In addition to the elevation and sectional details, plans are given of the decks and superstructure, ship's boats, etc. The overall length is 16⅜in. and the drawing, which is full size, costs 6s., postage 6d., from Bassett-Lowke, Ltd.

The Valtock Automatic Blowlamp

A NEW entirely automatic miniature blowlamp has come on to the market; it is being manufactured by Messrs. Valtock, Ltd., 5-6, Sherwood Street, Piccadilly Circus, London, W.1. It is compact and small, measuring 5½in. in height and weighing 7 oz., is made from solid brass tube, with a chrome finish, has no soldered joints and may be carried in the pocket with safety. Ideal for soft soldering work, it can be used in conjunction with a small hearth for silver soldering jobs. The lamp gives a small but very hot flame (2,000 deg. F. is the makers' figure) making it ideal for model-making or jewellery repairs; it can also be used for localised paint stripping, glass bending and drawings, etc.



The lamp is self-pressurising and no pumping is required, the fuel is methylated spirit and there are no working parts to go wrong. It is available by post from Messrs. John Bull and Sons, 246, High Street, Harlesden, N.W.10.

Your Queries Answered

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.

Battery Lighting for Enlarger

I WISH to build a photographic enlarger, but my house is lit by gas. Would it be possible for me to run the enlarger lighting system from a six- or 12-volt car battery ?—G. Yeoman (Leeds, 8).

IT would be quite practicable to use a battery for current supply and a small bulb inside a silvered reflector. Even ordinary cycle lamps are used for enlarging (electric, of course). These battery-fed lamps have the advantage of keeping cool, which high-wattage electric light bulbs do not.

Instead of giving exposures of say three seconds in the normal way, you have, with a small battery-fed lamp, to give two minutes. We speak figuratively, of course. You will also have the advantage of greater latitude in the timing. It is more difficult to lengthen or shorten by a definite fraction an exposure in seconds than it is in minutes.

Peat as a Boiler Fuel

I AM anxious to try using peat for boiler fuel and wonder if you could tell me anything at all about it, whether it has good heating qualities, is a slow burner, or whether it needs a good quantity of other fuel, such as coal or wood, to start it burning and to keep it alight ?

Do you know if it has any effect on chimney pots ? Could you give me the name and address of any firm who could supply me with about 14 lb. of peat for trial ? It seems to be unobtainable in southern England.—O. C. Wiltshire (Watford).

(1) PEAT or turf is a rapid-burning material and burns with a glow rather than with a large flame. It gives out plenty of heat, but produces a large amount of a voluminous ash, which renders it a "dirty," and an uneconomic, fuel for industrial use. The peat lights readily enough by the ordinary methods, using paper and wood to start it. A peat fire is recognised as being a hot one, provided the grate admits adequate air. There are, of course, different grades of peat, just as there are different grades of coal. A1 peats contain, in addition to woody and fibrous matters, small amounts of bituminous oils, tarry matters and lignite materials which aid the combustion of the fuel.

Chimney pots are never injured by chemical action alone. Cracking is due to sudden expansion of the pot or to some other thermal influence. Chemical action (as, for example, that of acid gases) would corrode rather than crack a chimney pot. Most pots are of a refractory nature and are well able to withstand such corrosive injuries. Hence, the replacement of coal or coke as a fuel by peat or turf would not result in the chimney pot cracking.

(2) Peat is a rather expensive commodity in England. Its price varies in different parts of the country according to its availability and the local demand which arises for it. An average price for domestic peat is about 10/- per 1,000 peat blocks.

Peat suppliers in southern England are:

The Eclipse Peat Co., Ltd., Ashcroft, Bridgwater, Somerset; Messrs. L. Garvin & Co., Ltd., Garvin House, Isleworth, Middlesex; Messrs. Ben Smith, Ltd., Brasted, Kent.

We are not aware of the minimum quantity which these firms will supply.

Improving "Frost Box" Efficiency

I HAVE a "frost box" consisting of porous tiles (like firebrick) in a light zinc frame and a lay-on lid. It is also zinc lined.

I have periodically soaked it in cold water (every five or six days in very hot weather) and have found it keeps fats firm but it does not keep the fats or uncooked meat (bacon) fresh. After a few days the contents of the box have a peculiar twang and become uneatable.

Can you tell me please how to remedy this trouble, or better still, could I rebuild the box so as to even improve its efficiency ?—L. G. Stone (Ashford).

THE only way in which you could increase the efficiency of your frost box would be to place it in a forced draught, such, for instance, as that which would be provided by placing one or two electric fans in its vicinity, or by standing it between two open doors. You will, of course, realise that the porous bricks must be kept well saturated with water in hot summer weather. This "watering" of the bricks should be done every day at least, not once every five or six days as you mention.

The greater the draught the greater the evaporation-rate of the moisture, and the greater this evaporation-rate the greater the degree of cooling.

Perishable foodstuffs are very liable actually to absorb impurities and smells, which influence their taste very strongly. Now, in your instance, we can only suggest that the odours come from the use of an impure water. Many tap waters are slightly impure, or contain traces of impurities which become entrapped in the pores of the absorbent material and accumulate therein. We suggest that you fill a clean bucket with water and that you stir into the bucket of water one teaspoonful of chloride of lime, afterwards reserving the water exclusively for the frost box. This treatment will neutralise any odour and prevent the slow development of odour within the box. If, as a result of this treatment, the foodstuffs acquire a metallic "disinfectant" taste, it is a sign that too much chloride of lime has been used in the water, and the amount should be reduced until the chloride taste and smell has vanished.

Provided that the firebrick material is adequately porous, it is doubtful whether you could improve the performance of the box in any way. Whatever you can do in the way of speeding up the draught to which the box is exposed will be beneficial because any such action will increase the temperature-drop of the box. But it is always necessary to remember that all these devices are only intended to give relatively small degrees of cooling. They are never in any sense substitutes for the orthodox domestic refrigerators.

Readers are asked to note that we have discontinued our electrical query service. Replies that appear in these pages from time to time are old ones and are published as being of general interest. Will readers requiring information on other subjects please be as brief as possible with their enquiries.

Making Flexible Moulds

WOULD you please give me the formula for making flexible moulds ?—E. Boyl (Dundee).

A SATISFACTORY material for making flexible moulds may be obtained by melting down ordinary cake glue and adding a small quantity of glycerine. On cooling, it then becomes rubbery instead of brittle. The precise quantity of glycerine must be determined by experiment, as it largely

(*Continued on page 44*)

depends upon the quality of the glue, which varies considerably.

A tougher mould is obtained if about 6oz. of brown sugar is added to each pound of glue and thoroughly dissolved. The mould faces must be lubricated with petroleum jelly so that water from the plaster is not absorbed. The mould material can, however, be made insoluble by adding a few crystals of di-chromate of potash, dissolved in a teaspoonful of hot water, to the glue and sugar mixture. Until you have acquired some experience in judging the required consistency of the liquid mix, it is best to omit the di-chromate. Without this ingredient, the mould can be melted down if too hard and made more flexible by adding a little water and/or glycerine.

Novel Lighting Effect

I HAVE a set of fairy lights and each bulb supports a glass tube in which there is a coloured liquid to within $\frac{1}{2}$in. of the top; when warm, coloured bubbles are actuated in the liquid. Could you please tell me the principle employed, the formula for the liquid and what prevents the glass from breaking?—W. Hollingshead (Aldershot).

WE have not had an opportunity to examine the lamps in question, but it would appear that the tube contains a liquid or a mixture of liquids, one of which has a fairly low boiling point. The pressure in the tube may be below atmospheric. Bubbles of vapour formed by heating of the liquid will then rise and be condensed to liquid again near the top of the tube. The tube will probably be designed so that its surface area is sufficient to dissipate heat from the surface of the tube at the same rate as it is generated, without much rise of temperature or pressure. Thus the lamp tube would not have to withstand much pressure, unless, possibly, it was placed in a very confined place and switched on for a very long period.

Repairing and Proofing Tents

COULD you advise me on a method of patching tents other than stitching, and a suitable mixture for reproofing? We hope to spray the reproofing solution. —K. Brown (St. Helens).

YOU can purchase from most sports outfitters pieces of fabric ready coated with self-adhesive material. These can be used satisfactorily for tent-patching purposes. But if, as we surmise, you want to keep down costs and, at the same time, to make a good job of the repairs, you should use part of an old tent for the patches or else obtain a quantity of new tent cloth, heavy, fine woven canvas or heavy sailcloth for the purpose. These pieces should be pre-waterproofed by immersing them for an hour in a solution of one part of aluminium naphthenate in six or seven parts of white spirit. Aluminium naphthenate is obtainable, price about 5s. per lb., from Messrs. Thomas Tyrer & Co. Ltd., Stratford, London, E.15, or from a firm of chemical and laboratory suppliers such as Messrs. Griffin & Tatlock, Ltd., Kemble Street, Kingsway, London, W.C.2.

After immersion in the aluminium naphthenate solution, the repair patches are hung up to dry, after which they should be applied to the tent material by stitching, NOT by adhesive. It is advisable to apply a little white paint to the fabric surfaces which are stitched together because this improves the waterproofing of the join as the paint dries and hardens and prevents the percolation of water through the thread holes made in the fabric.

After, but not before, stitching, the entire tent can be waterproofed with the above solution. This is best done by erecting the tent and by applying the solution by spray or brush to *both* sides of the canvas. Sufficient of the solution should be applied to penetrate the cloth. More than this is a mere waste.

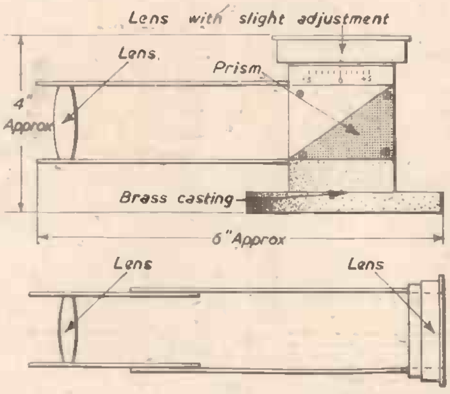
Making a Telescope

I HAVE a piece of ex-army equipment which appears to be part of a range-finder, or some similar instrument. I intend to make this into a telescope.

The lenses work quite well in line as far as magnification is concerned but the image is upside down.

How can I correct this? The original arrangement was as shown in the sketch. —W. T. J. Dorman (Wimbledon).

BY abandoning the prism you have inverted the image; it would have been better to have retained the prism and merely taken the telescope off the heavy casting. You would then have looked through the instrument by holding the long tube vertically instead of horizontally. You do not show what shape the lenses are; if the eye lens is a double convex then you can either add two or three more lenses to it, or you can substitute one double concave lens. The latter would give



The original arrangement of the ex-army range-finder.

much less magnification. Our advice is that you restore the instrument to its original form by using the prism.

Pig Sty Heating

I UNDERSTAND that there is a way of heating floors of pig sties by installing corrugated asbestos sheeting wrapped round with electric cabling, underneath a concrete floor.

Can you give me any information about this system and the approximate cost?—J. Moxon (Nr. Bradford).

THERE are two possible methods which might be employed. The floor could be heated by means of galvanised iron or resistance wire fed from the low voltage output of a step-down transformer from an A.C. supply. This is the method employed for soil heating, and details of heating elements and transformers are given in the Technical Report Ref. W/T7, "Simplified Electrically Heated Hotbeds," issued by The British Electrical and Allied Industries Research Association of 15, Savoy Street, London, W.C.2.

Another possible method would be to use mineral-insulated copper-sheathed Pyrotenax cables operated at high current density and fed direct from the mains. Details of such cables could be obtained from Messrs. Pyrotenax Ltd., of 7, Victoria Street, London, S.W.1.

More conventional methods of heating farrowing pens are by the provision of space heaters on the walls, or by the use of "creeps," strong low-built hutches at floor level which allow the piglets to enter, and which are heated by means of lamps or by thermostatically-controlled low-temperature heaters near the top of the hutch. We regret that we are unable to advise you of present-day costs.

Information Sought

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

Mr. L. A. Fantozzi asks: 1. What is the chemical composition and formula of ammonium reineckate?

2. Can you give an effective recipe for a depression garden (often called "coal flowers")?

Mr. D. Day writes: I wish to make a large insulating box to use on a van to carry ice cream. Please could you give me some advice on this? The probable size will be, two containers, each 2ft. by 2ft. by 1ft. 6in.

From Mr. E. Ratcliffe comes the following request: Can you forward details of materials and method of construction of a tiled fire-place?

Mr. W. E. Rickards writes: I should like to make small objects from glass—animals, flowers, etc., as sometimes seen in gift shops.

Could you give me any information on this matter?

The following request was received from Mr. H. G. Roberts: I would like to make a simple electric fire with or without a reflector. Can you supply me with drawings and details of construction?

Mr. R. Heney writes: I keep budgerigars, and quite an amount of seed wastage occurs due to the birds spilling it. Can you tell me how to make a winnower operated by a vacuum cleaner?

L/Cpl. Blighton of B.A.O.R. 32 writes as follows: I am interested in the construction of heat pumps (refrigeration principle) with heat delivery in the range of 400 B.Th.U.'s per minute.

Theory states that 73 units of energy are required to move 1,000 units of heat.

Such efficiency, of course, cannot be obtained, and I understand depends to a large extent on the delivery temperature level required.

As I am more concerned with obtaining a high heat transference efficiency than a high temperature I would be very grateful if you could furnish me with the necessary mathematical data required to calculate the energy absorbed by a compressor pump for any temperature delivery at the condenser with the evaporator temperature maintained at approaching 32 deg. F. Also information for calculating the surface area of condenser and evaporator required.

Mr. W. R. Field asks: Can you give me constructional details of an instrument for recording barometric pressure in connection with weather "outlooks"—the type in a glass case with a revolving graph-covered drum, on which is drawn the line of varying pressure via a long arm with a pen, attached at the other end to a vacuum capsule?

Mr. P. Williams' problem is: I wish to make a viewer for viewing 35 mm. colour transparencies, lit by electricity and giving slight enlargement. I shall appreciate any information you can give me, particularly as to type of magnifier and from where it can be obtained.

Mr. L. Webb's letter says: I have a "vibrator" pump supplying air to a filter and two diffusers in a goldfish aquarium. I should like to substitute it with a "rotary" (or similar) type of pump.

Please give me a design using ex-W.D. parts.

Mr. T. Brown says in his letter: I have a two manual pedal organ to which I would like to add a discus blower. Can you give me any information? I have a $\frac{1}{3}$ b.h.p. motor.

R. N. A. Underwood writes: Please supply me with a formula for making-up a liquid to be used in an electric model locomotive smoke producing unit.

An electric element heats the liquid and smoke so formed is blown to the chimney. This element is to work on 24 volts.

An extract from Mr. J. Baxter's letter is as follows: I have a 5-pint blowlamp with flexible extension, which I would like to use for weed destruction on my garden paths. What modification would be necessary to enable this lamp to be so used?

Mr. A. H. Lutman asks the following: I wish to construct a home knitting machine. Can you give me any information?

A request has also been received for details of the "Walton Mole." This is a cleaner made from brass, swivels and a brush, which will clean straight lengths of pipe and shallow bends. It is forced along by water pressure.

Mr. L. J. Buckingham's query is: I wish to build a coffee mill for use at home. It will be required to grind only 1 oz. of beans at a time and I wish to drive it by means of a small electric motor. I want the axis of the mill to be horizontal and to be able to grind the coffee very finely, but it is not necessary to have the adjustment continuously variable; it could be pre-set. Please, therefore, give me a sketch of a suitable design.

THE Cyclist

Editor: F. J. CAMM

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COMMENTS OF THE MONTH By F. J. C.

The National Committee and Rospa

THE National Committee on cycling has decided to become a member of the Royal Society for the Prevention of Accidents for a test period, and its chairman, Major H. R. Watling, has been nominated to represent it on the Executive Committee of Rospa. We congratulate it on this decision, but we should like to know whether it was unanimous; for the C.T.C., which is represented on the National Committee itself, withdrew from Rospa a year or so ago on the grounds that it was pro-motorist and/or anti-cyclist. Does the new decision mean that the C.T.C. will rejoin?

We do not consider that Rospa is anything but an impartial body and if, after investigation, impartially undertaken, it finds that a particular section of road users is blameworthy, that is not tantamount to saying that it is anti that particular section of road users. The truth is always unpopular to that person or section of persons to whom it applies. The C.T.C. in our view resigned out of pique. It has always represented the cycling community as haloed saints, and motorists as the wicked uncles of the piece. We are second to none in our support of the cause of cycling, but we have not and shall not indulge in the blind advocacy of a cause, supporting as the paid advocates support a cause whether it is right or wrong. Our policy is: cyclists, right or wrong—right to keep them so, wrong to help them right. Disservice to the cause of cycling was done by the withdrawal of the C.T.C. from membership of Rospa.

R. C. Shaw, in a statement to the Press concerning withdrawal of membership of the C.T.C., stated that accidents "had reached the dimensions of a national scandal." That is a nice-sounding phrase, but surely only a national body such as Rospa, representative of all sections of road users could help to solve the problem. The C.T.C. is not in a position to investigate causes of road accidents even though it may suggest impracticable cures, as it often has done.

Britain Leads

BRITAIN has every reason to be proud of the performances of Harris, Peacock and Brotherton in the World Championships, of which there are seven. During the last week of August in the World Championship Britain gained two world championships, one second and two thirds—10 points plus the omnium.

Reg. Harris becomes professional Sprint Champion of the world for the fourth time, while Cyril Peacock becomes the Amateur Sprint Champion, with Peter Brotherton as runner-up and Norman Shiel third in the Amateur Pursuit. J. Bunker was third in the Professional Motor Paced 100 km. raced.

It will be remembered that W. Bailey and Reg. Harris were holders of the Amateur Sprint Championship, Harris taking the title in 1947. In the Amateur Road Championship, E. van Cauter (Belgium) was first, H. E. Andresen (Denmark) second, and J. M. van der Borgh (Holland) third. In the Professional Road Championship, L. Bobet (France) was first, F. Schaer (Switzerland) second, and C. Gaul (Luxembourg) third. In the Motor-paced Championship, A. Verschueren (Belgium) was first, J. Pronk (Holland) second, and J. Bunker (Great Britain) third. In the Amateur Sprint Championship, C. Peacock (Great Britain) was first, J. Tressider (Australia) second, and R. Gaignard (France) third. As regards the Professional Sprint, R. H. Harris (Great Britain) was first, A. van Vliet (Holland) second, and E. Sacchi (Italy) third. In the Amateur Pursuit, L. Faggin (Italy) was first, P. Brotherton (Great Britain) second, and N. Shiel (Great Britain) third. The Professional Pursuit was won by G. Messina (Italy), with H. Koblet (Switzerland) second and L. Gillen (Luxembourg) third.

The Social Round

THE closure of the racing season presages the opening of the social season, the annual dinners and luncheons and the prize-giving. Where the annual function is a mixed affair, the dinner being followed by a dance, we urge club secretaries to arrange for the prize-giving as a separate function. It is boring to the ladies, having wined and dined and anxious for the dancing, to listen to a catalogue of times, interspersed with racing jokes they do not understand. A dinner, a dance and a prize presentation are altogether too much to crowd into one evening.

Very shortly, clubs will be holding their annual general meetings and appointing delegates. We hope this year that they will exercise extreme care in their selection. They should take heed of the events of the past year in the unclean sphere of cycling politics, and see that they select delegates free from bias and that they are adequately instructed on what to say and how to vote at national meetings. We urge those clubs known to harbour firebrands to get rid of them.

Social secretaries are generally remiss in their selection of proposers and responders to toasts. Select speakers known to be good, who know how to stand up, speak up and shut up, who can be witty without offence, and who can leave an audience, when they sit down, wishing for more. How often is it said "He's a nice chap, but when he opens his mouth . . . !" Good speech is of great value. Ask yourself the following questions: Can you hold a worthwhile conversation? When you do introduce people you do it clearly? Can you move a resolution promptly? Are your instructions plain and unmistakable? Can you give a toast or move a vote of thanks? Are you able to make a compact report? Can you talk for a minute on a subject? Can you open a debate with 15 minutes of persuasive talk? Is your explanation of an idea or a change of methods attractive? There is more behind good speech than mere words. One needs to know the meaning of words and their degrees of meaning. That does not call for an almighty range of long words—simple words are nearly always best.

The Cycle Show

AT the time of going to press there are no indications of great surprises or radical changes in design. We forecast that attendances will be up and that trade will reach a higher level than last year as a result of the dropping of hire purchase restrictions. No doubt most machines will have their lighting modified to comply with the revised law. Will manufacturers this year state the weights of their various models? I know that they agreed some years ago not to do so, but now that the stress is on weight (no pun intended) and so many manufacturers list lightweight models, the public is entitled to know what the weight really is. What is a lightweight? If it is defined as a machine weighing from 20lb. to 25lb., why cannot the weight be stated? If it is not a lightweight within those limits it should not be described as such. Every cyclist to-day knows that a couple of pounds extra weight on a bicycle is of no importance and he is not likely to make his choice on weight alone.

Winchester
The famous City Mill rebuilt in 1744 (now used as a YHA Hostel . . .

Wayside Thoughts

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

A Short Cut

FOR the first time in my life I cut a cycling holiday short and went back to work because of the weather. I had been looking forward to a Welsh run round the haunts of my youth in the company of an old friend near my years, the type of holiday involving moderate mileage and immoderate periods of sun-lounging amid delectable scenes, just the kind of roaming to fit the slower energy of the over-seventies. But we were disappointed, and were not the only ones by many a thousand during these stormy, fitful days of summer. We went one evening in late July to Bala by car, with a couple of bicycles slung on the back, a more comfortable method of penetrating to real countryside than train travel, and all the way thither it rained and blew as if the October gales had anticipated the calendar. Scattered leaves and twigs hit the windscreen and the ramrod rain danced a jig along the hard roads. We comforted ourselves with the notion such tantrums could not last and that this violence presaged a period when summer would bask on the hills and we should be the lucky ones to enjoy its beauty in freedom. I think it rained most of that night by the torrents' indication, but the morning was just fine, although the torn clouds were racing eastward and the light was grim and grey.

We unhitched our machines and made a couple of miles along the Ffestiniog road into the cool gale, and then quite suddenly the straight rain ran down the road with a hiss. An overhanging rock gave us temporary shelter, but the long wait did not bring the hoped-for let-up, indeed the deluge made a 36-hours' visit which ended on the evening of our second day. In the meantime we scurried to Bala, bolted on the bicycles and went dry, comfortable but disgruntled into the rain and mist, looking for the blue beyond the grey line of sky.

The New Dam

TWO evenings later we were at Llangurig in the lap of Plinlimmon, and it was then the rain ceased. Meanwhile we had wandered round much of North Wales without seeing it except through a damp, dismal, depressing mist. At Beddgelert on our second night out, our host told us that his houseful of people, who had come to walk and climb, had not seen the summit of Snowdon for 10 days! That Tuesday morning was fine, chill and windy, but by the time dawn had rubbed its eyes the sun was casting shadows and it seemed as if summer had at last found the way to push up the temperature and assume a shining aspect. So down we went with the Wye to Rhayader, flowing with the gale, but we did not find how cool it was until we tried a smoke at the bend of the river three miles from the entrance to Elan Valley, and then after five minutes, we were glad to push on in order to keep our blood atingle.

A cup of tea and biscuit at the deserted Elan Valley Hotel evoked the information that holiday-makers were forlorn, and the further suggestion we were a couple of unwise ancients to climb to Clearwen Dam into that heavy wind. We ordered a late lunch to await our return and cheerfully set about the six miles climb, following up the sparkling joyous river that comes singing down the hills to an arm of the lowest of the Elan Lakes. We were warm enough when round a bend the fan-like shape of the water-laced dam came in view, a fine sight it was too and one which we had all to ourselves. It is a grand bit of

Low Tide. Coverack
A corner of this delightful little Cornish fishing village.

work, where man has certainly improved the otherwise rather sombre valley of the Clearwen, and I'm glad to have seen that last addition to the Elan Scheme, for as a youth I rode that vale before the first dam was built.

The One Fine Day

THE power of the sun had by now warmed the air, but we were too hungry to greatly heed the cheerful change and used the wind and the slope to hurtle to our lunch. Then, finding a sheltered nook, we smoked and talked sleepily, looked at the blue sky—so novel a sight this summer—and finally in the late afternoon scanned the map deciding Newbridge-on-Wye would suit us. The New Inn could accommodate us and did so very well, so well indeed that we booked for the next night in the hope the weather would give us a gracious smile. On the way to Builth next morning a skither of rain swept over, from which we hid under a sloping rock, and when we turned to climb towards Llandrindod we found the edge of the wind cool and slightly damp. The hills were misted and the shut visions grey and wringing wet, with never a cheery call to sit and smoke and rest awhile; and in these days that is how I like to go cycle touring.

After lunch at Llandrindod we found a nook in the park by the little lake, into which the sunshine peeped for a kindly hour, and here we browsed and watched the duck flight in and the local lads at fishing. Idle? Yes, but that's how we intended it. It is only about five miles to Newbridge but we used an hour for the journey rather than don capes to ward off the switching storm passing over and smudging what visibility the dull morning had given.

After a cheerful meal we strolled to the Wye to find a trout—and did—and then the rain drove us to shelter for the rest of the night. The morning was fine but still cool and windy as we climbed quietly to Llangurig, which we reached just before the weather broke. Another deluge made our conviction that it was more comfortable at home, so home we went. It was the first time I have ever cut a cycling holiday in half.

The Way Down

A WEEK later my family prevailed on me to go camping on the Pembroke coast. There was not enough time to cycle, so I went on the truck—a new one with a high cab from which I could look over the hedges and far away; and it was confined to 30 m.p.h. by law, although on clear ways and downhill I'm afraid it trespassed.

Early on the Wednesday morning before Bank Holiday that truck was climbing Bromyard Downs through golden slants of sunshine, and all was merry. Forty miles farther on the "summer" opened up and once we had to stay awhile for want of vision until the violence had passed over. I could foresee our camping party of ten having a glorious tussle with the big tent which weighs half a ton, to say nothing of four smaller ones and a great tarpaulin that covered the truck and spread itself into a wide eve carried on poles from the truckside to make a convenient cooking and dining space. However, we were fortunate, as it happened. At Carmarthen we bought petrol and were told it hadn't stopped raining and blowing for three weeks; but that fellow must have been asleep some of the time. Ten miles out from St. Clears the rain ceased, and when an hour later we reached our lonely field the wind had dried the freshly mown grass and by eight o'clock that night the camp was as tight as a drum.

The meal we ate under the awning—a proper reward for a job well undertaken. It was as well, for in the noisy watches of the night the rain deluged in storm-driven spasms, and I began to think our Carmarthen pessimist was not twisting the truth beyond the picturesque. We were dry and comfortable, the most valuable assets of camp life, and gumboots kept our soles warm, particularly after porridge and bacon and eggs.

Those Ten Days

THERE were ten days of this. We were a merry party and no member ever lost temper for a moment: an ideal camp company. But then we have been at this game for over forty years: time enough to have experienced and overcome all kinds of conditions. This venture, however, was the wettest and stormiest of the series, and how other campers fared with their light equipment and dog-kennel tents I cannot guess. Of the ten days, we enjoyed two completely fine, one of which was a real summer's day. The others were either drenched or smeared with storm.

When we broke camp on the Saturday morning the weather did its best to drown us. Fortunately, we had packed the big tent on the Friday evening, but everything else was soaked, and the truckload heavier than when we arrived, for all the provender we had meanwhile eaten.

I came home on the truck; I like that high seat from which you can look over the hedges and away into the rain-washed distance. For no sooner had we cleared the field about midday than the rain ceased, and for 180 miles we chased the storms across the land, continually running over drenched roads with the rain but a mile in front, yet no spot fell on us until within 12 miles of home. It was a beautiful journey: the sparkling air, sun-slashed and rain-splashed, magnifying the hills; the ever-changing colours of field and fell bright and dour as the sun and storm went on ahead; and all the way the rainbows were with us, leaning on the hills and dipping into the vales.

Our friends felt sorry for us and wrote sympathetic postcards, but the kindly feelings were wasted, for there was never a camp party more joyously composed or more impervious to the damp and often weather-dismal conditions. Perhaps this was due to the old cycling tradition and outlook, for there is no better training for an individual to make the best of things.

AROUND THE WHEELWORLD

By ICARUS

The Age of Clubs

A READER who tells me that he is writing a history of cycling asks a number of questions, the answers to which may be of interest to other readers. I wish him well in this monumental task, for only two others have attempted to record the development of the bicycle: H. H. Griffin, whose classic work entitled "Cycling," published by George Bell in the "All England" series, is still very much sought after, having been out of print after many editions for over 20 years (incidentally the copyright is now owned by George Newnes, Ltd.); and H. O. Duncan, who wrote a voluminous tome entitled "The World on Wheels." The latter is not entirely devoted to cycling, for it deals with motor cycles and motor cars as well. The former book is a very exhaustive treatise on the history of the bicycle. Duncan's book is a heterogeny and does not seem to follow any chronological order. For such a vast book, an index surely is necessary, and there should have been some date sequence in the editorial treatment. To find any particular fact occupies a complete search of the pages. However, the first question my reader asks was, when were the various national associations formed. Although I had a fair notion of those dates I had to look up "Every Cyclist's Pocket Book" to verify them. That book is a mine of information on cycles and cycling and from it I find that the N.C.U. was founded in 1878. At its A.G.M. in 1888 the following resolution was passed: "The N.C.U. as a public body desires to discourage road racing, and calls upon clubs to assist it by refusing to hold races upon the roads, and it prohibits any of its officials from officiating or assisting at any road races, and refuses to recognise any records made on the road and that this be added to the rules." As a result of this, the Road Records Association came into being, largely as a result of the efforts of A. J. Wilson (Faed) and F. T. Bidlake. It is true to say that the N.C.U. lost its prestige with the clubs from that date and has never entirely recovered it.

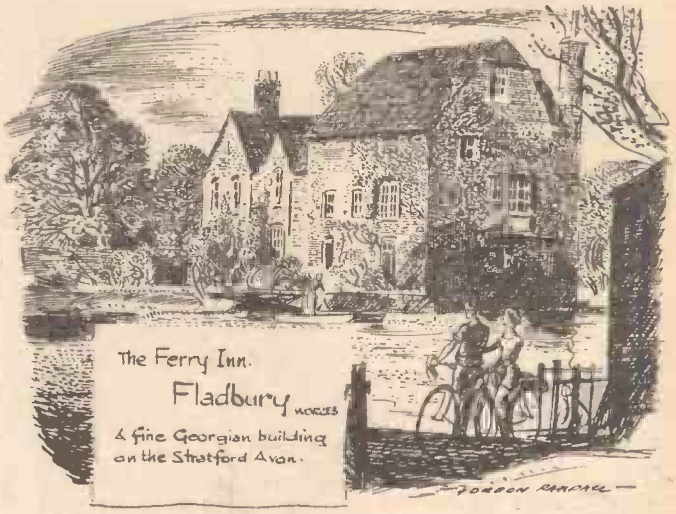
The C.T.C. was founded in 1878 as a result of an announcement which appeared in *Bicycling News*. It was originally known as the Bicycling Touring Club, which was changed to the present title as a result of a proposition at the A.G.M. in 1882.

The Road Records Association was founded in 1888, as I have said, by A. J. Wilson, then president of the North Road Cycling Club Ltd.

The Women's Road Record Association was founded in October, 1934, under rules similar to those of the R.R.A. The Road Time Trials Council was founded in 1937 to secure uniformity in the conduct of road time trials which had formerly been controlled by the Road Racing Council, which thus went out of existence in that year. The first chairman was the late F. T. Bidlake.

Coming to more recent times, the last National body to be formed was the British League of Racing Cyclists, founded in 1942 to control mass start and other forms of road racing. The first and oldest cycling club is the Pickwick Bicycling Club, which was founded on June 22nd, 1870. It does not function as a cycling club, and is now only a knife-and-fork club.

In 1870 there was only one club—the Pickwick B.C.; in 1871-2 there were four; 1873, five; 1874, seven; 1875, nine; 1876, 31; 1877, 38; 1878, 40; 1879, 55; 1880, 213. To-day there are approximately 3,000 N.C.U. and R.T.T.C. clubs, exclusive of the B.L.R.C.



The Hour Pace Record

ONE of the queries "to settle an argument" which I continually receive concerns the record for one hour's motor-pace cycling. It is 76 miles 504 yards, ridden in 60 minutes on a bicycle behind motor cycle pace, by Leon Vanderstuyft, the Belgian, at the Montelhéry Track, Paris, on September 30th, 1938. Albert Marouet, the Frenchman, covered one mile at a speed of 88.95 m.p.h., paced by a car with a special windshield. Whilst I am dealing with feats of endurance, it is well to recall that on May 17th, 1941, Alfred Letourner, a former six-day racer, pedalled one mile in 33.05 seconds, or at the rate of 108.92 miles an hour, on a highway near Bakersfield, California. He rode behind a shield attached to the rear of a racing car, driven by R. Householder. 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 the hour, unpaced, was H. L. Courtis, and the first to cover 60 miles in an hour paced was an Englishman, A. E. Wills.

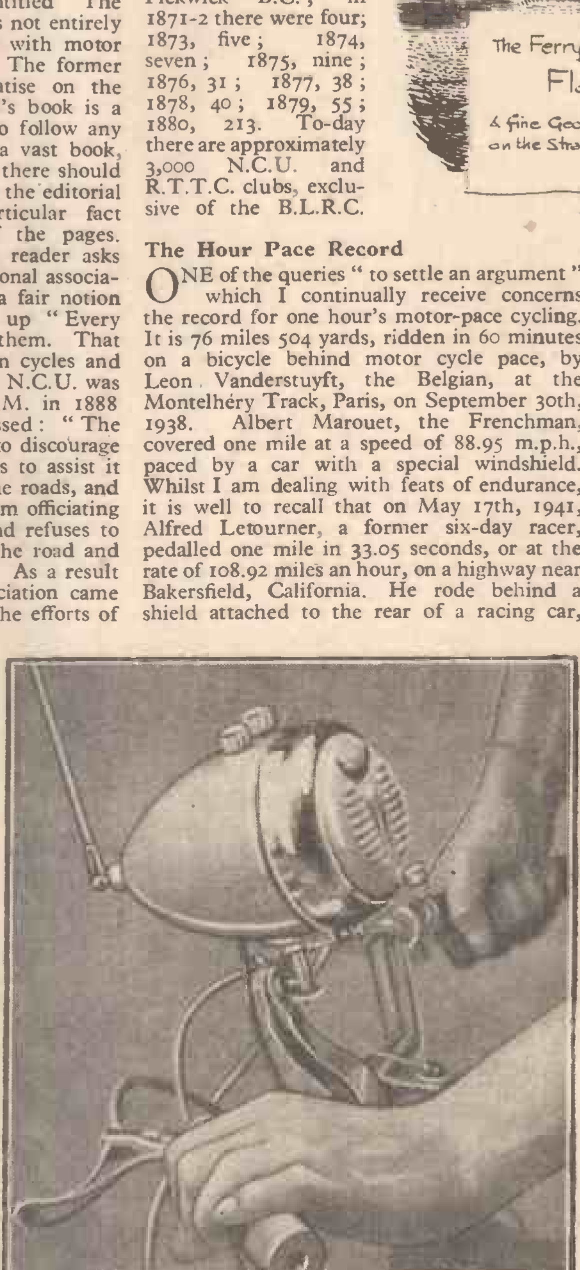
The Cycle Show

THE Cycle Show, which this year takes place in November, originated from the old Stanley Show, which was first put on in 1889, when 1,201 machines were exhibited, all equipped with solid tyres. The following year there were 1,564 bicycles, 20 of which had pneumatic tyres, one with cushion tyres and the remainder solids. By 1891 solids had dropped to 307, cushioned had risen to 571, and the pneumatics to 148. I hope these few facts will help my would-be historian of cycling and cycles. He can put me down as a purchaser if and when the book sees print.

How Many Cyclists?

ACCORDING to Hulton Readership Survey there are more cyclists to-day than ever before, although many of them use their cycles less frequently than they did in the pre-motorised-bicycle era. According to this survey, the number of cyclists aged 16 or over is 9,150,000, and of this total 6,150,000 use their bicycles regularly. If we add cyclists under the age of 16, which the survey does not take into account, the estimated total of 12,000,000 which has been so often quoted is not so far out.

It is difficult to understand why a census of cyclists has not been undertaken by the Ministry of Transport. Is it because of the fear that the staggering figures might reach the eye of the Chancellor of the Exchequer?



A Portable Radio for Cyclists.—This new invention of German origin has just been brought on to the market. The gadget is like an inverted bicycle lamp and is fixed to the handlebars, it is battery run and waterproof and the cost is £15. It is being distributed in this country by a British concern.

CYCLORAMA

By H. W. ELEY

Climbing the shoulder of Thorpe Cloud Derbyshire. The great mass of Bunster on the right, rising steeply from the River Dove forming the entrance to the celebrated dale.

GORDON RANDALL

Russet and Brown

IN late October, it is good to ride out into wooded country, and revel in the autumnal tints of the trees, for there is a veritable riot of russet and gold and brown, and at no season of the year is the English countryside more inviting. On Tullard Ridge, there are beeches, and oaks, and elms, and in the tangled, ragged hedge-rows the hawthorns are starred with red hips, and the wild roses with haws. Not yet is the season of decay, but there is a wistful sadness about the scene, for when October is out, King Winter will soon ascend his throne, and the glory of foliage will be gone. But there is time yet to enjoy rich beauty and the air is keen, and the roads good for a long ride. I cycle through Long Datcham and Fursley, and finally come out at Brendon Cross, where there is a good inn—and as everyone knows, there is no brew like an October brew! The lordly pheasant struts through the glades of Watton Woods; the rabbits are at their best, and it is time I went for a day's shooting with Tom Hodden, and revelled in the delights of rabbit-pie!

A Son of Sussex

ALMOST every week, my post contains a friendly letter from some cyclist who reads these rambling notes, and is good enough to write me with information about some place he loves, or to tell me of interesting and historic facts about towns, and villages, and churches and taverns. A letter the other morning from a cyclist from Sussex-by-the-Sea, and in it a lot of interesting information about ancient Winchelsea. My correspondent mentions that it was here that old John Wesley preached his last sermon in the open air . . . on October 7th, 1790. I gather that one can still see the big ash-tree under the friendly shade of which the great evangelist spoke and pleaded. Winchelsea has a certain sadness, for it possesses the ruins of a great church which was never completed. This church was part of a fine and ambitious plan for the complete rebuilding of the town, following destruction by tempest in the year 1287. Old admirals of the Cinque Ports are commemorated by monuments in the church, and I am sure that my cycling correspondent is right when he urges me to go to Sussex, and revel in the loveliness of the immemorial Downs, and capture the spirit of the county so ably and lovingly portrayed by that great interpreter of Sussex, Sheila Kay-Smith. One of these days I will go . . . but there are so many invitations to journey into lands of delight, and one's day is crowded . . .

Never Too Old to Cycle

MET an old man in a lane the other day, riding an ancient bicycle, and together we dismounted, and leant over a field gate, and chatted about cycles and cycling and the delights of the October countryside, and reminded each other of tours of the long-ago. He had been an ardent rider for many years, and had cycled all over England. He told me his age was seventy-six, and I do not think I ever met a fitter or more youthful man for his age. "A daily spin on the old bike, a pint of ale at some village inn, early to bed and up early in the mornings . . . that's my recipe for long life and good health!" And not at all a bad recipe I thought as I looked at his pink cheeks, and clear eyes. He told me that he was a native of Dorsetshire, and he talked, with love and pride, of Poole Harbour, where he had spent a happy boyhood. He talked, too, of the famous Walls of Wareham and of Chesil Beach and the Isle of Portland, and, as a true son of Dorset should be, was an enthusiast for the novels of Thomas Hardy. We drank ale together in the "Three Magpies" and I felt that in this old man who still found his greatest joy awheel, I had made a new friend.

Preparing for Winter

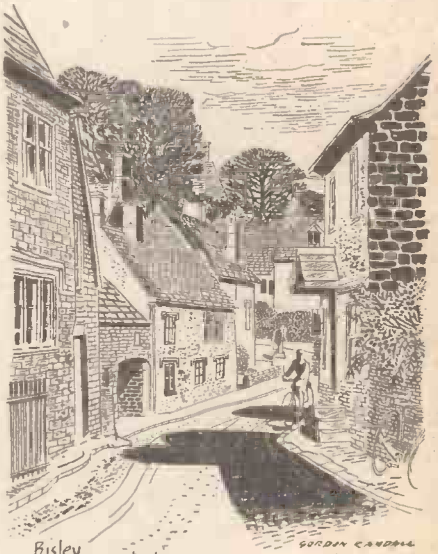
BY the time October comes round, I always feel that it is time to give my cycle a thorough overhaul, and make all the essential preparations for winter riding. I am an enthusiast for cycling during the winter period, but I do firmly believe in making my machine "weather-proof" and seeing to it that all the necessary adjustments are made, oiling and cleaning done, and my clothing gear in order. A long ride in November, or in bleak January, can be much more pleasant if one feels that everything is "ship-shape" to meet all the weather conditions one may encounter . . . and here in grey Derbyshire, one may meet some pretty severe conditions! So, one or two evenings spent on putting everything in order . . . and I face the winter with a good heart. Particularly, I see that my tyres are in good fettle, and, in fact, usually invest in a couple of new covers about this time of the year.

Dance of the Deermen

I AM not too far from the Staffordshire border, and this year, in early September, I journeyed to ancient Abbots Bromley, not far from Lichfield, and there witnessed that age-old ceremony, the "Dance of the Deermen." In this curious old survival, twelve Staffordshire yeomen each take a pair of deer's antlers from the Parish Church, and, holding them aloft, dance through the district. The dancers are clad in gay garb, with colourful breeches, and the whole effect of the ancient ceremony is weird indeed. I have often endeavoured to get at the authentic origin of this custom, but I am afraid that only garbled accounts are available. Cycling around the Derbyshire and Staffordshire villages, one comes across many ancient customs and I am collecting quite a lot of useful data on the subject . . . possibly, some time in the dim and distant future, I may compile a book on the customs and ceremonies still kept up in these parts.

The Magic of the Morning

GOOD it is, on these crisp, October mornings, to be "up with the lark," have a substantial breakfast, and set off for a cycle ride before the roads bear their burden of traffic, and when the air is at its sweetest. I find that by making an early start to a fairish long ride, it is possible to be far afield by noon . . . just at the magic moment when an inn door opens, and one may enter and take welcome refreshment from a tankard or a mug. The wispy cobwebs are on the hedge-rows when I start; the air is keen to the face; rooks are flying low over the wide fields, and one has the long, winding road to oneself. It is a magic hour, and one to be made the most of, for come November, and the fogs may come, and the landscape be blotted out, and no fruit-filled orchards will greet one down the lanes. A pause at Long Staunton about ten o'clock, a look round the ancient grey church, and then on to Harkley End, where there is an old forge by the road-side, and I hear the music of the hammer on the anvil, and smell the acrid smell of burning hoof. A word with the "Smithy" and then on to my journey's end . . . for my pipe and ale, and a quiet half-hour in an inn in front of which the Michaelmas daisies bloom gaily, and there is a vase of bronze chrysanthemums on the bar-counter, and a canary chirps merrily to me as I sit and muse . . . yes, October is a good month, and especially good if you are out on the road early!



Bisley Gloucestershire GORDON RANDALL

Quaint and remote among the hills near Stroud

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