A 12-FT. ALL-WOOD CANOE

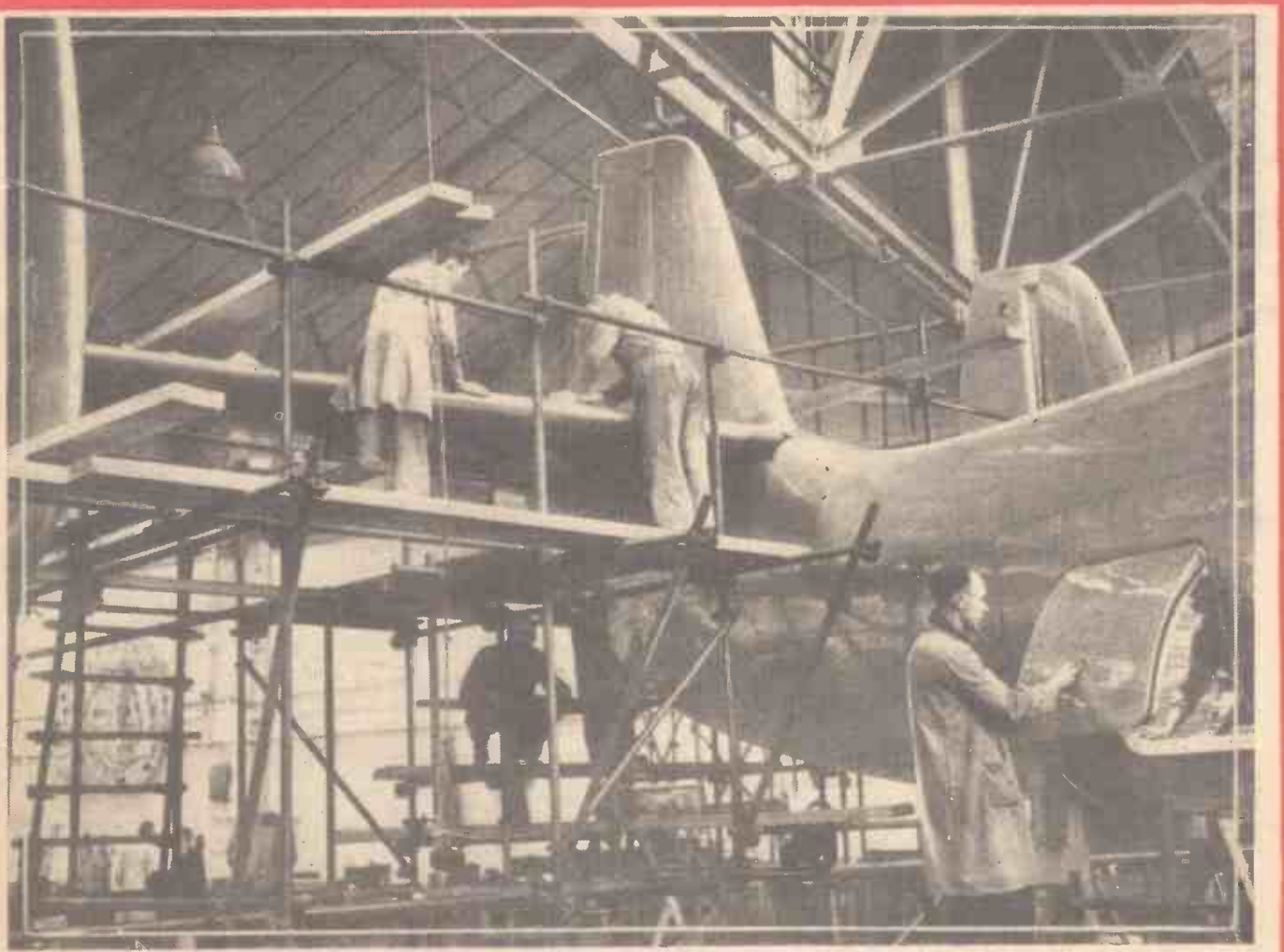
NEWNES

PRACTICAL MECHANICS

9D.

EDITOR : F. J. CAMM

APRIL 1947



AT WORK ON THE NEW 40-SEATER AIR LINER "AMBASSADOR" (See page 247)

PRINCIPAL CONTENTS

CLIPS
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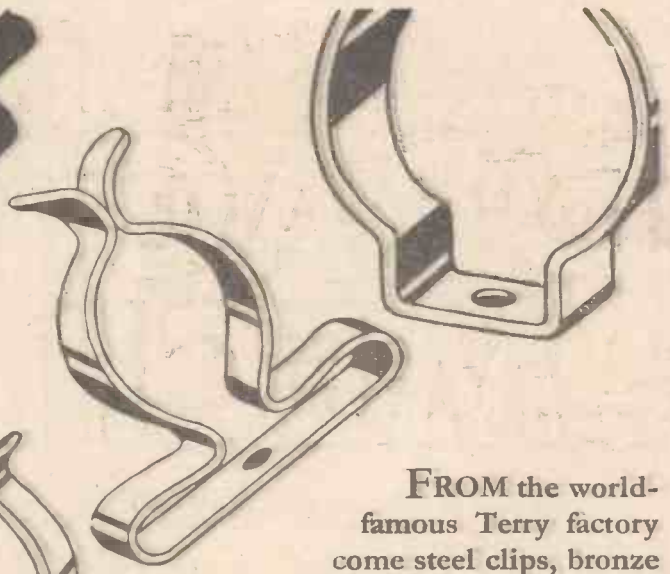

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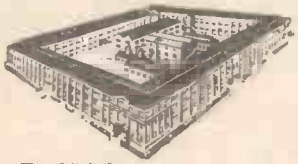

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PRACTICAL MECHANICS

Owing to the paper shortage "The Cyclist," "Practical Motorist," and "Home Movies" are temporarily incorporated.

Editor: F. J. CAMM

VOL. XIV APRIL, 1947 No. 163

FAIR COMMENT — BY THE EDITOR

Late!

WE apologise to our readers because this issue is a few days late in publication. No one could foresee the coal crisis, which has disrupted industry for a number of weeks, and the full effects of which have yet to be felt. When the paper ration was increased last year we thought that the worst of our troubles were over, but we were reckoning without the fuel crisis, the calamity which has struck us all such a disastrous blow, and which has set us back so badly.

Coal figures very largely in paper making, and our paper mills are suffering from this acute coal shortage. We are hoping, of course, that we shall not have to reduce the size of this journal. Readers may rest assured that we are doing our utmost to cope with the situation in these most difficult times, and that we shall endeavour not to break faith with them. We ask their indulgence if for these reasons we are unable to give that promptitude of service upon which we pride ourselves.

Engineers' Appointments Bureau.

PROFESSIONAL Engineers' Appointments Bureau commenced operations in October, 1945, and since that time it has done a large amount of useful work. The bureau invites applications for registration for employment from members who, by reason of their engineering qualifications, belong to the Institution of Civil Engineers, the Institution of Mechanical Engineers, or the Institution of Electrical Engineers; or from persons whose engineering qualifications for election or admission to one of those bodies have been approved by the respective council. The necessary forms may be obtained on application to the Registrar of the Bureau, at 13, Victoria Street, Westminster, S.W.1. The registrar interviews applicants who have completed the necessary form.

Employers of Professional Engineers are invited to submit details of positions vacant on their staff, indicating any special requirements, stating the salary range offered. Any details necessary for the guidance of the bureau which it is desired should be kept confidential should be indicated accordingly.

During 1946, the average number of engineers on the register was 964, 184 of these being primarily civil, 390 mechanical, and 390 electrical engineers. Employers have supported the bureau well by notifying 1,155 vacancies during the year, a number of the applications being for more than one engineer. In general, nominations have been made within seven days of the vacancy being notified.

It is known that at least 217 engineers have obtained posts with the employers to whom they were nominated by the bureau. This is above the estimate of the results anticipated for the bureau's first year of operation, but actual results may well be higher, as information has not yet been obtained on a number of the nominations made, despite the operation of a "follow-up" system, the necessity for which has increased the pressure on the bureau's small staff of four.

It is also known that at least a further 158 engineers were offered posts, as a result of the bureau's introductions, at or above the minimum salaries they specified, but the positions were not accepted for various reasons, the most usual being the lack of suitable living accommodation. These figures do not, of course, include the numerous engineers who have registered, but have either decided to stay with their present employers after testing the market or have decided, on the bureau's advice, to return to their pre-war employers.

Except under special circumstances, it has been the policy of the bureau to refrain from putting engineers forward for posts carrying salaries below the minimum figures shown on their application forms. In the early part of the year it was noticeable that a large proportion of engineers on the register were specifying minimum salaries considerably in excess of those offered by employers notifying vacancies, but in the latter part, matters had improved appreciably in this respect. The salaries at which posts have been filled range up to £2,000 per annum, and the age of the candidates over 40 years of age, though where possible the bureau has tried to influence employers not to specify low maximum age limits. An age analysis of engineers on the register has indicated that approximately 40 per cent. of these were under 30, 35 per cent. between 30 and 40, and 25 per cent. over 40. A corresponding analysis of the age of the engineers who have been placed shows that 50 per cent. were under 30, 40 per cent. between 30 and 40, and 10 per cent. over 40; 52 per cent. of the engineers placed were ex-servicemen.

Extensive use has been made of the advisory services of the bureau both by registered engineers and employers, and judging from the replies received this function of the bureau has been widely appreciated.

Whilst a large number of engineers on the register have indicated they are anxious to obtain employment in the Dominions, the majority of the overseas vacancies notified have been for the Middle and Far East, or Central and West Africa, and difficulty has been experienced in finding candidates who appear willing to go to these countries.

The bureau is not a profit-making concern, and its sponsors are the three associations we have named. The charges made to applicants are stated on the registration form. No charge is made to employers. The three institutions evolved the whole scheme, and the board consists of the president and secretaries and three members of the council of the three institutions.

Although the bureau is not incorporated, and therefore has no authorised capital, the funds are available as the result of donations received from employers and from the institutions. The registrar and secretary, Mr. R. W. L. Harris, B.Sc., served his apprenticeship in engineering and rose to the position of personal technical assistant to the technical director. Later he became a senior engineer and was engaged on work for the Central Electricity Board and Government of Northern Ireland. He is, of course, a member of the three institutions concerned.

Contributions

WE invite contributions from readers on practical subjects within their experience. It is necessary when submitting manuscripts to include details of your qualifications to write on the particular subject. Manuscripts are promptly considered, and they should be accompanied by drawings or photographs, which should be captioned. Manuscripts for preference should be typewritten on one side of the paper only, with a 1in. margin down each side, and double spaced. A stamped addressed envelope should be enclosed for the return of rejected manuscripts.

Airmen as Craftsmen

MANY of our readers received wartime training in certain trades, and they will be glad to know that those who completed five years' service in their trade are eligible for admission as skilled men in certain engineering and allied civilian occupations. The admission, however, as fully skilled members of the appropriate trade union is a matter for negotiation between the airmen and the union concerned.

Normally men are only accepted for trade union membership if they are in actual employment at the time of applying, but service in the R.A.F. is recognised as employment for this purpose.

This agreement does not affect that made between the Air Ministry and the Amalgamated Engineering Union, under which the training received by apprentices at Horton and Cranwell is regarded as fully equivalent to that given to civilian apprentices in the engineering industry.

A Miniature Gas Blowpipe

Constructional Details of a Small but Efficient Appliance for the Home Workshop

By H. H. WARD

THE blowpipe about to be described was designed in the first instance for fine work on silver and gold, and has, in point of fact, been used for gold soldering the hinges on watch cases and other very small jobs. For these purposes it is possible to adjust the flame until it is only ¾in. in length and tapers to almost a needle point. At full gas and air pressure, however, the flame is over 4in. long and is quite hot enough to silver solder larger work, such as fitting the unions on to model steam pipes and building up small parts. It will also be found to be of ample heat for sweating articles of a fairly large size or for carrying out the smaller glass-blowing operations. Up to about half power the air supply can conveniently be supplied by the lungs of the user and thus be under very accurate control, but beyond this point the aid of a pair of bellows or a blower is required. Taps were not fitted to the gas and air supplies as these were already at hand on the supply pipes, which were well within reach. Where it is necessary to work at some distance from the gas tap and air supply, taps with nozzle ends for rubber tubing should be fitted in place of the plain ends shown.

Details of Construction

The construction can be commenced by making the head of the blowpipe, which is seen in section in Fig. 3. For this a piece of rectangular brass of ¾in. x ⅜in. section

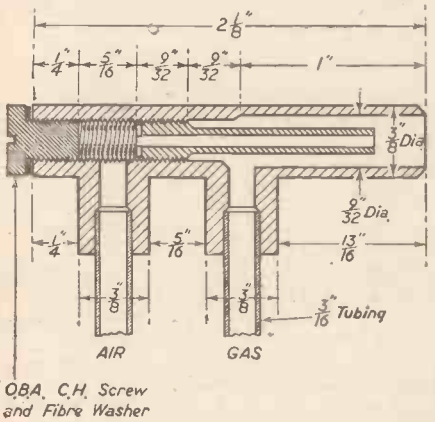


Fig. 3.—Section of the blowpipe head.

and at least 2¼in. long will be needed. At one end the bar is marked out as at "A" in Fig. 2, and the heavily shaded piece is cut out, care being taken to saw on the waste side of the lines. The opposite end should be centred in the same way, but no work should be done on this end unless there is no four-jaw chuck fitted to one's lathe. If this is so, then the ends should be drilled down with a Slocombe bit in preparation for between centre turning. Either held and centred in the four-jaw chuck or mounted between centres, the corners are turned off the projecting piece, leaving it as shown at "B." When the job has been reversed, either in the chuck or the centres, a fine parting tool is used to make successive overlapping cuts to remove the metal in the centre of the plain part so as to leave two ⅜in. square blocks standing out as at "C." The round part projecting has next to be gripped in a chuck, which will hold it concentrically so that an O-B.A. tapping size hole can be drilled completely through the block. The hole is shown in Fig. 3 as being tapped out to O-B.A., and this tapping can be carried out at this stage with an intermediate tap, which is stopped when it has penetrated to a depth of ¾in. The figure shown in the sketch is approximate, and the final adjustment of the air jet is best carried out by trial and error after assembly and testing. For this purpose a plug tap can be inserted to give the final position.

Air and Gas Tubes

The opposite end of this hole, from which

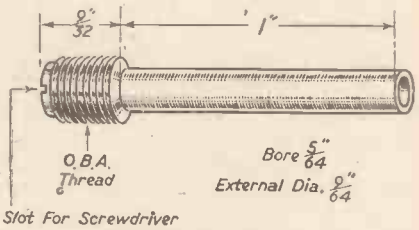


Fig. 4.—The air nozzle.

the flame will emerge, is next opened out to 9/32in. diameter, care being taken to prevent the drill from snatching and going deeper than the 1in. required. At the ends of the projecting square blocks diagonals are drawn to find the centre, after which ⅛in. diameter holes are bored through to the main bore and enlarged to take the 3/16in. tubes, as shown in Fig. 3. These are of brass and may be obtained from a plumber's merchant, and, like most tubing from that source, may be relied upon to be just a trifle oversize. This enables the tubes to be eased down until they are a driving fit

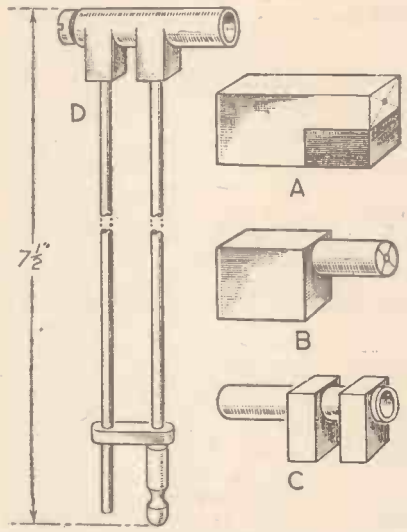


Fig. 1.—The completed blowpipe. *Fig. 2.—Details of the blowpipe head.*

in the holes, and the solder which is applied only serves to make them gas tight. The air nozzle is turned, bored and threaded from ¼in. diameter brass rod at one setting, and is then cut off. It has a sawcut made in the back end, as shown in Fig. 4. The screw at the rear end need not be exactly as specified, provided that it closes the end hole and does not extend far enough to close the air passage. To complete the head, the top part is rounded off, as seen at "D" in Fig. 1. The jet is screwed in from the back as far as it will go with the aid of a narrow bladed screwdriver, and the flame is tested. Then the jet is removed and the plug tap is used to deepen the hole. It will probably be found that the best flame is obtained when the end of the inner jet is about ⅛in., or perhaps a shade more, behind the outer tube. The details of the lower part will be clear from the drawing, the various parts being secured by soldering.

Submarines, acting as floating electric power-stations, are to provide power for some of the Royal Dockyards. This is to ease the situation caused by the shortage of coal. It is understood that 26 submarines will be used—15 at Portsmouth, 9 at Devonport, and two at Sheerness. Two or three submarines, working together, can produce an output of power equivalent to that of a fairly large power-station. Each vessel is expected to supply about 1,000 kilowatts daily. The illustration shows the switchboard of the submarine H.M.S. "Tiptoe," which has arrived at Sheerness to provide electricity for the dockyard.

A Vertical Enlarger—2

Details of Baseboard, Print Holder, and Enlargement from Ordinary Negatives

By R. J. CHAMBERLAIN

(*Concluded from page 211, March issue.*)

IN last month's issue, details of the lamp house, lens box and sleeve, including the negative carrier, were given and, by this time, no doubt, the reader will have experimented with any different lenses which may have come his way, and decided on the degree of enlargements of prints he prefers.

Assuming ¼-plate size enlargements are preferred, the baseboard can be made to the dimensions shown in Fig. 7. It is cut to shape from a piece of seasoned deal 12in. long by 7½in. wide by ½in. thick. If a piece of ½in. plywood is available, it should be used. However, ordinary ½in. deal shelving material is ideal if properly seasoned; fresh, damp board is sure to warp, particularly if "hearty" in the centre.

When the wood is cut to shape, using a keyhole saw or scroll saw, the edges are trimmed and glasspapered smooth, including the surface. A ¼in. hole, for the flex wire, is bored at the rear end. A second hole, acting as an outlet for the wire, is bored to meet the first hole, as indicated by the dotted lines.

The two discs, 3in. and 2in. in diameter, are cut from ½in. wood. The ¼in. central holes should be bored before cutting the disc to shape. The larger disc is glued centrally over the base-board flex wire hole, then the smaller disc affixed on top. A 3in. diameter wooden disc, ½in. thick, is cut from plywood and glued on at the underside. Two 1in. diameter by ½in. thick discs are adhered at the front end corners on the underside, as shown. These discs serve as tōes and ensure that the baseboard rests firmly on any table top.

The Metal Tube

The tubular upright is an 18in. length of ½in. diameter curtain rod, either brass covered or plain mild steel. A 3ft. length (or more, according to individual requirements) of twin flex wire is threaded through the baseboard hole and brought up at the top. Having inserted the end of the wire through the tubing, the latter is pushed down into the baseboard discs.

The lamp house is pushed over the metal rod and the flexible cable connected to the lamp holder, with a plug, or an adaptor, connected at the opposite end. If there is no switch handy for cutting off current, a small line switch could be connected between the baseboard and plug or adaptor. An alternative arrangement is to have a push-bar-switch lamp holder fitted to the top of the lamp house.

The Print Holder

Because of the close proximity of the negative carrier and brightness of illumination, ordinary ¼-plate contact printing papers—which are not so sensitive to light as the bromide printing paper—can be used. Hence, the print holder is of a size suiting ¼-plate contact papers which are more commonly known as "gas-light papers." If desired, a printing frame could be purchased.

A printing frame, however, is not so conveniently arranged as the home-made print holder. One could, nevertheless, fit a new back. In fact, this will be essential, because the back of the home-made holder is covered on the inside with a sheet of white card which is used for focusing purposes prior to inserting the printing paper for making exposures.

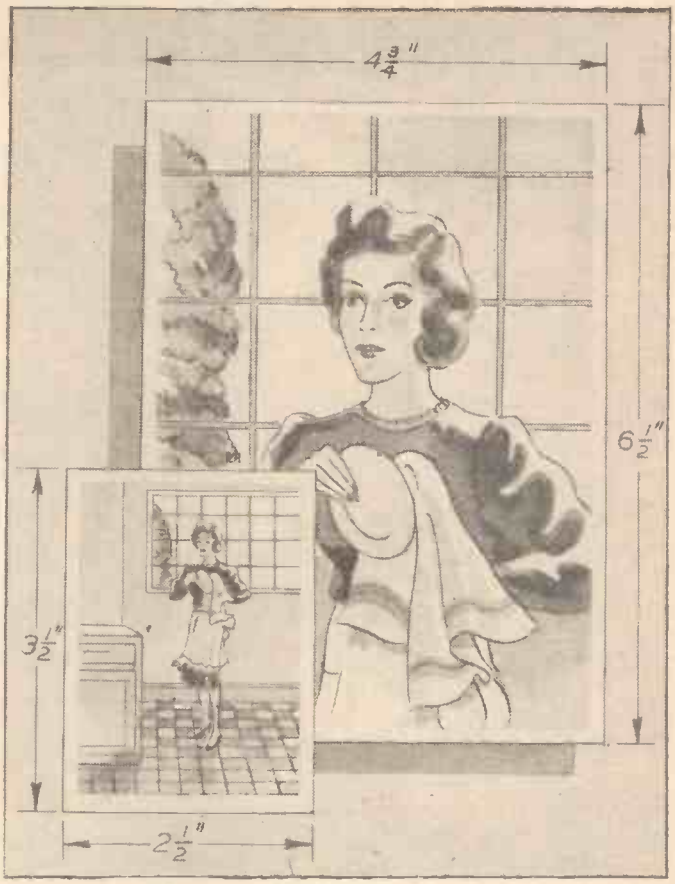


Fig. 12.—Showing how a half-plate enlargement can be made from an ordinary "snap" negative.

The bought printing frame will have a glass front and a back which is hinged in the middle, either half of which can be lifted up for inspection purposes when making daylight exposures on P.O.P. (printing-out paper). If you do not wish to fit a new back, a sheet of thin, white card 4½in. by 3½in. could always be inserted in the frame for focusing purposes, then removed and the printing paper inserted.

The glass front is undoubtedly an advantage, since it keeps the printing paper absolutely flat. The glass is absolutely necessary in a printing frame when making contact prints with film negatives. If plates are used, then no glass is needed.

But experience shows that a glassless print holder, so far as enlargements are concerned, is the best. Glass collects dust, fluff and finger marks, and unless kept clean, pictures may be marred. So, it will be seen that while a bought printing frame can be used, the best type is the one designed for use with the home-made enlarger.

Deciding the Size

Bromide printing paper is always used when making enlargements. Being more sensitive than gas-light paper, less exposure time is required. If you prefer it and desire to save a little extra money by making use of ½-plate size printing paper (6½in. by 4¾in.) cut in quarters, the rebate of the home-made print holder could be made to suit, this measuring 3¼in. by 2⅜in. As a result, the picture will measure 3in. by 2¼in. and show an ⅛in. white border all round.

Otherwise, of course, the print holder parts are cut to the sizes given in Fig. 8. Part O is the centre piece forming the rebate

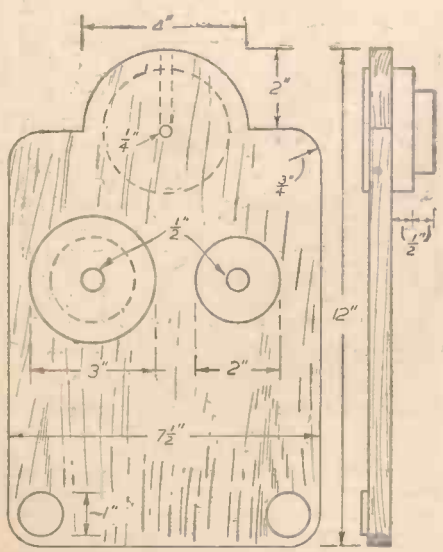


Fig. 7.—Plan and side view of the baseboard.

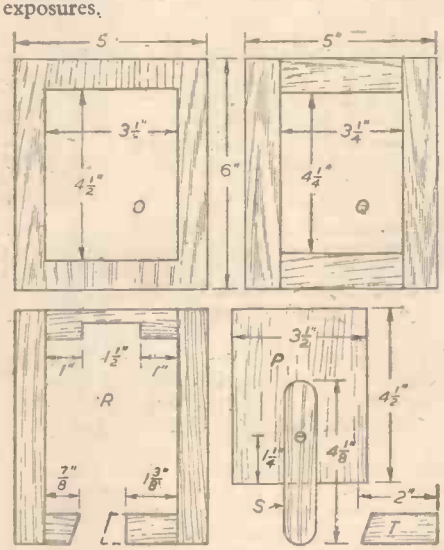


Fig. 8.—The parts from which the print holder is made.

to the frame; it is cut from ¼in. wood. Pieces Q are cut from ⅛in. wood and form the "lip" to the centre piece (O). Pieces R go on the opposite side of piece O to deepen the rebate. Piece T is a lug for the snib (S) pivoted on the back, P, the latter being cut from 3/16in. plywood and faced on one side with white card, as shown in the constructional view, Fig. 9. The snib and lug are cut from ¼in. plywood.

The back is fixed in position with a 1½in. long brass butt hinge. The hinge is attached with ¼in. by 4 flathead screws. It is advisable to have the back hinged in place before adhering the card to it since the points of the

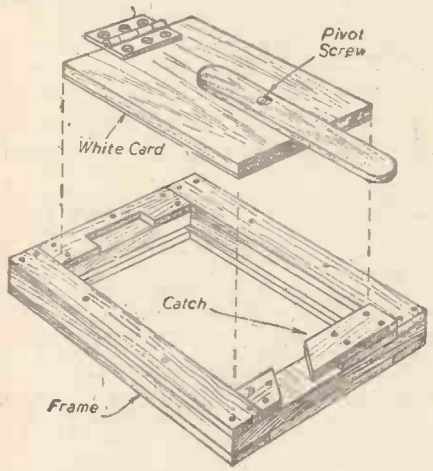


Fig. 9.—How the print-holder parts are assembled together.

screws may project and need filing flat, this also applying to the snib pivot screw. The latter is a tight fit in the backing, but free in the snib. The white card should be about 1/16in. thick; postcard material could be used.

The holder, when completed, is hinged upon the baseboard to be directly under the lens holder. Use a couple of small metal brackets high enough to permit the holder frame to turn over. It might be thought, by the way, that with the lens holder close to the print holder, the latter could not be turned over. This is so, but in practice you will find that it is impossible to make suitable-sized enlargements with the lens holder so close to the print holder. Note that the print holder is kept level with the surface of the baseboard with a small wooden rest (see side elevation).

The Finish

There is no need to finish off the work in any way beyond applying a coat of black spirit stain. Such a stain can be made by adding some lamp-black powder to sufficient methylated spirit. A water stain could be made and used, but this tends to raise the grain of the wood.

If you are particular about the finish the lamp house could be covered with black leatherette paper, removing the top and vent covers for this purpose, including the arm support bracket. The vent covers, top lid, arm, base and print holder could be stained and polished ebony black. The reason for not polishing the lamp house is that the heat may effect the polish.

A Temporary Dark-room

If you are an amateur who intends to do a lot of enlarging at home, the kitchen or scullery can be easily turned into a temporary "dark-room" at a moment's notice by means of a ruby-coloured electric lamp cover, this resembling a small glass jar having a screw-off lid. The cover is for use on any electric light point; it enables such work as plate loading, processing, etc., to be carried out in safety. If such a cover is needed for print developing and fixing only, there is a special cover for this purpose, the glass being an orange colour.

Bromide paper is insensitive to orange-tinted light. It is also insensitive to ruby-tinted light, but the latter—as produced by the ruby lamp cover—has a peculiar effect upon one's sight, making it difficult to judge the correct development of prints; the reddish glow, however, is better than no light at all. Apart from covers, one can obtain special coloured electric lamps. To save buying two separate lamps or lamp covers, one lamp could be orange-coloured; it could be enclosed in a ruby-coloured lamp cover, the cover being removed when necessary.

Cine Film Enlargements

Cinematograph films are, as you doubtless know, printed from film negatives. It is possible to reverse the process and make negative pictures from the prints. This is done by enclosing a strip of the film between an undeveloped plate and a sheet of clear glass the size of the plate and giving about ⅓th second exposure to white light, after which the plate is developed and fixed in the usual manner.

The experiment can be tried with, say,

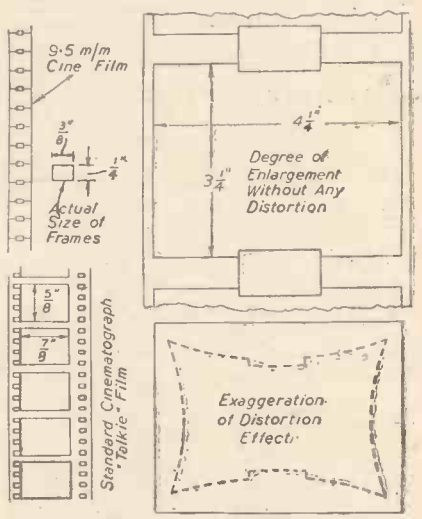


Fig. 10.—Diagrams showing the amount of possible enlargement from a miniature cine film.

a 4¼in. by 3¼in. plate, the clear glass being an old 4¼in. by 3¼in. plate that has been cleaned free of emulsion in warm, soapy water, then rinsed and dried. The emulsion side of the film must face the emulsion side of the plate, with the clear glass on top of the film to press it flat.

Several strips of film can be "sandwiched" between the new plate and its sheet of glass. The strips are kept side by side, and central with the plate. This leaves sufficient space at the ends for the fingers to hold the plate and clear glass tightly together during the brief exposure.

Having processed the plate, the negative images are projected on bromide paper to make the enlargements required. When dealing with 9.5 mm. cine film, the maximum degree of enlargement possible without any distortion is about 4¼in. by 3¼in., as shown in Fig. 10.

Any attempt at reducing the enlargement will cause a slight distortion (see dotted lines). The distortion effect will be more accentuated if an attempt is made at "crushing" part of a miniature film, such as standard size cinematograph film, into dimensions smaller than 4¼in. by 3¼in. This means any portion of film larger than the "mask" size, i.e., 9/16in. by 7/16in., or thereabouts.

Standard Cinematograph Pictures

Approximately one quarter of the "frame" of standard cinematograph film can be enlarged at a time, as shown in Fig. 11. No "mask" need be used. Provided the plate negative images are properly exposed and developed, resultant enlargements will be sharp, with correct density and contrast. The only stipulation is that only one quarter of the film "frame" can be dealt with. The remainder of the projection will be "bent" and out of focus, as shown by the shading.

An Alternative Procedure

If you cannot make a success of printing negative images on an undeveloped plate, an alternative method of dealing with the film is to project the "negative" enlargements on the printing paper and process the latter to make a paper negative.

In this case one obtains a "negro minstrel" effect, i.e., a picture of the negative. Having developed and fixed the print, it is set in a printing frame, face side upwards, and a fresh sheet of bromide paper set on top, with its sensitive side facing the negative picture.

Because of the thickness of the printing paper—a single weight paper is advised—a fairly long exposure to white light is necessary. You will have to experiment to find the amount of exposure time necessary. After exposure, the print is processed. It will be, perhaps, slightly hazy, due to the grain in the texture of the paper itself, but you have at least obtained a print. And if extra copies are wanted, the paper negative can be used repeatedly without the need again for the enlarger.

Enlargements from Popular Negatives

The most popular size of negative measures 3¼in. by 2¼in., this being the size made with Six-20 "Brownie" box cameras and folding cameras, and consequently, many readers will have this size of negative available. Here, again, only portions of the negative

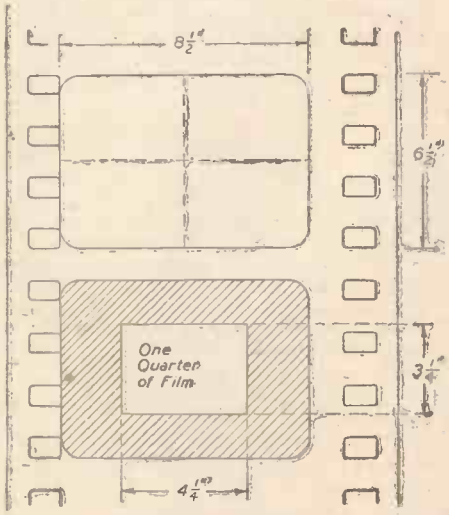


Fig. 11.—Only one quarter of standard cinematograph film can be enlarged, the shaded area being distorted.

can be treated successfully, but this is an advantage rather than a hindrance.

The enlarger enables one to cut out redundant matter in the negative. Let us assume, for instance, you have a good indoor snap (or time exposure) of, say, a lady friend and that, with exception of the features, the picture is somewhat spoiled by the surroundings.

Now, by making a half-plate size print holder and using half-plate printing paper, the snap can be turned into an excellent portrait, as revealed in the drawing, Fig. 12. A really "sharp" negative is essential, such as produced by high-precision miniature cameras, but the ordinary negative, while not producing a clear-cut picture, produces a "soft" enlargement which tends to enhance the features of individuals, so there should be no complaints.

Should the head be too large, as in the case of a close-up, it will not be possible to make any enlargement. Head and the shoulders should fit into the mask aperture. Fortunately, box cameras and folding cameras, unlike stand cameras, have a fixed focus which, unless a portrait lens is fitted over the original lens, does not enable close-ups to be taken. Objects have to be 5ft. to 8ft. distant and beyond 10ft. to infinity, seldom nearer, so that most 3¼in. by 2¼in. negatives give portraiture areas within a 7/16in. by 5/16in. mask aperture.

Printing Frame Sizes

If you prefer to buy ready-made printing frames for use with the enlarger as print holders, it should be noted that there is a variation in size of frames for plates and frames for films, as shown below:

It must again be pointed out that prints larger than half-plate size require a larger baseboard, with an increase in the length of the lamp house tubular rod upright and an extension of the lamp house arm. There is, too, a limit to the magnification possible with the enlarging lens used, and the reader should experiment to find sizes which give the most pleasing results (on a white card) prior to buying a print holder.

FOR PLATES (no glass)	FOR FILMS (with glass)
Size of rebate Print size	Size of rebate Print size
3¼ x 2¼in. .. 3¼ x 2¼in.	3¼ x 2¼in. .. 3 x 2in.
4¼ x 3¼in. .. 4 x 3in.	3¼ x 2¼in. .. 3¼ x 2¼in.
5¼ x 3¼in. .. 5¼ x 3¼in.	4¼ x 2¼in. .. 4¼ x 2¼in.
6¼ x 4¼in. .. 6¼ x 4¼in.	5¼ x 3¼in. .. 4¼ x 2¼in.
8¼ x 6¼in. .. 8¼ x 6¼in.	5¼ x 4¼in. .. 5 x 4in.

Glues, Cements, and Adhesives—3

Cold Glues, Pastes, Gums and Their Uses

By "HANDYMAN"

(*Continued from page 194, March issue.*)

Making Starch and Dextrine Pastes

SOME time ago I came across a recipe for making starch paste in which it was advised to add boiling water to dry starch and not first to make a "batter" with cold water. This scheme tends to produce lumps and the instruction that it should be strained through coarse linen is inviting a messy job. There is also danger of "cooking" the starch. The method I prefer is to make a creamy mixture of starch and cold water in a heavy receptacle, such as an enamelled iron pot or cup, and to place this in a saucepan of hot water which is brought up to a simmering boil while the starch is being stirred continually. A second gas-ring should be lighted, so that another supply of hot water is available, and this should be poured on as required until a lumpless sticky mass is formed, the process not going so far as to make it absolutely transparent. It should remain white like milk. Another method is to make it in a double saucepan, the creamy batter being sufficiently thinned out so that the right final bulk is obtained, no additional hot water being necessary. The secret here is to maintain stirring so that no part of the mixture is overheated.

Don't on any account make the mixture so hot that it becomes transparent, unless it is going to be used at once. The overcooking of starch causes it, I have found, to liquefy and lose its adhesive qualities in a few hours. The addition of a teaspoonful of nitro-benzine—quite a cheap chemical—and a thorough mixing up result in a mucilage with a fragrant almond-like odour. If the cold batter of starch is not brought to a temperature much below that which makes it translucent and a little gum arabic jelly is added with the nitro-benzine quite a good office paste is obtained.

Flour Pastes

I have always prepared wheaten flour paste in exactly the same way as the foregoing, with the batter in heated water, and with the addition of nitro-benzine have found the paste remain quite good for over four months. Previous to using this chemical I always employed alum, in the proportion of 1 to 20, put into the flour before making the batter. Alum in paste tends to abstract the water and also makes it more adhesive. It certainly prevents the paste going mouldy or decomposing, and its presence does not injure coloured work except perhaps gilt or bronzed paper.

In making paste the final mixture must not be cooked. This destroys the adhesive properties. Therefore, there is no object in letting the cup of made paste remain boiling in the outer receptacle. In fact, definite experiments in boiling the paste, after it has been made in the saucepan with the lid jammed on tightly so as to increase the temperature above the normal boiling point, have shown that the paste is not so good as before.

Glues and gums may be added to flour pastes, but make them a little more prone to go mouldy. The addition of one of the fish glues (as sold in tubes) is better than putting in a solution of carpenter's glue.

Don't attempt to make a flour paste in a cold receptacle, especially with a batter that is too thin. Flour requires to be brought more nearly to the cooking stage than dextrine or starch, and the heat abstracted from the applied boiling water may be so great in amount that the flour granules are not made hot enough to release the glutens. If more boiling water is added the paste becomes too thin for anything but special uses.

Gum Arabic

Gums are distinguishable from the resins—and there are many sorts of each—by a simple test. A true gum simply chars in a flame but a resin takes fire and burns smokily. A resin does not dissolve. Resin is soluble in methylated spirit or turpentine, but a gum is not acted upon in any way by these solvents.

Gum arabic is obtained from the acacia tree grown in the Sudan. It has been used since the days of the Ancient Egyptians, but was rediscovered about 250 years ago. The colourless variety is the best, and the best gum is odourless and tasteless and perfectly soluble in water, yielding quite a clear solution.

Gum arabic contains sulphur and is acid, which impurities render it liable to become mouldy and cloudy. It can be treated by dissolving it in a mixture of lime and water 1 to 5, adding a few drops of sulphuric acid. The lime is changed to sulphate of calcium, which will settle, leaving a clear solution of gum. This can be decanted off.

Uses of Gum Arabic

Common qualities are used for adhesive purposes—envelopes, postage stamps, etc.—and to prevent the gum from cracking a modicum of glycerine is added.

For the best cardboard model work such as architectural models the best gum arabic should always be used. There is no danger of the work falling to pieces, and I have seen examples which are now forty years old, and which are as good as the day they were made. The material recommended for all these models is Bristol board and no wood need enter into their construction—simply the fine cardboard and white gum arabic, built up layer on layer to give the necessary relief.

Gum arabic, being rather brittle when dry, does not affix labels and paper objects to smooth surfaces like glass or polished wood. To render it more elastic glycerine is sometimes added in the following proportions: 1 part gum arabic, 50 parts hot water and ½ part glycerine to attract moisture and thus tend to loosen the work. It, however, certainly lessens the brittleness of the gum.

Sulphate of alumina (note, not common alum) can be dissolved and mixed with the gum arabic jelly to make it more flexible. This does not attract the moisture. Sometimes a solution of sugar candy is added to a gum arabic mucilage to lessen its brittleness on drying.

Waterglass as an Adhesive

One of the cheapest adhesives for paper and other similar work is silicate of soda—the familiar waterglass or egg preservative. It should be used as it is obtained in a clear, sticky mass, without the addition of water.

(*To be continued.*)

Hydro-electric Equipment for Tummel Garry

THE present acute difficulties in obtaining coal supplies will give an added importance in this country to hydro-electric generation, and the progress of the North of Scotland Scheme will therefore be watched with great interest.

For the Errochty power station in the Tummel Garry scheme, forming one of the most important parts of the general project, the North of Scotland Hydro-Electric Board has placed a contract with The General Electric Co., Ltd., for the manufacture and installation of three vertical-shaft water turbo-alternators with turbines of Boving manufacture. Each alternator will have an output of 27,800 kVA M.C.R. at 11,000 volts, and the Boving turbines a specified rating of 35,000 h.p. against a 525ft. head of water.

It is of interest to note that as much of the plant as possible will be made in Scotland, where the water turbines will be built, and all the heavy forgings for the alternators produced. The electrical equipment will be manufactured throughout at the G.E.C. Engineering Works at Witton.

Messrs. Merz & McLellan are the consultants for this scheme, and it is hoped to complete the installation for the winter load of 1948.

Rocket Propulsion

The Vickers-Armstrong Project—Pilotless Aircraft for Transonic Research

By K. W. GATLAND

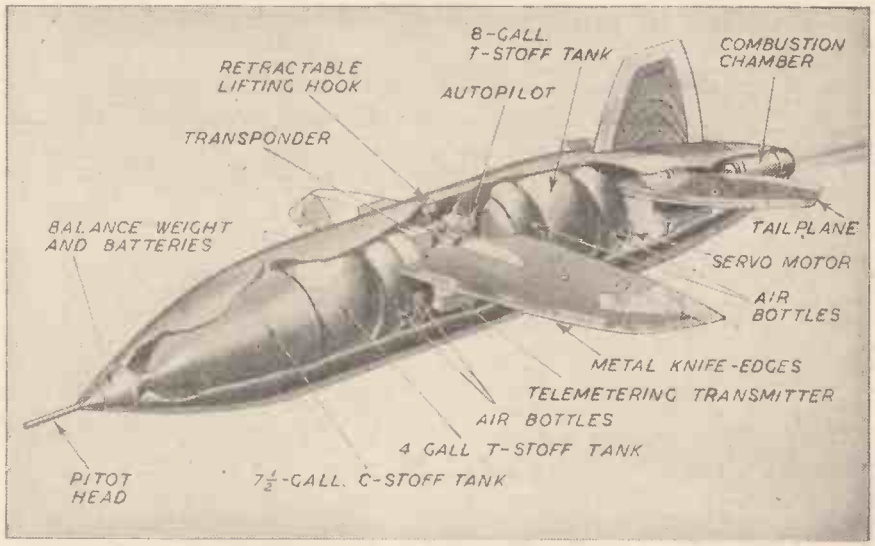
(*Continued from page 194, March issue.*)

THE first fully controlled aeroplane to achieve supersonic flight is almost certain to be American. There can be no doubting the success of the Bell XS-1 during its recent powered trials, and with at least three other machines featuring in the U.S.A.A.F.'s "S" (for sonic) programme, it would seem that some interesting times are ahead at Murac Flight Test Base, California. The Bell Aircraft Corporation is reported to have in hand a swept-back wing version of the XS-1, the XS-2, with Douglas developing an XS-3, a near "flying-wing," and Northrop a similar project known as the XS-4.

British Research Progress

It would be interesting to know exactly how all this compares with British research. On the surface, our progress seems slow. The Miles M.52 might well have been in the air *before* the XS-1 had its contract not been cancelled; and nothing further has been heard of the enterprising programme of research which features pilotless models built by Vickers-Armstrong, Ltd., first reported last July. The folly of passing judgment on the basis of public knowledge, however, is obvious.

In any event, a logical series of experiments with controlled models seems a proper *first* step. The ideal shape for transonic flight is yet a matter for experiment, and full-scale research at this critical stage seems in many ways a gamble—in life, material and man-hours. The tragedy which overtook Geoffrey de Havilland at speed in the D.H.108 is surely sufficient justification for not plunging directly into the design of piloted aircraft for even faster travel. This, however, is not to excuse the scrapping of a project so advanced as the M.52, with its detachable cabin ensuring reasonable safety for the pilot.



Sectionalised drawing of the Vickers-Armstrong rocket-propelled transonic aircraft.

The Vickers-Armstrong Project

The research programme which Sir Ben Lockspeiser, Director-General of Scientific Research (Air) at the Ministry of Supply, has before him should endanger no one, and yet provide complete data on a large variety of wing forms—and therefore virtually different aircraft—while involving minimum expenditure.

There are likely to be several models produced, each with some different arrangement of wing and tail, some tail-less, but all retaining the same bullet-like lines of fuselage.

The first model to come from Vicker's works at Weybridge was basically a 0.3 copy of the Miles M.52, and no doubt this has been produced mainly for static tests. Only when complete reliability is assured, both as regards its aerodynamic qualities and the accuracy of the air-to-ground recording system, can it be expected that models of other shapes will follow. In all essential respects, it serves the same purpose as the prototype of a full-scale aircraft, though the simile is not quite accurate. It was said at the R.A.E. when the model was first exhibited that five others would be built to this design.

The complete series will probably not be ready until sometime later this year.

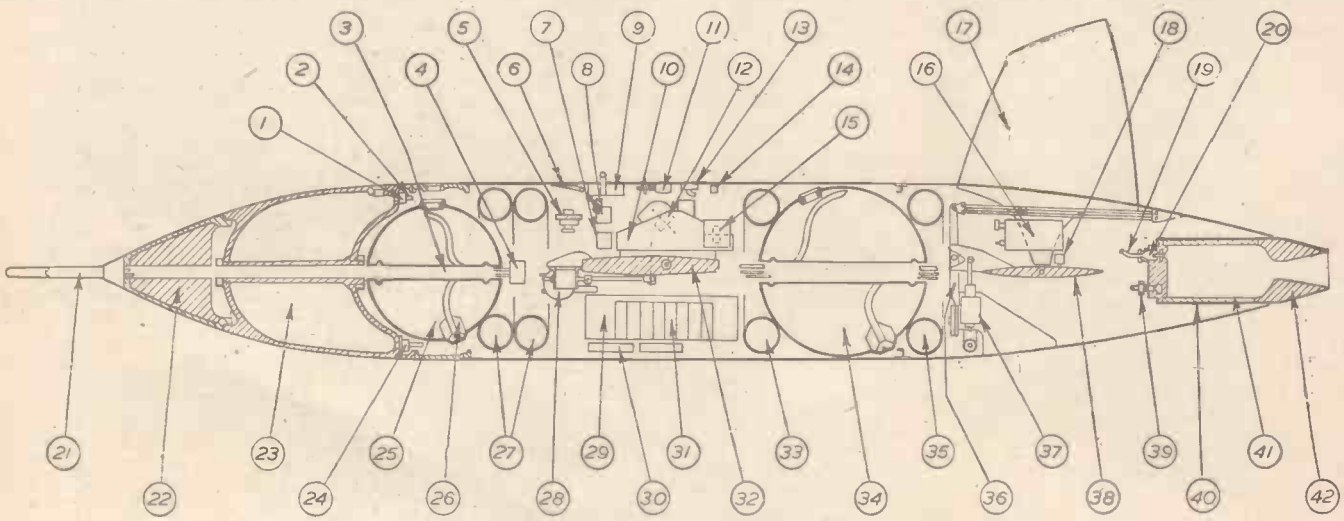


Fig. 94. Diagram of rocket-propelled aircraft giving nomenclature of component parts.

1. Non-return Valve in Air Pipe.
2. Air Pressure Pipe.
3. Pipe Conduit.
4. Air Speed Indicator.
5. Reducing Valve.
6. Hot Air—External Supply.
7. Longitudinal Accelerometer.
8. Normal Accelerometer.
9. Suspension Hook, Retracted.
10. Automatic Pilot.
11. Rocket-starting Starting Switches.
12. Position Gyroscope.
13. Electric External Services.
14. Air-External Supply.
15. Rate Gyroscopes, Roll and Pitch.
16. Radar Transponder.
17. Fin.
18. Reactance.
19. Hydrogen Peroxide Inlet.
20. Mixing Valve and Burner.
21. Pitôt Head.
22. Balance Weight.
23. Fuel—Alcohol Hydrazine Hydrate.
24. Safety Diaphragm.
25. Hydrogen Peroxide.
26. Anti Cavitation Vanes on Outlet Pipe.
27. Air Supply for Pressurising Tanks.
28. Servo motor for Ailerons.
29. Telemetering Six Channel Unit.
30. Oscillator.
31. Batteries.
32. Mainplane.
33. Air Supply for Pressurising Tanks.
34. Hydrogen Peroxide.
35. Air Supply for Controls.
36. Locking Device for Tailplane.
37. Twin Servo Motors.
38. Tailplane.
39. Alcohol Fuel Inlet.
40. Combustion Chamber.
41. Polygon Lining.
42. Carbon Venturi.

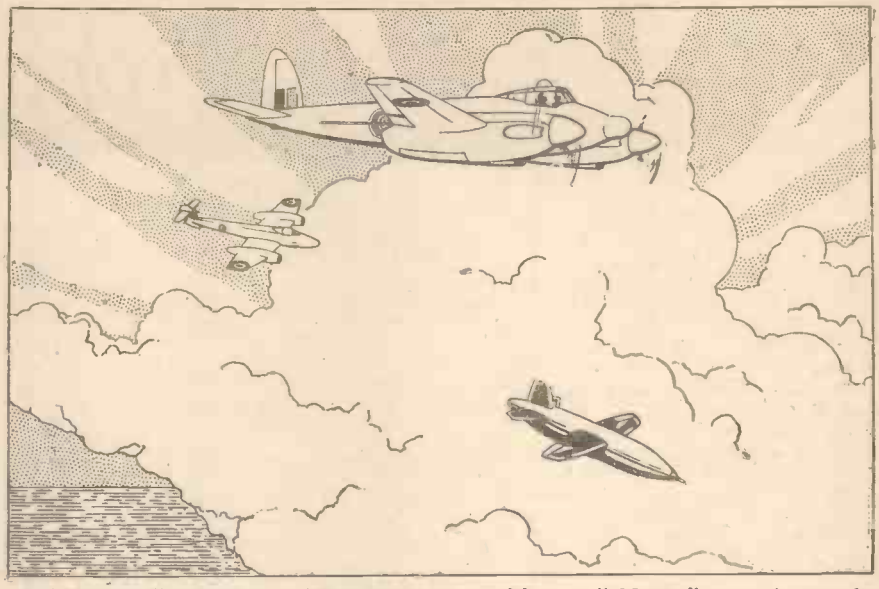
"Operation Transonic"

The scene for the actual flight experiments is set 36,000ft. above the Atlantic, a few miles west of the fringe of Cornwall, and a similar distance north of the Isle of Scilly.

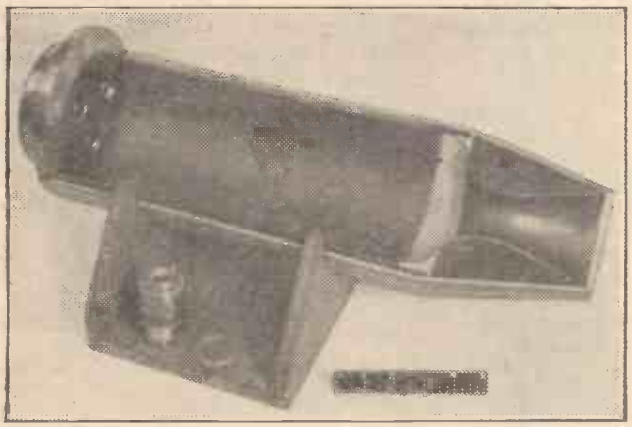
Each model will be taken up to height beneath a specially adapted "Mosquito" and released during level flight at 400 m.p.h. A single point suspension on the c.g. line of the missile is provided to secure the model beneath the 4,000lb. bomb-bay of its parent. To eliminate the drag that it would otherwise incur, this lug is spring loaded and immediately after release retracts flush with the skin surface.

The parent aircraft having dropped its load, climbs away sharply so that the slipstream of its propellers will have little chance of upsetting the model's trim. The auto-pilot in the missile comes into action immediately and a clockwork mechanism causes it to dive at an angle of 10 deg. for a period of 15 seconds before levelling out. There is a loss in altitude of about 1,000ft., which must be conceded to ensure undisturbed air and steadiness in the missile.

As soon as the missile assumes level flight, a diaphragm bursts and releases air pressure to the propellant system, feeding T-stoff and C-stoff in correctly metered proportions to the single combustion chamber. The mixture is self combusting and the resulting thrust drives the model up to sonic speed within the space of 18 seconds. It then continues to accelerate up to its maximum Mach number of 1.3 (at 35,000ft.) which is reached in a total time of 70 seconds.



A "Mosquito" releases a Vickers-Armstrong model as a "Meteor" races in to take cine-pictures.



Section of combustion chamber for Vicker's rocket unit, showing the carbon venturi.

The propellant exhausts at this point and a horizontal glide of about 2-1/2 miles follows. Then, having decellerated to subsonic speed, the auto-pilot locks down the tailplane and the model plummets into the sea. From the time of release it will have covered over 22 miles in level flight, having attained maximum speed (880 m.p.h.) after travelling some 12 miles.

The course of each missile will be plotted by radar from a station in the Scilly Isles. This is arranged quite simply, a signal transmitted from the ground being picked up by the missile's *transponder* and retransmitted on a different frequency. At the same time, the pilot of a Gloster "Meteor" will attempt to obtain cine-photo's, and thus a complete picture of what happens during each test will be built up.

Advantages of Air Launching

The Vicker's models represent a considerable advance over those of the German "Feuerlilie" series; and not only because of their remarkably simplified power plants.

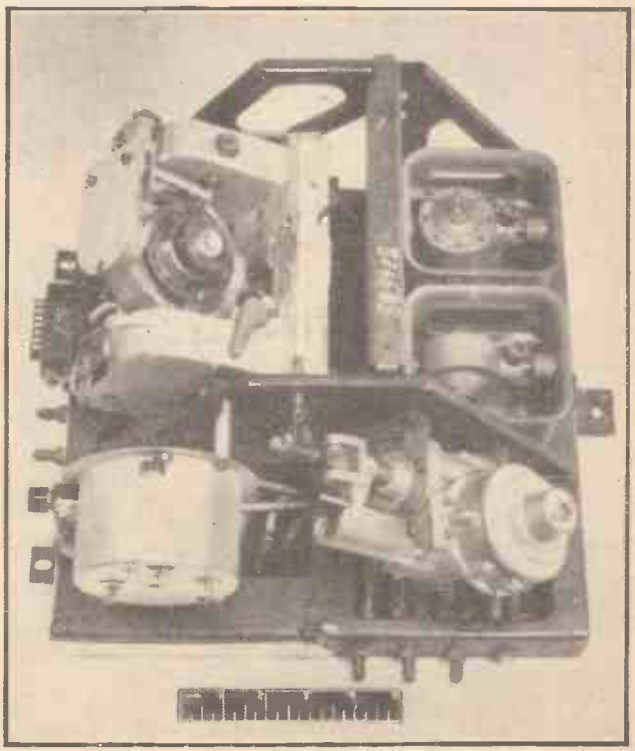
A rocket will operate with maximum efficiency only at *high speed* and in rarified atmosphere, preferably in *vacuum*. The Germans achieved the former ideal with di-lycol boosters, but by no means could they operate their missiles at effective altitude. It was not a case of no suitable aircraft being available. There would have been no difficulty in converting an Me.110, for example, to carry them up into comparatively rarified strata—the great problem was to obtain data from the models once they were released.

The German technique depended upon tracing the trajectory of models by means of cine-theodolites which, with air launching, was obviously out of the question; and having no such device as the telemeter, there was no ready solution. The use of graphical recorders within the models might have been a way out but for the fact that there was no apparent method of retrieving them in one piece. More often than not, a small crater in the ground would mark the resting place of a model and so there seemed no future in integral recording. Radio-control, with the possibility of bringing the models into a reasonable landing was likewise no salvation; the effective controlling range was not sufficiently great, and size and weight were also against it.

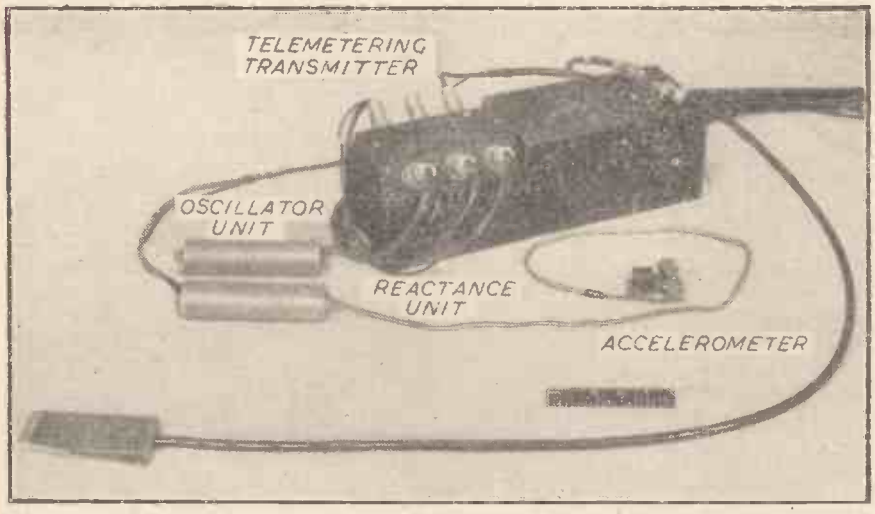
It is surprising that the only real solution, that of ejecting the instruments with their recording drums and landing them by parachute, does not appear to have been attempted. Such a device need not have been excessively complicated.

The Vicker's models operate under no such handicap. Despite their small size—the "first off" was only 11.83ft. long and 8.1ft. in span—each has its own telemeter which transmits six simultaneous readings; of dynamic pressure, static pressure, normal acceleration, longitudinal acceleration, combustion chamber pressure and tailplane angle. These signals are picked up by the ground station where the data is recorded and later tabulated to give comparative figures of performance for the entire series.

Accuracy and *simplicity of operation* are the key-notes of the telemeter which is becoming important in all flight test work. With parallel progress in radio-control, it should soon become possible to carry out the testing



The auto-pilot adapted from the V-1 unit. Components are as follow: (top left) position control gyro; (bottom left) clockwork mechanism; (top right) pitch control gyro; (centre right) roll control gyro; and (bottom right) altitude control unit.



The telemetering transmitter. The input leads for the six measurements are clearly shown. Note also how the metal insert in the wing leading edge is utilised as an aerial.

of full-size aircraft entirely by remote control. Perhaps this course will be adopted after the complete programme has been flown off, and data is available for the design of a full-scale transonic machine.

The Vicker's Project in Detail

The three main features that technicians of Vicker's and the R.A.E., Farnborough, are building into their transonic missiles are: (a) a bi-fuel rocket system based on the German "cold" units, yet of greater simplicity and improved efficiency; (b) an auto-pilot, and (c) the all-important telemeter. It is clear that German research has contributed much to the *detail* design, and yet it is the refinements made in the rocket system and the incorporation of the telemeter that, coupled with air-launching, have made these models outstanding.

The Rocket Unit

One of the most striking features of the rocket system is the simplicity of its combustion chamber. It is truly a remarkable piece of work and comprises only four main parts. The size and make up of the unit can be gauged from the accompanying photograph and it will be seen that there is a steel outer casing, swaged down at one end into which a machined carbon venturi fits. A $\frac{3}{8}$in. thick polygon insert protects the walls of the chamber and both this and the nozzle are set in position with a special ceramic paste, the joint being smoothed off to ensure good flow conditions. The injector plate, with its three stainless steel inlet nozzles, completes the assembly—the result, a perfect job without a single rivet or bolt. Approximate dimensions of the carbon nozzle are: throat diameter, 1.5in. mouth diameter, 3.5in., and the distance from the minimum throat diameter to the mouth, 4in.

The thrust developed by this motor is 209lb/lb. fluid second; the specific consumption, 17.2 lb/lb. thrust hour, and the actual temperature rise, 1,750 degrees Centigrade. As already mentioned, the unit operates on T-stoff and C-stoff, the same propellant as used in the Messerschmitt 163. These comprise hydrogen peroxide of 80 per cent. concentration (T-stoff) and a combination of 57 per cent. methyl alcohol, 30 per cent. hydrazine hydrate, 13 per cent. water. A small amount of potassium cuprocyanide is added to the C-stoff to catalyse the peroxide, thereby ensuring spontaneous combustion of the two components when they meet in the chamber. The actual fuel/peroxide ratio (by weight) is 0.300.

The swaged end of the rocket motor is exposed to the airstream at the missile's rear. There are two spherical tanks for the T-stoff, having a total capacity of 12 gallons, while $7\frac{1}{2}$ gallons of C-stoff are carried in an annular casting at the nose. Three tubular tanks in the shape of rings (in a word, "toroidal") comprise the other main items of the propellant system, supplying air to pressurise the propellant tanks. A fourth toroidal container is provided as an air drive for the gyroscopes. The location of these components will be apparent from the drawing, Fig. 94.

It will be seen also that a pitôt head projects from the nose of the missile and that the readings are conveyed to an air-speed indicator placed just aft of the small T-stoff tank, the capillaries being taken through the centre of each of the forward tanks. A similar arrangement allows for the passage of feed lines and electrical leads through the aft T-stoff tank.

The longitudinal accelerometer, normal accelerometer, and auto-pilot are all situated above the mainplane, with the six channel telemetering unit, oscillator and batteries beneath. The radar transponder is mounted above the tailplane.

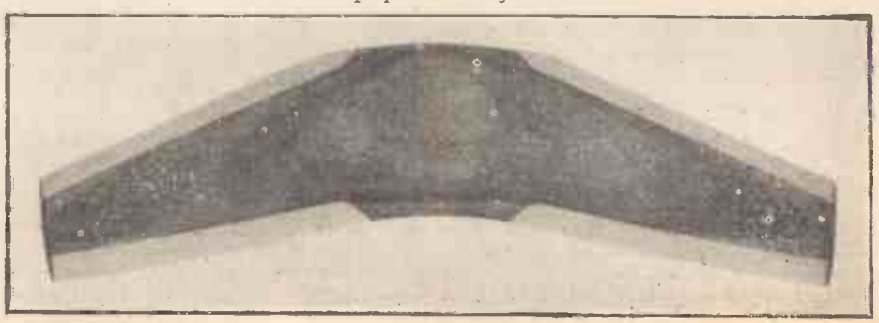
Constructional Detail

The fuselage shell is of light steel, 18in. in diameter with an ogival nosing and tapered towards the rear. The supporting and stabilising surfaces are all true bi-convex sections, the mainplane constructed in laminated mahogany, and the tailplane and fin in laminated birch.

An ingenious feature of the wing make-up is that stainless-steel "knife-edges" are bonded into the upper surface of the leading edge, serving the purpose of aerials for the telemetering transmitter, with similar profiles of light alloy let into the lower surface of the trailing edge and at the tips. There are also light alloy plates bonded into the centre of the top surface and others near the aileron cut-outs to strengthen the structure. The tailplane and fin embody similar inserts, those in the leading edge of the former being utilised for the radar transponder.

Both wing and tailplane are single-piece units passing through the fuselage. The wing is rigidly fixed at 0 degrees 33 minutes to

Birch wing for the Vicker's transonic rocket aircraft.



(Above) Mahogany wing, and (below) birch tailplane for the Vicker's transonic rocket-propelled aircraft.

the body axis, and the aileron links (from servo unit to the aileron lever arms) are taken through internal channels. Like the arrangement for the Miles M.52 (and also in the Bell XS-1), the tailplane is "all-moving." It is pivotally anchored so as to obtain elevator effect under the action of its servo motors, having a range of movement 8 degrees down and 5 degrees up. The lower part of the fin, rooted approximately a quarter the overall length of the fuselage from the rear, provides a point of pivot for the tailplane.

Conclusions

It is inevitable in a research undertaking of this nature that many alterations will be necessary before final perfection is achieved. The telemeter, for example, though a development of far reaching importance, is still virtually untried (especially in a machine of model proportions) and if, in the course of preliminary trials, its accuracy should be found anything less than 100 per cent., the missiles will not be acceptable for their exacting job. It will obvously be no use building the complete series of models if no account can be made of their performance.

New technique presented by the use of a transponder may prove equally troublesome.

No doubt there have been, or are yet to be, free-flight tests of the preliminary models to ensure good flight and control characteristics, after which it may well be that some components will require modification, perhaps complete redesign. Thus, the experimental work may be expected to continue for some time until, in the light of further flight tests, the design is found to possess no apparent fault. However, as nothing has been heard of the project for some time, it seems likely that a fair amount of the ground work is by now completed.

Those contributing to the Vickers-Armstrong project are to be congratulated on a very plausible approach to some difficult problems. The programme is admittedly less spectacular than the American, but it is nevertheless of great importance and may still pay dividends should tests prove the A.A.F.'s "XS" series premature.

(To be continued)

A 12ft. All-wood Canoe

Constructional Details of an Inexpensive Craft for the Amateur Canoeist

By R. J. CHAMBERLAIN

An easily-made craft designed for speed and buoyancy.

THIS canoe has been designed for speed, extra buoyancy and grace in shape. It is made entirely from wood, such as deal. This helps to keep the craft light in weight and, despite the softness of deal timber, it is strong—much stronger than a canvas-covered canoe.

It has a large water-tight compartment at the bow and three smaller water-tight compartments aft. Thus, in the event of a capsize, the canoe will not sink should it become flooded with water. In any case, every canoeist should be a person who can swim, particularly if fond of "coasting" around a seaside resort or crossing large inland lakes.

To fully appreciate the length of the canoe illustrated, a distance of 12ft. should be marked out on the ground. It may be considered that the craft is too long, but one feels a sense of greater security in a 12ft. canoe than, say, a 9ft. model. Indeed, some canoes are over 14ft. long.

The length of 12ft., with a beam (width) of approximately 24in. and a bow depth of 14in. and a stern depth of 8in. ensures that the canoe is suitable for carrying most individuals. It is intended for a single passenger only, but if a craft is wanted for two youths, it is a comparatively simple matter to build the craft as a double-seater type. This could be done by extending the fore end of the cockpit to the nearest forward hull-former framing, extending the length of the three footing laths and adding extra cross-pieces to make the extra seat. This alteration in plan may, be it noted, have effect on the construction of the craft, as described in this article, and the reader must make allowances, and use his own ideas.

A Suggested Design

To be quite frank, the sizes, drawings and shapes are presented more with a suggestive view in mind rather than a set principle. The construction is on the simplest lines possible with wood. Having got the general idea, the reader can no doubt plan his own particular canoe.

He should, to make his craft graceful, adopt the long, tapering bow and the "angled" deck and hulls. Wooden canoes with vertical hulls and bottoms identical in size and shape as the decks are easier to build, but lack a graceful, streamlined appearance.

The extremely high bow means that one can dash through fairly high waves in a choppy sea with a minimum of splash or spray. The cockpit coaming is an extra form of breakwater. Due to the shape of the deck (which slopes at each side from the centre) water trickles off almost immediately. And since the bottom is much narrower than the deck width, the craft, unlike the equidistant-sided type, will "settle" better in the water. These points must, therefore, be borne in mind.

The Bottom Shape

To lay the "keel," prepare the bottom piece. This consists of two 10in. wide by ½in. thick shelving boards tongued and grooved together, or alternatively, dowelled together, using ½in. dowelling and marine (waterproof) glue.

It is advisable to adhere the boards together unshaped and, when the glue dries, trim the joint with a smoothing plane and then proceed to mark the curvature shape. This is best done with a long lath of wood which bends easily. The lath is affixed with a nail at one end of the joint, kept out to width at the centre with another nail, then bent to the joint of the board at the other end and nailed. The bent lath serves as a guide for the pencil.

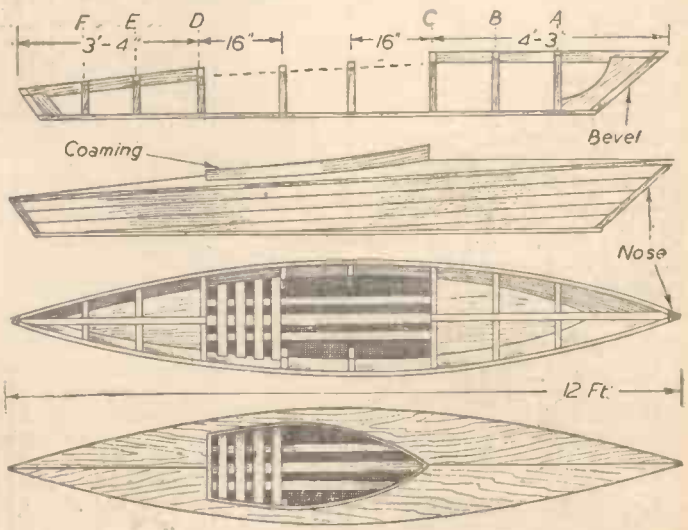


Fig. 1.—Side elevation of skeleton framework, with plan views.

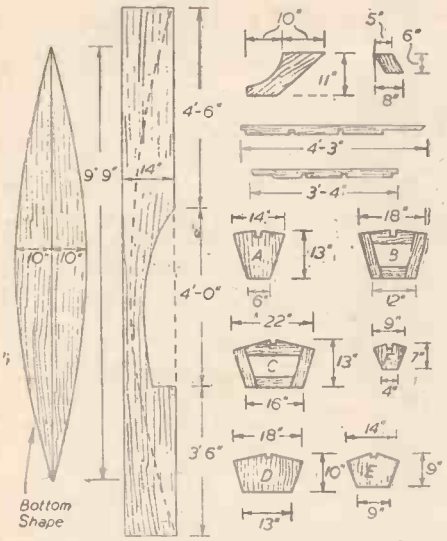


Fig. 2.—Bottom and deck shapes, with details of end posts and hull formers.

The other side can be marked in the same way, or by means of the waste wood when cut away. Cutting is done, of course, with a bow-saw or keyhole saw. The edges should not be trimmed until the hull-former frames are attached, as these will give the necessary angle to which the bottom edges are planed.

Hull-former Frames

The hull-former frames A, B, C, D, E and F (Fig. 1) are cut either from ½in. wood or ⅜in. stuff. The formers B and C are made as frames, being dowelled together, the others being cut out from solid material, rub-jointed together to make up the width or, better still, to ensure strength, they can be dowelled together.

Approximate dimensions are provided. The top centre of each former is notched to take the deck bars. The latter, including the bow and stern posts, must be cut from ⅜in. wood, as shown at Fig. 2. Attach the bow and stern posts to their respective bars, then add the hull formers. Use glue and 2in. oval nails. A few nails driven into the posts and a single nail at each former will suffice. The top edges of the bars are bevelled to conform with the angle of the formers, so all nail heads should be sunk slightly with a nail punch.

This bevelling is best done when the framing has been fixed to the bottom board. To do so, set the work temporarily in position and mark the position of the formers and end posts with a pencil. Make holes between the pencil lines with a bradawl or drill for 1¼in. by 6 flathead brass screws, countersinking same on the opposite side, i.e., the under side, of the canoe bottom board.

Having secured the framing temporarily with a few screws, the parts are finally glued and screwed together. If marine glue is not available, use a thick paint, such as old oil paint or tar paint. When driving home the screws, partly fill the holes with putty. Afterwards, conceal the screw heads with putty and level off with glasspaper. Iron screws may be used, but these are liable to rust. The edges of the bottom board are planed to the angle of the formers, and the end posts bevelled.

The Hull Boards

The view at Fig. 3 shows the constructional work clearly, and although the "skeleton" may seem frail, the addition of the hull boards and deck makes everything strong and rigid. Regarding the hull boards, the best material to use is ⅜in. thick matching (tongued-and-grooved sheeting) boards. This stuff is made in the popular width of 3½in., but may also be obtained about 2½in. wide or less.

The latter is more easily "bent" around the hull framework. Sheeting is normally obtainable in lengths up to 14ft. Pick lengths free from loose knots and cracks as much as possible. The first length to be attached has its grooved edge planed away (see Fig. 4). When attaching it, have the end projecting a few inches beyond the bow post; apply thick paint to the formers and use small screws or copper nails which take a good grip. Should the posts themselves not afford a good grip for the nails or screws, strengthening block strips could be added, planing same to conform with the curvature of the work.

Having attached one board, a second length is added. It needs to be bent and forced close prior to securing with nails or screws. There should be a guide line marked on the first hull board, central with the edges of the formers. The tongues and grooves should be coated with paint to keep the joints waterproof.

If you have difficulty in obtaining sheeting, an alternative is to fit "stringers" (laths of wood about 1½in. wide by ½in. thick) at each side of the framework. The stringers are kept about 2in. apart, the topmost being flush with the formers, this also applying to the bottom side, the remainder fitting between.

The spaces between each stringer at the formers are packed with strips of ½in. thick wood. When the stringers have been attached, they are covered with roofing felt. This is carried out after applying paint to the stringers. Before the deck is added, the interior of the canoe is liberally coated with oil paint to make all joints completely waterproof. If desired, red lead paint could be used.

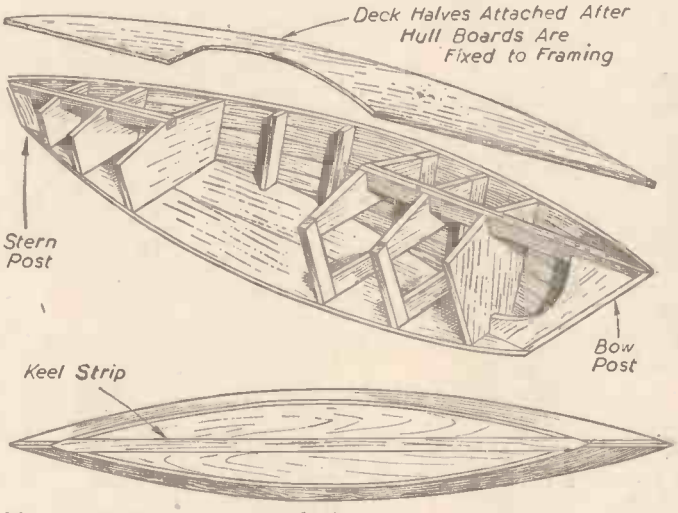


Fig. 3.—General constructional view, with underside view, showing keel.

The Deck Shape

Assuming you prefer to use matching board for the hulls, proceed in the manner already described. Owing to the gradual decrease in width from the bow to stern, some lengths become shorter. Allow the ends to project beyond the bottom board for cutting flush later on with a panel saw. The projections at the bow and stern posts are also cut level with the posts and the meeting ends "pointed" with nosing pieces (see top view at Fig. 1) which are painted and nailed on.

The deck consists of two half shapes. In order that these lie flat, the top edges of the hull boards and the bow and stern deck bars are bevelled to the angle of the formers with (preferably) a sharp, finely-set try-plane or steel jack plane. The deck, of necessity, must be made as separate halves.

One of these halves is shown in Fig. 3. The width of the boards used is about 14in. Since ½in. deal shelving material is never more than 11in. wide, it is essential to dowel two 7in. wide boards together, or use widths which make up 14in.

It is also imperative that the half cockpit shape is cut in each board. This permits the wood to be "twisted" midway so that it lies flat on the tops of the formers. Therefore, having prepared the two boards and cut out the half cockpit shapes, the joining edges are bevelled to meet correctly (see enlarged mid-sectional view—Fig. 5).

Lay one board so that its bevelled joining edge is central with the deck bars and nail down temporarily. Attach the opposite board similarly. The curvature of the hull sides is then marked by scribing with a pencil, following which the deck boards are removed and cut to shape.

When this has been carried out, the interior sides of the deck boards are painted, then laid down permanently with oval nails. Use 1½in. long nails and to prevent splitting the wood, and to ensure that the nails drive straight into the edges of the hull boards, make suitable holes with a bradawl. All nail heads are sunk slightly with a punch and concealed with putty. The deck edges are trimmed with a smoothing plane and rounded slightly; this will also apply to the bottom edges. Any gaps or fissures in the hull boards, when shortened, should be filled with putty. Putty sticks better to a painted surface, so it could be used after the woodwork is given its primary coat of paint, which may be red-lead paint.

The Coaming

Note the two upright "rib" members fitting against the hull boards midway in the cockpit (see Fig. 3). These strips are best fitted prior to attaching the deck boards, being secured with screws. They serve as strengthening battens to the hull boards.

The rim of the cockpit space is surrounded with lengths of ⅜in. matching board, the tongue and groove being removed. The strips should bend easily to correspond with the curvature of the shape, but if not, bending will be facilitated by making a series of

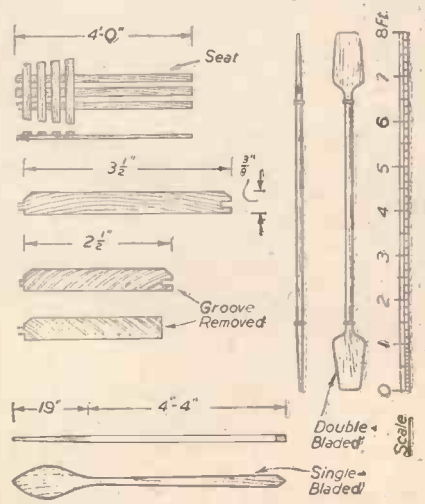


Fig. 4.—Details of seat, paddles and sections of tongued-and-grooved sheeting material used in making the hull.

3/16in. deep cross cuts in the strips about 1in. apart. The kerfs " close " against each other as the wood is bent.

Attach the curving strips first, with the fore ends mitred. The back piece goes between. Have the coaming attached with paint and raised-head screws or ordinary flathead screws. If raised-head screws are used, it will still be necessary to countersink the holes slightly, as such screws have half flat-head and half-round-head heads.

Seat, Keel and Paddles

The seat, as shown in Figs. 1 and 4, is formed by arranging three floor slats together, with the seating laths on top, the latter being about 2in. wide by ½ in., this also applying to the three floor slats. The pieces are merely nailed together, then screwed to the canoe bottom.

To project the underside of the canoe, and also help to give extra strength to the joint, a keel lath (running the length of the craft) should be attached; it can be cut from ½in. wood 3in. wide. The keel is clearly seen at Figs. 1 and 3.

Regarding a suitable paddle, details of a double-bladed type are given in Fig. 4. This may be made from a 1in. thick deal board 8ft. long by 8in. or 9in. wide. It will be observed that the blades are planed to taper at the tips. Drip rings, near the shoulders, are necessary to prevent the water running down the shaft into the hands; these rings can be formed with a binding of cord. The rings could be placed nearer the middle of the shaft.

The single-bladed paddle is made from a deal board 6ft. long by 9in. by 1in. When cut to shape, and the blade tapered, all edges should be smoothly rounded by spoke-

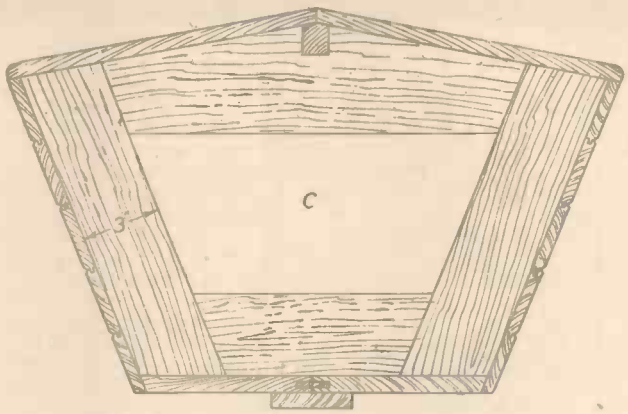


Fig. 5.—Mid-sectional view at hull former C.

shaving and glasspapering. To finish off, apply two or three thin coats of oil paint.

Canoe Finish

The canoe itself is finished by applying two thin coats of oil paint, or a hard-gloss enamel paint, over the foundation coat of red lead. Colour depends on individual tastes, but as this is a bright, modern age, the writer suggests bright colours. Light green (on the exterior) and bright red (on the interior), with paddles to match, is an attractive combination. And to make everything complete, fit a strong screw-eye to the bow and provide a mooring rope, with S-shaped hook at one end for engaging with the hookeye. This rope can be stored in the "open" compartments. You might also care to finish your craft with a name which can be neatly lettered on the bows with black or red paint.

The canoe has a fairly shallow draft so that it can be used on shallow waters. It will, too, stand up to a lot of hard buffeting and accidental collisions with submerged boulders or rocks. The wise canoeist will, however, avoid as much harsh treatment as possible, remembering that sudden bumps cause strain and the breaking of joints in the wood.

In conclusion, it might be added that, in the event of very slight leakages of water into the watertight compartments, due to severe bumping, it is a good idea to have outlet holes in the decks which are plugged with a cork. These holes are, of course, bored over the watertight compartments only.

The Road Safety Exhibition

By the MARQUIS of DONEGALL

WE have to face the fact that in any exhibition of this kind we are merely skimming the surface of the problem. The twentieth century has let loose a number of lethal weapons on society. Of these the motor-car is one and atomic energy is the latest. Science has outpaced human capacity for assimilation and its capacity for mastering the principles involved and using them solely for its own advantage. It takes the lion-tamer many years to learn exactly what he can safely do with lions.

But mankind has not been granted a long enough period to reach even the realisation of the dangers that lurk in the creations of its own genius.

Of these dangers, the motor-car is the most commonplace and is the one which we have had longest to get used to. It is more pacific than most of them in that, unless it is misused, it will be a useful servant. It will not destroy you from an altitude nor, in peacetime, will it throw things at you in anger. It will only turn savage if one of two parties does something foolish.

Pacific as its intentions are, humanity has so failed to understand its destructive possibilities that it has been forced into the top rank of life-destroyers, and vies only with heart-disease and other natural causes as a destructor of human life.

We do not want to go into morbid statistics. Let one or two suffice: Over six hundred people were killed in London alone in 1946, and deaths averaged 14 a day for the whole country. But twenty-eight thousand cases of injury in the same year is astronomical. The L.C.C. ambulances answer an average of 130 emergency calls per day.

Persuasion and education are all very well—this exhibition is good, and it is organised entertainingly, in so far as such a gruesome subject may be entertaining.

I will leave it to child psychologists to ponder on the case of the brother and sister who returned from the exhibition and started a new game which consisted of running into the chairs and knocking them over. Asked what they were doing, the six-year-old girl said: "We are playing accidents, and we have already killed ten pedestrians!"

The Miles Tester

On entering the exhibition I turned to the right at the top of the wide staircase and found that the driving-test on the Miles Tester was in progress. This reminded me a good deal of the blind-flying trainer which I tried during the war at an R.A.F. aerodrome. I finished up by doing a spin straight into the ground from 3,000ft., but they were kind enough to say that a fighter squadron-leader had done even worse on his first effort only the day before.

So it is with the Miles Tester, in that the steering being very light it is quite easy to run off the edge of the road and even through the hedge or into a tree.

The road that unwinds in front of the stationary "car" looks just like one of those films that one often sees at the movies when the shot is being taken along the bonnet of a moving vehicle.

I was much surprised on being invited by one of the representatives of the Royal Society for the Prevention of Accidents to go behind the scenes to find that the effect was not produced by the back-projection of a film.

The system employed consists of a revolving circular glass turntable which increases in speed as the accelerator pedal of the "car" is pressed. On this turntable are miniature road and scenic effects, the hedges being about ¼in. high, roughly on the gramophone-record principle. It is a small light controlled by the steering-wheel of the "car" and suspended on to the road that back-projects the impression of a film to the person being tested.

"In that case," I asked, "you could easily go through a hedge?" "Yes," said my expert, wistfully. "People do and we have to spend a lot of time reconstructing the things they knock down on this turntable."

Apart from the steering test, which is really easy if you are careful, they give you a reaction test. You have to pull up as quickly as possible when you see a little red light go on at the end of the bonnet. They say that the average reaction is seven-tenths of a second. Mine was three-fifths of a second, and my driver (who, I must admit, had been tipped off by me exactly what was going to happen) got all the credit by registering half a second.

The experts freely admit that this tester, excellent as it is in principle, can be improved upon. They are trying to devise ways whereby realistic pedestrians could dash across at a distance where it is possible to avoid an accident if the person being tested does the right thing. They are also trying to provide the complications of oncoming traffic.

Road Safety Competition

Feeling that we have not done as well as we might, we emerge from the Training Booth and take a look at the prize-winning posters designed by London schoolchildren in the Road Safety Competition. By far the best is that of Derek Stokes, of Forest Hill, entitled "Beware of the Shadow on the Road." The shadow is a skeleton in front of an oncoming car, and the whole poster is well conceived and executed.

Some of the posters devised by the Royal Society for the Prevention of Accidents are well designed to appeal to schoolchildren. One shows Mary and her little lamb:

"She toddled off to school each day,
The lamb behind her strode,
But at the kerb they looked each way
And safely crossed the road."

In a room apart is the display of the L.C.C. Ambulance Service. An extraordinary array of instruments and aids to releasing trapped, gassed and semi-drowned casualties is on display. A large map of the London area shows a typical ambulance day by means of pins to represent each emergency call. I had started to count them when a helpful ambulance attendant informed me that there were 130.

We then pass to the main hall, where as much entertainment as possible was provided for the youthful element—almost on the fun-fair principle. Plenty of buttons to press, illuminating panels which in sequence told the story of the consequences of some rash action. Conversely, other machines show how no harm results if traffic is treated with respect.

At the recent Road Safety Exhibition Mr. Alfred Barnes, the Minister of Transport, tries out the Motor Trainer, designed for testing the motorist's reactions to various traffic emergencies. The test, watched by the Lord Mayor of London, Sir Bracewell Smith, is being conducted by a member of the Metropolitan Police.

Demonstration of Braking Power

Perhaps the most fascinating exhibit from the pont of view of boys aged seven to 70 is a demonstration of braking power. Given that the normal person takes seven-tenths of a second for the eye to connect through the brain and muscles to the brake and clutch-pedals you get the following result :

(1) At 10 m.p.h. you go 10ft. before your reaction takes effect and a further 5ft. to pull up.

(2) At 20 m.p.h. you go 20ft. to react and 20ft. to come to a standstill.

(3) At 30 m.p.h., 30ft. for reaction and 50ft. for the brakes.

(4) At 40 m.p.h., 40ft. and 85ft.

(5) At 50 m.p.h., 50ft. and 125ft.

In order to demonstrate this and induce people to have their brakes periodically tested, the organisers had set up a gadget resembling one of those roller coasters that used to delight some of us in our gardens, as children. At the top of the slope you could adjust a miniature car so that its brakes would be 100, 50 or 25 per cent. efficient. Having let it run off from the top of the slope, you could then go down and verify on another dial the equivalent of how many feet it had taken to pull up.

So much for the exhibition, which was certainly admirably organised, entertaining, and can but do good. I feel, however, that all such things only nibble at the problem, and that if education continues to fail to stop at any rate the increase of road accidents, something much more drastic will have to be done to protect the public—I include all forms of road users—from the consequences of their own carelessness. It is, of course, the duty of the State to make the roads that exist as safe as possible, to build by-passes, fly-overs, tunnels, cycle-tracks, etc. But as we seem incapable of even building houses at the moment there will be a vast army of casualties long before we can hope for anything of that sort to happen.

Fines for Road Carelessness !

In the meantime, I suggest that the situation calls for drastic action, and as dictatorial measures are not entirely unknown to the present Government I suggest that road carelessness on the part of any road user should be punishable. Motorists are already pretty efficiently hemmed in by regulations and known penalties for infringing them. It would be unfair to increase these penalties and thus further lay the onus of accident on one section of the road-using public while inevitably increasing the carelessness and, in some cases, dare-devilry of another section.

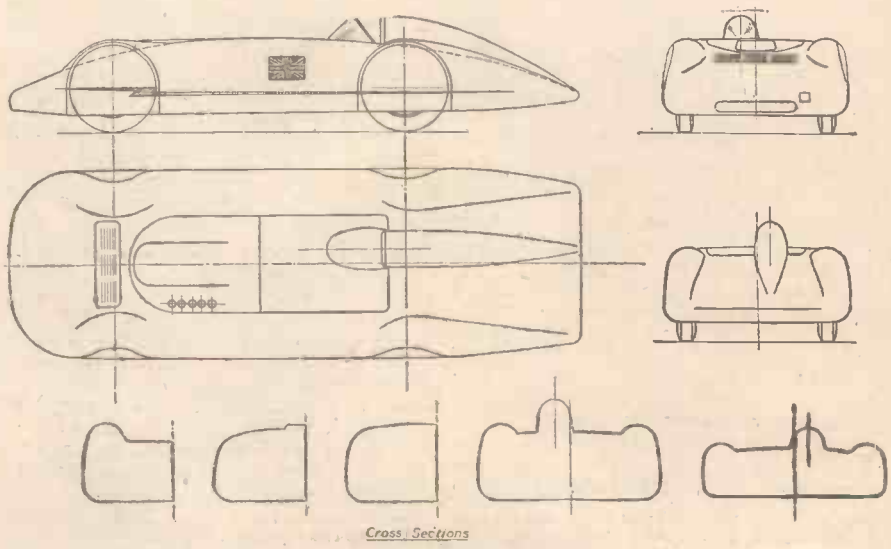
It might be somewhat difficult to fine a quarter of the nation every day, but the mere knowledge that you are committing an offence and are liable to a fine—as opposed to being frightfully clever—if you ask for death and escape it only by the skill of a driver, or successfully negotiate a busy thoroughfare without using an island, would have far-reaching results.

I firmly believe that a hundred or so well-publicised fines for careless walking every day for a week in all the major cities of the British Isles would have a greater psychological effect than all the costly propaganda and exhibitions.

As to the practicability, far more dictatorial things have been done in this country since the end of the war than to issue every policeman with a book of half-crown and five-shilling fine tickets and let him use his judgment, as indeed is already done with great success in Madrid.

Scalemobile Blueprints

WE have received two examples in the series of blueprints published by H. Pratley, 72, Walpole Road, South Woodford, London, E.18. These blueprints give scale details of the Gardner-M.G., the world's fastest light car, and the 1938 winner of the Segrave Trophy. Measuring 22in. by 14in. these prints are intended for model racing car enthusiasts. The accompanying illustration is a reproduction of one of the blueprints, the other one giving fully dimensioned details for a ½in. to 1ft. model. Interested readers requiring further information on the subject are invited to write to the address given above.



A reproduction of one of the Scalemobile blueprints (greatly reduced).

The Mystic Art of Alchemy

Some Strange Beliefs of an Age-old Chemical Cult

ALCHEMY, that infant, semi-mystic cult of chemistry, which, in many countries, flourished exceedingly for a thousand years or more, died a hard, lingering death.

Indeed, even at the present day there seem to exist a few people who harbour alchemical notions just as there are fanatical thinkers who persist in asserting that the world is flat. And so, despite the mighty creations of scientific chemistry, we come across, now and again, a few isolated " adepts " who endeavour to resurrect alchemical notions and to place them on a basis of experimental fact.

Alchemy is practically as old as mankind itself. As soon as man found that by mixing one material with another and that by treating the mixture in some special way he could make something new, something having altogether different properties from those of the mixed ingredients, then alchemy began.

The Chinese had their alchemists and their alchemical systems. So, also, had the ancient Hindus. The Greeks despised the art, and so did the Romans, because to those great nations anything which savoured of experimental demonstration was mean and ignoble, and unworthy of the attention of any serious thinker.

But the ancient Egyptians were confirmed alchemists. Through their alchemical cults they seem to have discovered various chemical facts and processes such as the different methods of embalming the dead, of making colours and paints, of working in metals and of medicine-making. Indeed, many of the mediæval alchemists in England and in other European countries looked to these old Egyptians as the first originators of their cult. Particularly did they refer to one *Hermes Trismegistos* as the father of the alchemical art. This ancient alchemical adept is supposed to have lived in Egypt about the period B.C. 3,400 and to have contributed some 36,000 original writings to alchemical literature.

The Hermetic Art

The best known of these is the Emerald Table of Hermes, which consists of a number of mystic precepts for the guidance of ardent alchemists which are frequently quoted in the ultra-fantastic and quasi-occult writings of the mediæval alchemical enthusiasts.

A mediæval alchemical laboratory which was reconstructed in Liepzig, Germany, previous to the war.

From Hermes we get the old name of alchemy—the " Hermetic art." Our present expression, " hermetically sealed," is derived from the same source. But the probable fact is that Hermes Trismegistos never existed. He was probably the Egyptian moon-god who was supposed to excel in the art of healing. He was also regarded as a patron of music, and the sacred number 4 was assigned to him.

The golden age of alchemy—so far as European countries were concerned—occurred from the 13th to the 15th centuries. During this period, kings, princes, doctors, students, tradesmen and even ecclesiastics tried their various hands at the alchemical art. It is quite untrue to suggest, as many writers have done, that all these varied people were utter rogues, impostors and hypocrites. To many of them alchemy was almost a sacred study. It was the study of material things and of the immaterial, semi-spiritual " essences " which were considered to lie behind the material entities and to guide and dominate their properties.

Naturally, mediæval alchemy had its due proportion of tricksters among its ranks. The adept who pretended to make gold, knowing perfectly well that he had not done so was a typical member of this alchemical category. So, also, was the old hermit who offered medicinal cure-alls at enhanced prices to a credulous public.

Of course, this gentleman is still with us at the present time. Even scientific chemistry is not free from him, although successive Acts of Parliament are nowadays making his fraudulent activities more and more difficult.

However, the point for us to bear in mind is that most of the alchemists of old were not any more dishonest than are the scientific chemists of to-day. They were stupid, selfish, obsessed by fixed ideas, self-deceived and greatly addicted to a vast amount of muddled thinking, but they believed in their cult and

The four degrees of heat. An alchemical idea of temperature.

Hermes, the father of Alchemy. (From an early print.)

The vase of Hermes in an alchemical furnace.

were ready to sacrifice comfort, health, riches and even life itself for it.

Alchemy was nothing if it was not an entirely mystic art. If it had been able to shed its confirmed and entirely purposeless mysticism, it might have got somewhere and done something centuries before it very gradually developed into the first glimmerings of scientific chemistry.

The " Soul " of Things

The ruling idea of the alchemist was that material things were all possessed of a " soul," and that although you might not be able to change things physically, you could bring about profound changes by influencing the " soul " of the material—if only you could discover the way.

One of the greatest failings of the alchemists was that they were very much averse to the statement of plain facts. Everything had to be put into writing in the form of an allegory ora parable. Even the names of common substances had to be changed. Argentum or silver was termed in alchemical writings, *Luna*—the moon, because the moon shone like silver, and in alchemical formulæ it was given the symbol of the crescent. If an alchemist wanted to put into writing the fact that the action of sulphur on silver was to darken the metal, he would write something to the effect that the face of Luna was obscured by a black cloud, whilst if he desired to describe the solvent action of nitric acid on silver, he would portray such a fact by means of a drawing representing a fiery dragon devouring the moon.

It was this sort of incomprehensible obscuration of plain fact which, in the end, brought about the downfall of the alchemical systems. No one could make head or tail of their mystical writings. One feels, indeed, that they must have been totally unable to decipher or, at least, to explain one another's writings. But if you will refer to any alchemical treatise or manuscript in our great libraries you will find this sort of thing at every page of these now ancient and venerable tomes. And after a careful examination of their pages you will come away hardly a whit wiser than before.

It would be useless to try to enumerate the various types of mystic recipes which the alchemists wrote down for the information of posterity and of one another. Most of them were so much gibberish. Others require various outlandish materials such as toad's venom, the slime of snails, the hair of dead infants, the eyes of spiders, and so on.

The alchemists, too, had a trick of assigning occult numbers to their materials, which figures they put into their recipes and formulæ. Hence, we get this sort of thing which is extracted from an old alchemical work and which purports to be an infallible recipe for making gold from quicksilver :

" Of several things, take 2, 3 and 3, 1 ; 1 to 3 is 4 ; 3, 2 and 1. Between 4 and 3, there is 1 ; 3 from 4 is 1 ; then 1 and 1, 3 and 4 ; 1 from 3 is 2. Between 2 and 3 there is 1, between 3 and 2 there is 1. 1, 1, 1 and 1, 2, 2 and 1, 1 and 1 to 2. Then 1 is 1. I have told you all."

The Seven Metals

Seven metals were known to the alchemists —gold, silver, iron, copper, mercury, lead and tin, these metals being associated with the planets and officially represented by

An alchemical emblem of the Philosopher's Stone, the source of all perfection.

planetary and astrological signs. Thus gold was symbolised by the Sun, silver was given the symbol of the Moon, iron that of Mars, and copper that of Venus. Mercury was assigned to the planet Mercury, tin to Jupiter and lead to the slow-moving planet, Saturn.

Seven, to the ancients, was a sacred number. Hence, seven metals fitted in very well indeed with their notions. It was only towards the end of the alchemical period that three additional metals were discovered, namely antimony, bismuth and zinc, and these at first were considered to be mixtures of the other seven.

To the alchemist, there was only one real metal. That was gold, the perfect metal, the shining, lustrous, incorrodible one, which was symbolised by " Sol," the Sun. They had the curious theory that their remaining six metals represented different stages in metallic evolution, the final stage being gold, the metal of perfect maturity. Metals were generated and actually grew within the earth just as animals are born and grow to maturity on the earth's surface.

By certain alchemical means, the alchemist believed that it would be possible to assist Nature in this matter of metal growth. It was possible, they believed, to make a certain substance with which the inferior metals could be treated and which would at once rid them of their dross, speed up their growth and convert them into pure, shining incorruptible gold.

The Philosopher's Stone

To this supposed magic substance were variously given the names of *The Alchemical Essence*, *The Universal Essence*, *The Red Lion*, *The Fountain of the King*, *The Red Tincture*, *The Stone of the Wise*, *The One Thing*, but more generally it became known universally as *The Philosopher's Stone.*

By mixing numerous materials (one recipe mentions some 600 of them) the alchemists considered it possible to bring into being the Philosopher's Stone and, by its use to turn base metals (and even non-metallic substances) into gold.

Just as the Philosopher's Stone had, according to the alchemists, the property of ennobling metals, ridding them of their supposed dross and converting them into perfect creations, so, considered these mediæval adepts, there existed another material which would be found to have a similar effect on man himself.

This, the *Grand Magisterium*, the *Grand Elixir*, or the *Elixir of Life*, as they called it, would be found to have precisely the same effect on man as the Philosopher's Stone was supposed to have on metals, and other objects of inanimate creation. The Elixir of Life would cure all human ills, would restore youthfulness and prolong life for many centuries.

To some alchemists the Philosopher's Stone and the Elixir were different materials, but according to the majority of alchemical writings, the Stone and the Elixir were more or less identical. Indeed, most alchemists in their treatises went so far as to describe the appearance of the Stone. According to some it was a red powder. To others, it was a liquid. Some conceived it to be hard and shining like rock crystal, whilst a few alchemists, more accommodating than the majority of their fraternity, allowed the Stone to be of " any colour, shape or texture " according to its mode of preparation.

With these conceptions of transmutation thoroughly ingrained into its very texture and system, the cult of mediæval alchemy constituted one long, self-deceptive search for the Philosopher's Stone and for the Elixir of Life. Numerous people, high and low in degree, rich and poor, being gifted with what we should now term an experimental turn of mind, joined in the search, a

An alchemical distillation apparatus of Moorish origin. (Sometimes known as a " Moor's Head.")

quest which was, for the most part, conducted with much secrecy and which was garbed with a quasi-religious or spiritual atmosphere.

Alchemical adepts spent their lives, their health and sometimes their fortunes in the search. Kings employed official alchemists much in the way in which our modern governments employ official chemists.

Naturally, all sorts of claims to success were made. Even as late as the 18th century

The "Chymic Choir" of the Seven Metals. An alchemical allegory of transmutation.

various statements were made to the effect that several of the mediæval alchemists, having discovered the Stone and the Elixir, were still alive and living in Asia many hundreds of years after their assumed deaths.

The illusion, too, was kept up to some extent by the accidental discovery of gold-like alloys which could be made cheaply from brass. Charlatans dipped copper articles into a solution of mercury in nitric acid, whereupon a shining film of mercury was instantly deposited on the metal. "There!" exclaimed the experimenter. "I have succeeded in turning copper into silver. Before long I shall be able to take the final step and turn it into gold."

It was all, of course, a manifestation of the old, old story, a breaking-out of mankind's inborn desire for riches and for immortality. And although the alchemists, despite their numerous and varied claims to success, never transmuted anything and certainly never concocted anything even remotely in the nature of a universal elixir, they did a lot of useful chemical work. For instance, as a result of their secret and individual calcinings, their "projections" and innumerable mixings, their distillations and dissolvings, they stumbled on the preparation of a host of useful materials such as nitric, sulphuric and hydrochloric acids, iron sulphate, magnesium sulphate, various mineral compounds, pigment colours, dyes, certain medicinal extracts and various other things.

Indeed, their mediæval terminology still persists to some extent in these days of modern chemistry. We still talk of "elixirs" and of "decoctions." For hydrochloric acid we still at times use the name "spirit of salt." We have still with us "spirit of wine" (alcohol), "spirit of nitre" and so on. All these "spirits" are relics of a time when the alchemists believed that there was a soul or a spirit behind every material thing, a spirit or essence which could be alchemically extracted, bottled and subsequently used for some special effect or purpose.

The Universal Solvent

Another strange conception of the alchemists was that of the *Alkahest* or *Universal Solvent*, a substance which had the power of converting all bodies into liquid.

Probably this notion arose in consequence of the discovery that many metals and other normally insoluble materials could be dissolved in certain acids. The alchemical mind, therefore, always mystically reaching out towards an imagined perfection of character, was not long in postulating a sort of super-solvent which dissolved everything. This they termed the Alkahest, from the German *allgeist*, meaning "all-spirit."

The fact that a few alchemists, perhaps a little shrewder than their brethren, from time to time inquired as to what sort of vessel might be used for containing the Universal Solvent did not in any way diminish the faith which these old experimenters had in the existence of this magic liquid. It is, indeed, a remarkable fact that van Helmont, the Dutch experimenter who flourished in the 17th century, and who has been styled the "last of the alchemists," claimed a solution of his *sal mirabile* (miraculous salt), which was nothing more than a solution of sodium sulphate, to be the long-awaited Universal Solvent, in spite of the fact that he stored it in a glass flask! The paradox of the whole proceeding never seems to have occurred to van Helmont.

The Philosopher's Egg

The preparation of the Philosopher's Stone was alluded to by the alchemists as the "Great Work." The furnace, retort or other vessel in which the Stone was prepared was dubbed, quasi-mystically, the *Philosopher's Egg* or, sometimes, alternatively, as the *Hermetic Vase*.

Sometimes, if the Philosopher's Egg was of glass, it was termed allegorically the *House of Glass*, and at other times the *Prison of the King*.

Various other alchemical operations were similarly styled. For instance, a mixing vessel would be given the name of *The Sepulchre*, or the *House of the Chick*. A retort or distillation apparatus might be called the *Green Lion*, and a concentrating-bottle or flask the *Triple Vessel*.

The Philosopher's Egg. An allegorical representation of an alchemical furnace.

It all, of course, added to the mystery and atmosphere of magic and allegory with which mediæval alchemy was invariably enshrouded. And it lasted until a few outstanding individuals such as Robert Boyle (1626-1691), having an inborn scientific spirit and a gift for accurate experimentation, cried out for a cessation of this nonsense, and an investigation and recording of plain facts only.

Lingering Beliefs

And yet, in spite of the rapid rise of scientific chemistry throughout the 18th century, alchemical beliefs seem in some way to have persisted strongly. Even at the beginning of the last century, a certain Peter Woulfe, living near Holborn, London, asserted that he would gain the secret of the Philosopher's Stone and of transmutation if he could keep his materials digesting in a philosophical furnace for precisely seven years. He does appear actually to have kept his lamp burning for six years 11 months and a few days, but, unfortunately for this enthusiast, the lamp suddenly went out and the experiment failed!

Near Hitchin, too, about 1828, there was an active alchemist named Kellerman who asserted that he had discovered the Philosopher's Stone and, also, the Alkahest. He offered to reveal his secret only in the presence of the King, but the King's ministers declined the offer, whereupon Kellerman vowed that his secret should die with him.

Still later in the century, an alchemical advertiser in a London paper offered for a fee of 200 guineas to furnish "a philosophical student or other pupil with a proper quantity of the requisite mercurial matter with which to operate for the profitable application of the Hermetic science as a source of wealth to the fortunate operator in this mystical branch of metallurgic chemistry so successfully practised by the adepto-chemical philosophers of the Middle Ages."

And so the last remnants of the alchemical art have persisted until our own days. But it is all a chimera, fantastic and untrue. Modern chemistry has displayed more wonders than alchemy ever claimed. Its scope and sphere of influence, its power for good is, indeed, far greater than anything which alchemy, in its wildest moments, ever imagined.

Lighthouse Engineering

The History and Development of Lighthouses and Their Equipment

By G. W. McARD

ALTHOUGH the lighthouse generally is a unit taken for granted by the majority of engineers to-day, few can visit a modern example without being deeply impressed by the many factors which combine to form the whole, whether the tower, the scheme of lighting, the lens projector, or the operating mechanism be considered. Like many other products of the engineering community, lighthouses have evolved from strange and wonderful beginnings, and a glimpse into the past, as a preface to a somewhat more detailed scrutiny of present productions, may be a useful preamble.

The need for some illuminated guide for the mariner was recognised several hundred years before the birth of Christ, and culminated in the Colossus of Rhodes—a huge brass figure that bridged the entrance to the harbour of Rhodes and, in an upraised hand, carried the light for the sailor—and, some years later, the Pharos of Alexandria, a lighthouse built in white marble. In the Roman period lighthouses were erected at different points round Europe, and from time to time light towers were erected wherever the seafaring fraternity—or, perhaps, more important in some quarters, the needs of the merchants they supplied—seemed to call for protection. Not until the early part of the nineteenth century did the subject receive the attention it merited, though many clever designers were at work, and positive evidence of this fact soon materialised.

Trinity House

An event which influenced greatly the future development of lighthouses and similar units in Britain was the inauguration of the Corporation of Trinity House in 1514, when the first charter was granted to this community. One of their first duties became the systematic maintenance of many of the existing beacons and sea-marks round our coasts, and in 1600 a new light was established at Caister in Norfolk—the first since the Roman occupation—succeeded by others at Lowestoft and Dungeness. These, however, and many others which followed, were built on land, notwithstanding the fact that many danger points existed round the coasts in rock-girt zones where a land light was worse than useless. The earliest "rock" lighthouse to be built was in 1700 when the first Eddystone—Winstanley's—was completed. Whether through lack of experience or some defect in building, its life was brief, the whole edifice being swept away in one of the storms for which that locality is famed. Four different erections have been made at this spot, the last being completed in 1882, and standing to-day as a monument to the skill of its builder, Sir James Douglass, the then Engineer-in-chief to Trinity House. The height is approximately 160ft., its tower and lantern being subject to the full blast of Atlantic gales, with waves that attain a height of 100ft. and over.

The experience gained in more than two centuries has been put to excellent purpose, and many lighthouses exist to-day in different parts of the world as well as round the coasts of Britain and Ireland. Where the edifice must resist successfully the repeated onslaught of, literally, hundreds of tons of sea water, the foundations are well and truly built into the base of the rock on which the tower is to be erected, the bottom layer of stones and granite being keyed to the rock and all subsequent tiers dovetailed stone to stone, and interlocked to the preceding layer to form what for all practical purposes is a solid tower and a sound engineering job. Only so can its security be assured, but remembering the difficulties attending such work, and the

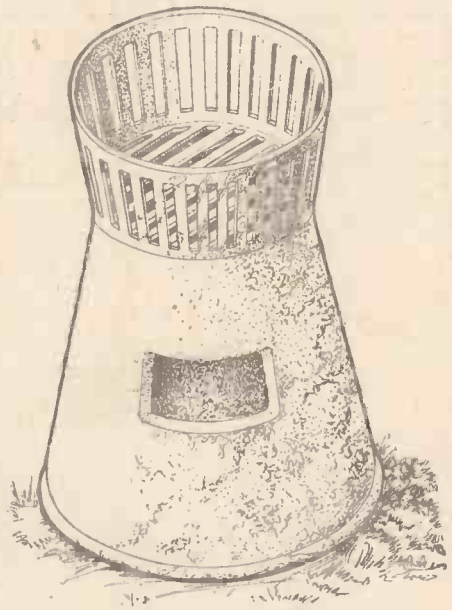


Fig. 1.—Early type of coal grate (or chauffer) used for lighthouse duty.

fact that actual working hours per annum in many instances are relatively few because sea and weather conditions are so often unfavourable—when building the Minot's Lodge tower off the Massachusetts coast, the contractor's men could only work for 30 hours during the first year—the time taken on most erections in this class is long and the cost high.

The Lantern

An important section surmounting the tower of any lighthouse is the lantern or glazed framework which serves to protect the light and the optical apparatus. This part, though seemingly unimportant, involves much careful design in order to afford the maximum protection in the worst storms, while causing the least possible interference to the flashing of the light, and many different designs have been evolved to secure these features. The glass used must be special quality plate sheet approximately ⅜in. in thickness, the lantern itself being usually circular in section when seen from above. Polygonal lanterns were tried but found unsuitable, as the darkness outside sometimes converted the flat side of the polygon behind the light into a mirror and gave what were found to be false flashes. A further important function which the lantern must carry out is that of natural ventilation for the entire lighthouse.

In view of the tremendous increase in sea traffic since the introduction of steam propulsion in the 19th century, the necessity for a complete system of lights and, incidentally, their individual characterisation, became increasingly evident. As the result different authorities were created throughout those lands possessing maritime frontiers, and to-day international conferences are held regularly, when not prevented by war, to which all interested nations send representatives for the discussion of major problems, and the pooling of vital information affecting the subject at issue.

A point which is always greatly stressed in regard to lighthouse machinery concerns its reliability and availability, and the statement has frequently been made that unless the design and production of a proposed new light can be guaranteed no matter what the circumstances may be, it is better to have no light at all. A little thought confirms this view, and probably no other branch of engineering exists to-day in which so many lives are dependent daily on the correct and regular functioning of a relatively delicate installation regardless of the state of the elements surrounding it or, indeed, of any other factor.

Two classes of light are employed, namely, fixed and revolving. A fixed light must be visible equally from any point on the horizon of its range, and to achieve this condition all light which would otherwise be lost above and below the desired plane of projection must be deflected and concentrated to this end. In the revolving light, however, since the object is to illuminate a single point only at predetermined intervals of time, all the light rays must be condensed, horizontally and vertically, into a single powerful beam of maximum intensity.

Light Sources

The methods employed, past and present, in producing the actual light have been strangely varied. In the early examples, fires of coal or wood logs burned in grates or chauffers, similar to that shown in Fig. 1, were the only source of illumination, and not infrequently the mariner's side was obscured by dense clouds of smoke, the light being visible to landward only! Curiously enough, in spite of its many drawbacks—one of which was its heavy consumption of fuel, as much as 400 tons per annum in some cases—the coal fire persisted until as late as 1822, when the last unit, the Flatholm, in the Bristol Channel, was converted to oil. Candles, however, preceded oil, and Smeaton's famous Eddystone was lighted by a chandelier having

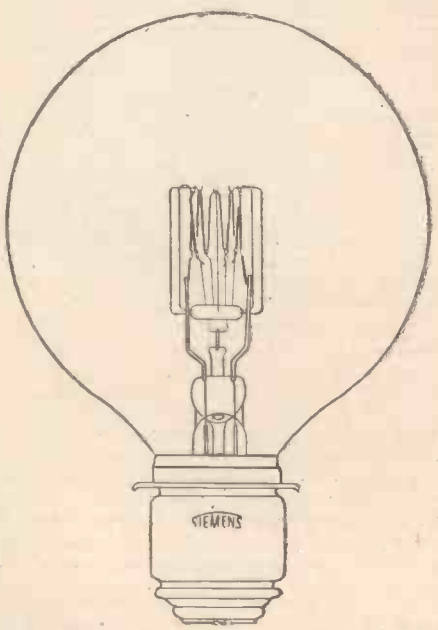


Fig. 2.—British lighthouse electric lamp (Siemens).

24 candles, an interesting contrast to the modern light, which may have an intensity running into millions of candlepower. (The term "candlepower" is now becoming obsolescent in so far as lighthouse illuminants are concerned, owing to the variation in the value of the candlepower in different countries, and is being replaced by that of "lumens," a relatively new term.)

The illumination provided by candles, even twenty-four, was obviously inadequate for the purpose, judged by present-day knowledge, and until the arrival of a more powerful illuminant the natural step to take was to intensify by reflectors; first, by small glass mirrors fitted together to form a paraboloid, and later, by silvered metal reflectors, one to each of the 24 candles being fitted in Smeaton's Eddystone.

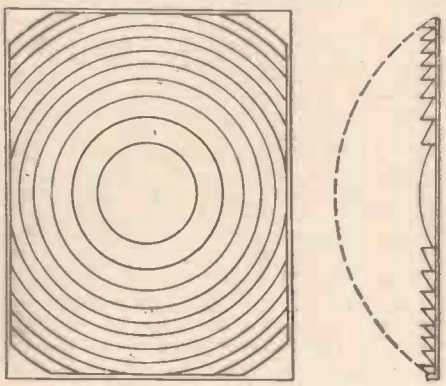


Fig. 4.—Fresnel's lens.

Oil Burners

The next development was the application of the oil wick burner, using, latterly, a circular wick which gave a flame diameter varying from 4in. to 6in. according to the power required. This was superseded in the early years of the present century by the incandescent oil burner and mantle which is still largely employed, the respective candlepowers of the lights being approximately 730 and 1,250 for a 4½in. diameter wick and an incandescent oil mantle 2in. in diameter, and oil consumptions of 4 pints and 1 pint per hour. From oil the natural step was to the use of electricity, first by employing the arc lamp—having many disadvantages—and later by gas-filled lamps, special lighthouse types being designed and perfected, having the filament suitably concentrated to project a high-power beam. The lamp illustrated by Fig. 2 is of ½ kilowatt capacity, working at 230 volts and giving a candlepower of approximately 600 (or 7,500 lumens). Coal gas and also acetylene gas are both used—generally, however, as standby lights in case of an electric mains failure, an automatic mechanism swinging the failed lamp out of position and the reserve light into correct focus.

Light Combinations

To ensure that no failure of light shall interfere with the effective working of a lighthouse, at least two sources of supply are usually made available by employing the changing mechanism already referred to. The combinations provided may be any of the following:—

(1) An electric lamp so disposed on its stand that lamp and holder may be removed in the event of filament or mains breakdown, and a standby oil wick capillary lamp placed in position.

(2) As for (1) above, except that the standby unit is of the petroleum vapour incandescent burner type, with a special screw adjustment to compensate for the difference in overall height of the oil burner, and the light centre length of the electric lamp.

(3) An electric lamp and a standby acetylene burner (or a coal gas burner) mounted on a semi-automatic "changing" mechanism. "Semi-automatic" in that after the mechanism has functioned once automatically, it must be reset for the next change.

(4) Two electric lamps mounted on a semi-automatic lamp changer, with a mains supply to one lamp, and a battery or special supply through the mains for the second lamp. This "special" supply is usually obtained from an automatic generating set which comes into operation immediately a failure occurs, an audible warning being given in the keeper's room by bell or horn to indicate the failure of lamp or mains. Two advantages at least are obtained with such a scheme, viz., the beam intensity remains constant, and the functioning of the light is practically ensured regardless of human intervention, so long as the filament of the second lamp remains in working order.

(5) Two electric lamps and an acetylene burner carried on a semi-automatic changer so designed that failure of the first lamp causes the second to swing into place, and failure of the second, or a mains failure, brings the acetylene into position. This also occurs each time the light is switched off, and the changer has therefore to be reset by hand each day.

(6) Two electric lamps and an acetylene burner mounted on a fully automatic lamp changer which operates on somewhat similar lines to (5) above, except that where a mains failure has caused the acetylene lamp to be swung into position, on a resumption of mains supply the machine automatically swings the acetylene lamp unit out and replaces the electric lamp. Fig. 3 shows a changer of this class.

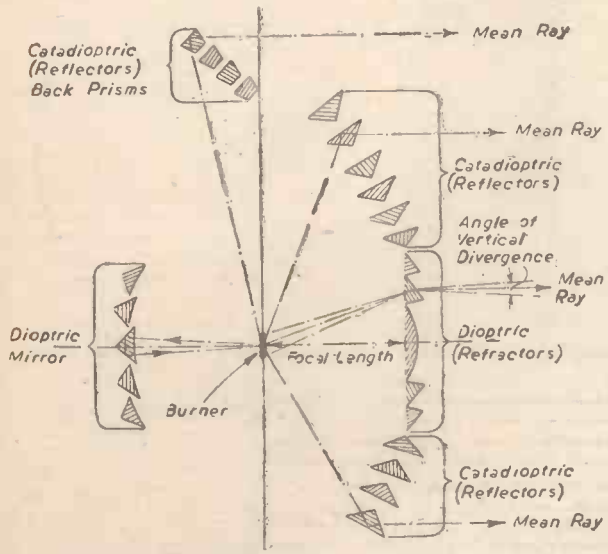


Fig. 5.—Diagram illustrating the several elements which combine to form a modern lighthouse optical apparatus.

Lenses

An interesting result of the change in illuminants has been the alteration in the design of the lenses required, since the filament of the electric lamp previously referred to is only about 1in. in diameter as against a possible 6in. flame diameter for the oil wick burner, this difference obviously affecting the foci of the lenses and their curvature. The

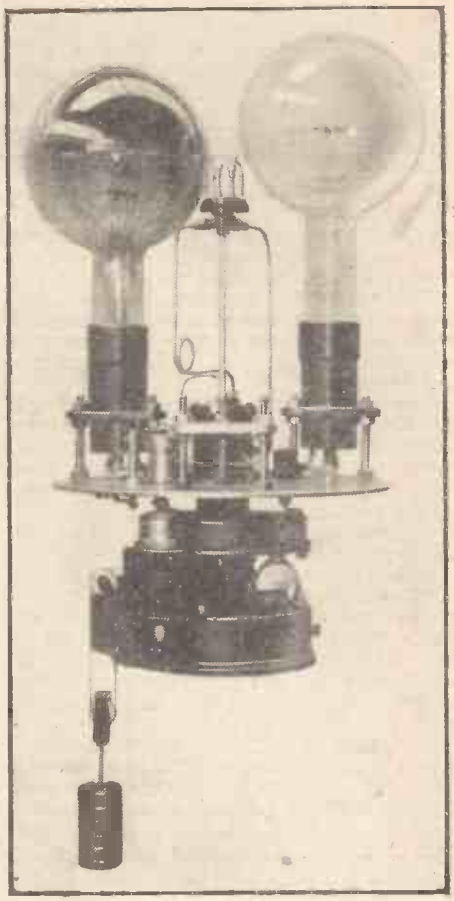


Fig. 3.—Automatic lamp changer.

introduction of prisms to collect and intensify the light beam has been one of the most outstanding developments in lighthouse engineering, and the object before the designer to-day is to intercept the maximum number of light rays and to focus them with the greatest degree of accuracy and the smallest number of prisms. As already stated, metal reflectors were used in earlier lighthouses, but experience proved that these deteriorated somewhat rapidly in a salt-laden atmosphere, and also through scratches received during cleaning operations. Many optical equipments supplied nearly 100 years ago are as serviceable to-day as when first fitted.

Possibly one of the earliest attempts to concentrate light rays by means of a glass lens was that devised by Augustin Fresnel, a famous French physicist and lighthouse engineer in the early years of the last century. This is illustrated in Fig. 4, and comprises a series of concentric rings—each having a different profile and centre of curvature—which collect all available rays of light, and focus them on a common object. From this evolved the combination of glass prisms which serve to form the complete lighthouse optic, using some as reflecting agents and others for refracting purposes. Fig. 5 shows the different forms of glass elements employed and their purposes when functioning together, and it will be seen that Fresnel's first invention is employed as the refracting agent, covering a total angle of light beam equal to approximately 80 deg. To engage the rays outside this angle, metal reflectors were at first employed, and to replace these the aid of skilfully designed glass prisms was sought, using the principle of internal reflection. Fig. 5 illustrates clearly how this operates, the rays refracting as they enter the prism, striking the rear face and emerging through the third face at the same angle as that of entry.

(*To be continued.*)

Eliminating the Boring Beetle

The Woodworm Pest and How to Deal With It

By J. F. STIRLING

THE annual ravages of the few species of boring beetles which are unfortunately only too common in this country present a perennial problem to house and property owners, connoisseurs of good furniture, to custodians of historic buildings, and to all concerned in one way or another with the preservation of structural and furniture woodwork.

These insect pests, multitudinous enough in their numbers before the war, seem to have increased enormously in recent years, and, worse still, the English species have been reinforced by numbers of their American relatives which, in the guise of the "Powder Post" beetles, have been imported into this country chiefly from the United States.

Exposed structural timbers in blitzed sites have formed a happy paradise for these timber and furniture destroying creatures during the last few years. So much so that it may be said that there are no areas of woodwork which are permanently safe from them unless such areas have received special treatment previously.

The damage inflicted by wood-boring beetles on English woodwork must amount to some thousands of pounds annually. For, like the majority of other living pests, the wood-beetles are always with us, and having once obtained a footing in a house or other building their depredations ever tend to increase in extent.

A remarkable photograph of a Death-watch beetle in the act of "ticking," a noise which the insect makes by striking its head in rapid succession on the woodwork surface. In this photograph the insect is many times enlarged.

The problem of the "worm in the wood" is a real one for anyone interested in the preservation of structural woodwork and furniture, but, fortunately, it is a problem which is readily amenable to careful treatment.

The Life Cycle

In order to control or eradicate an attack of woodworm in furniture or timber we must, in the first place, have a clear understanding of what is known as the "life cycle" of the pest with which we are dealing. The various insect pest research stations have now worked out this cycle fairly accurately, so that we are no longer in the dark concerning the precise activities and habits of the wood-boring creatures in this country.

In the natural order of things, the various wood-boring beetles serve a useful purpose in facilitating the slow natural removal of dead forest trees. The beetles will not attack living timbers. But when a tree dies and crashes to the ground it is not long before its timber becomes riddled through by the tunnels of the wood-borers. Air and moisture thereby gain access to the substance of the timber, and with them come the multitudinous varieties of the wood-rotting fungi which eventually destroy the timber and reduce it to a soft, brown powder.

Such is the natural function of the wood-boring beetle. In Nature, he is an expert and indefatigable scavenger, a shifter of unwanted objects in forest and woodland. He only becomes an intolerable nuisance to us through his constitutional inability to distinguish between a dead tree branch or trunk in a woodland glade and a dead tree in the guise of a piece of structural timber or an antique chair, cupboard or bookcase. They are all the same to the wood-boring beetle, providing fresh food and living space for his voracious progeny!

Let us trace the life history of the wood-boring beetle from the time its eggs are laid by the female insect in tiny cracks and crevices in the rough undersides of furniture, and in the less exposed areas of structural timbers. The egg-laying business generally takes place during the months of June, July and August. After about a fortnight (more or less) the eggs hatch out into tiny thread-like grubs which are almost invisible to the naked, untrained eye. Although these whitish specks of living matter could be crushed to death by the merest touch of the finger, they are possessed of black jaws which are very tough.

Close-up view of the culprit, many times enlarged. This tiny "worm" has iron-hard jaws which cause the well-known damage to structural timber and furniture.

And they proceed immediately to make good use of such appendages, digging down into the wood and excavating minute tunnels into it as they proceed.

A photograph of a carefully sectionised wooden spindle showing a woodworm (greatly enlarged) actually at work.

The furniture beetle. This photograph was taken with a special camera 5ft. long.

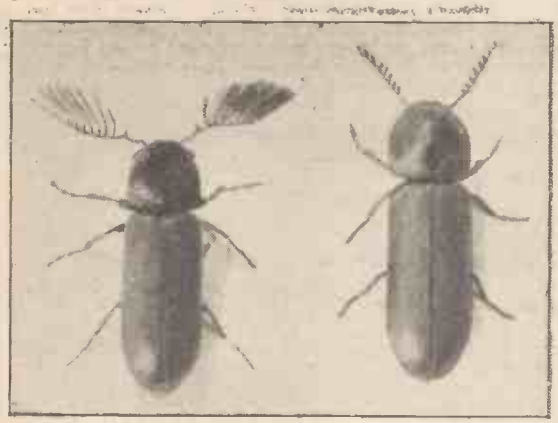
Bulldozer Jaws

Within a day or two, they have disappeared from sight. Down into the wood they go with their bulldozer jaws, always following the grain of the wood and seldom going across it. Their necessary nutriment they extract from the particles of wood fibre which they digest as they go along. But there is not a great deal of nourishment in the wood for them. Most of the ingested wood is excreted in the form of a brown powder—and, often enough, this brown dust falling to the ground around the areas of open worm-holes is the first warning that some valuable piece of furniture is under active attack by these pests.

By the middle of September, the newly hatched woodworm has got well under way, and ordinarily, no suspicion of his destructive existence within the woodwork is evident. There may be hordes of these tiny grubs present within the timber, but they are all confirmed individualists and they all bore their own tunnels along the woodwork.

Throughout the long winter months and through the whole of the following year each individual tunnelling grub plays the rôle of the miner at the coal face, ever digging away at the solid mass of wood in front of him, ever lengthening his tunnel, growing perceptibly in size and, therefore, ever increasing the diameter of his burrow.

Never does the grub in one tunnel bore into the neighbouring tunnel of another grub. Tunnels may go parallel for feet through a piece of timber and they may be so close together that the walls almost touch, yet one



"Powder Post" beetles (male and female), an American importation, which are rapidly increasing in numbers in timber yards. They are now attacking structural timbers.

grub never intrudes on another grub's work.

In the winter-time, the work of tunnelling proceeds slowly, being at a minimum during the coldest months. But with the advent of the warmer weather, the grub speeds up its work and its hidden destructive work increases. Various estimates have been given as to the total length of tunnelling which an average woodworm is capable of during its lifetime, but there is no agreement on this matter. Nor is there on the actual speed of tunnelling of the worm.

The Chrysalis Stage

However, some eighteen months after its first entry into the woodwork, that is to say during the first months of the second year following its hatching from the egg, the woodworm, being now fully mature, decides to end its seemingly interminable tunnelling activities. About the February of the year it ceases to bore longitudinally through the wood. Instead, it takes a direct turn upwards to the surface of the timber. But it never reaches the actual timber surface. By some inscrutable instinct inherent within itself it ceases its tunnelling when it has reached to within a quarter or even an eight of an inch from the wood surface. At once it makes for itself a sort of tiny cell or cavity and immediately afterwards it passes into a dormant phase and turns into a "pupa" or chrysalis in exactly the same manner as an ordinary caterpillar proceeds into this stage.

During the ensuing month, the grub changes into the adult insect—the beetle—and, at the end of this dormant period, the beetle, on waking up into activity, loses no time in boring its way upwards to the surface of the wood and emerging therefrom. It drills its way out of the wood (having arrived at the surface) by dint of revolving its head backwards and forwards through two semi-circles, and it occupies six or seven hours in the task of thus finally escaping from the wood.

The beetles begin to emerge from the wood about the end of March, and successive broods continue to emerge up to about the middle of August. At first the adult beetles crawl about slowly on the wood surface and on adjacent walls, wallpapers and windows, but in the summer weather they actually fly through open windows from one building to another, from one room to another, from one piece of furniture to another piece.

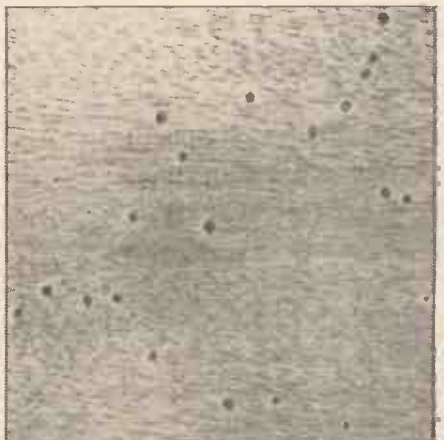
This is the way in which wood-beetle damage is extended and multiplied. In cases of bad attack, you can often see hundreds of these tiny, brackish-brown beetles crowding on to a sunny window-pane, in which place they are usually mistaken for "midges."

The "Ticking" of the Death Watch

A word must here be said about the characteristic "ticking" of the adult wood-beetles. The adult insects have a habit of setting up a faint ticking noise, which they effect by striking their heads on the surface of the woodwork some seven or eight times in rapid succession. At the dead of night, when silence surrounds a room, this habitual ticking noise can be very pronounced. In olden days, it was popularly taken to presage approaching death. Hence the term "Death-watch" beetle which is still applied to one family of these creatures.

Needless to say, all such superstitions (which still exist in some parts of the country) are sheer nonsense. The ticking of the wood-beetle is, as it were, a love-call, a signal by which one beetle attracts its mate. Indeed, by rapidly tapping on the woodwork with a pencil point, the hidden wood-beetle can nearly always be got to give answering taps, thereby revealing to some degree its approximate position on the woodwork.

There are two common families of wood-beetles in this country: the "Death-watch" beetle, which is the smaller and which attacks mainly structural timbers, and the "Furniture" beetle, which is bigger and which prefers



Wormholes. The ominous signs of pest wood-worm attack in a panel of a chest.

articles of furniture, particularly of oak, mahogany and walnut. Pine wood is not usually attacked, unless it is very old, since it is too resinous.

An understanding of the life-history of the wood-beetle will dictate the best methods for its eradication.

In the first place, it is obvious that attempts at treatment during the winter are more or less useless, because it is at that time that the wood-boring grubs are at their deepest within the woodwork. Treatment, therefore, should always be commenced between mid-March and mid-April whenever possible, although it may be carried out any time during the summer months.

Fortunately, the wood-beetle at all its stages is killed by the simplest of substances. Paraffin oil is sufficient to destroy it, provided that the liquid can make contact with the insect. Creosote, of course, is quite deadly to it and always gives positive results. Nevertheless, creosote has the great objection of staining.

A good mixture for woodworm eradication is paraffin oil, 10 parts (by volume), good grade creosote, 1 part. This will not stain and it can be applied to even furniture woodwork. It is a good plan to dissolve sufficient copper naphthenate or copper resinate in the paraffin to colour it a strong green. Zinc resinate or naphthenate can be used instead if the green coloration is objected to. Both the zinc and the copper naphthenates (or resinates) are powerfully toxic to insect life. They have the great advantage of being quite insoluble in water and, hence once they penetrate into the woodwork through the medium of the paraffin oil, they remain there for good and render the woodwork permanently proof against beetle attack.

Solvent naphtha can be used in place of paraffin, if desired, since, in some areas, it is more plentiful.

All aqueous fluids and solutions are worse than useless. They do not penetrate the wood, and sometimes they accumulate in cracks and crevices and cause the wood to split or to warp.

Treatment even with oils may, in some instances, cause dry woodwork to swell considerably. This is a point which should be borne in mind when treating the drawer sides of cabinets and bureaux, since it sometimes happens that drawers which have "run" smoothly and easily tend to bind after oil treatment for the eradication of woodworm.

Penetration the Secret

The whole secret of success in this type of woodwork treatment is to get the oil medium to penetrate the wood. For this reason, it is always advisable to apply the oil hot. It is a good plan to add some methyl-salicylate (synthetic oil of wintergreen) to any oil mixture with which the woodwork may be treated, since the salicylate has very powerful penetrating powers and helps to carry down the oil and toxic matter into the pores of the wood. Ten per cent. by volume of the methyl-salicylate calculated on the total volume of the oily liquid used is sufficient for this purpose.

Ortho-dichlorbenzene is a liquid which is now being recommended for woodworm eradication, so much so that it may now be obtained from a number of paint stores. It is an excellent liquid for this purpose, and it may be used "neat" or diluted with paraffin or naphtha. It has, however, a very penetrating and a rather disagreeable smell, an odour which lingers and which, on occasion, has been known to give rise to the remark that the wood-beetles themselves are preferable to the dichlorbenzene!

Various proprietary preparations are available for the treatment of wood-beetle attack on structural timbers and furniture. They are all effective, but not more so than any of the solutions above mentioned. The main factor is to ensure that the liquid penetrates the

Transverse section of a chair leg after it has undergone a severe attack by woodworms.

woodwork, and for this reason, as previously mentioned, it should be applied hot.

During March of the year the woodworms approach the wood surface to enter into their chrysalis state, and it is their nearness to the surface which renders them specially susceptible to eradication by means of applied penetrating liquids.

Hence, if even a single article of furniture is found to have been attacked by wood-beetles, not only that article but all the others in the room should be given a brushing-on treatment with one of the oil liquids above mentioned. The article which has been actually infested should have its treatment renewed at fortnightly intervals during the summer, but the other non-infested articles of furniture need not be re-treated more than once or twice during the year.

Although this sort of persistent treatment will usually eradicate even a bad woodworm attack, it is always advisable to renew the treatment once or twice during the same period of the following year in order to deal with any of the insects which, having been deep in the wood, may possibly have escaped destruction in the preceding year.

It is an excellent plan to treat all furniture woodwork in a room in which an attack of "beetle" has broken out with one of the new and highly-effective insecticidal dusts—"Gammexane" or "D.D.T." These cannot, of course, penetrate the woodwork, but scattered over the hidden portions of furniture, along drawer bottoms, and at the bottoms of cabinets and bookcases, they will deal instantly with any stray wood-boring beetle which has escaped the general destruction of its kith and kin.

Heat Treatment

It is useful to remember that no species of woodworm can withstand a dry heat of about 55 deg. C. (131 deg. F.). Hence, in the case of small articles, it may be possible in some instances to place the affected piece of woodwork in an oven heated to this temperature. Four hours' heating at this temperature will destroy all worms within the wood, but, of course, it should be remembered that such heating may possibly cause wood to warp, twist or otherwise distort.

Another excellent method for positively eradicating woodworm is one which may be employed at all times of the year, but which, unfortunately, is ordinarily only applicable to small articles which can be completely immersed in a bath of liquid.

Using any of the toxic liquids previously enumerated, place the wooden article to be treated in a vessel and completely cover it with the chosen liquid, placing a weight on top of it to keep it continuously submerged. Then slowly heat the liquid to near its boiling-point—bearing in mind, of course, the inflammability of liquids such as paraffin and naphtha. Retain the liquid at this high temperature for an hour. Then allow it to cool slowly.

After this, repeat the process of slow heating and cooling. All this time the wooden article must remain completely submerged by the liquid and it must not be raised in any way.

During the heating, air is expelled from the pores of the wood and, during the ensuing cooling, the liquid is forcibly squeezed by atmospheric pressure into the woodwork pores in consequence of the partial vacuum created by the previous expulsion of air. Here, therefore, is a very positive means of ensuring that the deepest possible penetration of the woodwork by the toxic liquid is effected. The wooden article, however, must be completely immersed in the liquid, otherwise the process will only be partially effective.

Structural timbers, but not usually furniture, are nowadays being attacked by the intensely destructive "Power Post" beetles which originally came over to this country in American timbers, and which are often a plague in raw timber yards. Their cycle of destruction is more rapid than that of the old-fashioned English "Death-watch" beetle, but the methods for its eradication are precisely similar.

Filling Wormholes

For the filling-up of wormholes in treated furniture (and this always ought to be done lest the holes provide a lodging for fungi and other pests) use coloured plastic wood, or a mixture of fine sawdust and thick glue.

Delicate and valuable articles of woodwork which, through woodworm attack, have become very crumbly can be strengthened up considerably by saturating them with glue water or with a gelatine solution made by dissolving 10 parts (by weight) of cooking gelatine in 90 parts of water. After becoming semi-dry, such articles are brushed over with a solution of commercial formalin (diluted with an equal bulk of water). The formalin renders the glue or gelatine tough, hard and completely insoluble in water.

After this gelatine-formalin treatment, the wormholes in delicate articles of woodwork are carefully stopped up (one by one if necessary) with plastic wood or other composition, the whole being then carefully varnished over. In this way, even the worst attacked woodwork articles can be preserved and made good permanently in structure, and in appearance.

Like measures apply, in the main, to dealing with wormholes in structural timbers, but, naturally, in many instances, these can be hidden by being painted over.

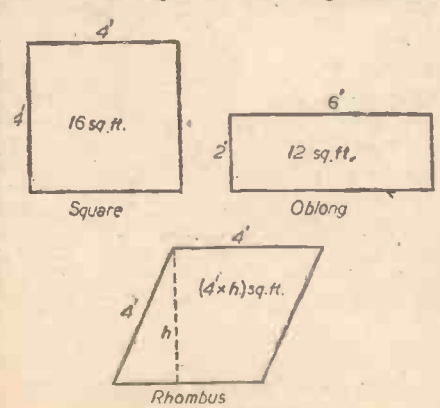
Mathematics as a Pastime—4

Squaring the Circle.

By W. J. WESTON

YOUR many times great-grandfather hit upon two truths that lessened his labours. He found that, with his available wood supply, the most capacious structure he could make was in the form of a square. The 16ft. of planking you have will make you a square of 16 sq. ft.; but the oblong, 2 by 6, gives you only 12 sq. ft.; and the rhombus with 4ft. sides gives you only of 4 multiplied by a height less than 4.

The second truth was that a wheel in the form of a circle rolled more easily than the wheel that bulged. The square and the circle—these were his ideal figures, and among the first of the problems that eager students posed to themselves was the relation between the figures. How can you turn a circle into a square covering the same space? How find the exact area of any circle? If only you knew how many times the diameter can go round the circumference, you solve the problem.



Diagrams of areas.

The Greek word for circumference is *periphery*, and π (pronounced *pi*) is the initial of periphery; π, therefore, became the symbol for the relation between *diameter* (the distance through) and *periphery* (the distance round). The search for an exact relation has been shown to be vain; but you can get near enough to satisfy all but the most exacting.

Join the old mathematicians and have a try yourself. With your compass draw a circle. With your set-square set off angles of 60 deg. at the centre, so getting six points on the circumference. Join the points; you have then a regular hexagon inside the circle, each side being equal to the radius. The periphery of this hexagon is therefore exactly three times the diameter. That enables you to make one statement about the circumference lying outside the hexagon: it must be more than thrice the diameter.

Now, with your set-square at each of the six points, set off lines at right-angles to the radius. Make all these lines meet, and you have a regular hexagon outside the circle. You find by measuring, you confirm by calculating, that the periphery of this hexagon is over 3.47 times the diameter; the circumference, therefore, lying inside the hexagon must be less than 3.47 times the diameter.

And if you, as generations of circle squarers have done, increase the number of sides in your polygon, you bring the two limits nearer. For a hexagon is nearer to a circle than a square; our twelve-sided threepenny-piece is nearer still; the circle itself is the final limit of a sequence of regular polygons. A famous Dutch mathematician, patient and industrious, calculated π by this method to 35 decimal places, and he had the achievement recorded on his tombstone. Perhaps you will be less ambitious and content yourself with getting within sight of 3.1416, even of 3.1/7.

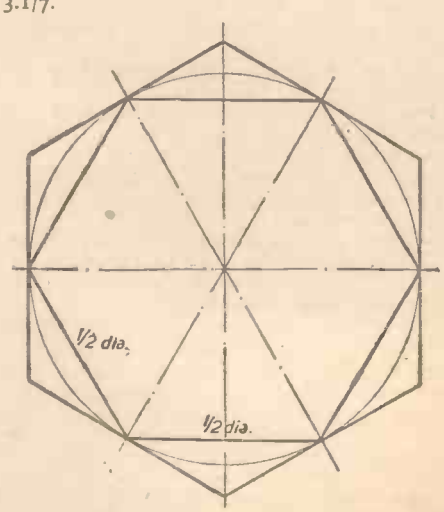


Diagram illustrating the squaring of the circle.

Observations—2

Further Interesting Facts About Everyday Topics

By Prof. A. M. LOW

(*Continued from page 206, March issue*)

Tied by Electricity

It is fascinating to think that everything is held together by electric forces, and that our bodies are mostly space which we cannot see.

And there is this queer thing, that on the surface of liquids there is an added attraction which produces a kind of hard skin or a form of "surface tension." Colloidal chemistry has shown us how particles of gold can be made so small as to stay suspended in water, but surface attraction is quite another story, and if you take a perfectly dry needle and drop it very close to the surface of some water, keeping it absolutely level, it will commonly float. Reminiscent, in fact, of some forms of these new military bridges.

A still more striking example is shown by covering the surface of a bowl of water with the lycopodium powder which comes from a moss found in Russia. These particles are so small that their "tension value" is very high, and you can plunge your hand into the bowl of water, through the skin of thin particles, without it becoming wet in any way.

Don't be Caught

It is very difficult to observe any occurrences accurately. You will find that if three people in front of, say, twelve, are watched in a simple action such as one man dropping a bunch of keys, one kicking it, and one returning it to the first man, and the three then sitting down in different order, every single person in the audience will give a different account of the performance. Or very nearly so. This is why road accidents cause so much apparent lying. Anyway, it is one *kindly* reason.

The camera now being used to judge racing is the only real method unless we have some electronic recorder, which I hope will be used one day for voting. These high-speed cameras are fascinating things, and I observe that they have now introduced a revolving winning post, so that it will not interfere too much with the lines of sight but appear stationary as the camera clicks.

Very embarrassing for the onlookers who might be in the unhappy position of the man who entered a ballroom which had a sprung floor. He had dined adequately and was heard to mutter "does it, or am I?"

But high-speed cameras do show what happens if you break an electric light bulb with a hammer. The side opposite to the hammer usually falls out first because the column of gas inside pokes it out before the hammer has time to penetrate the fracture.

It was once argued in Court that a certain photograph had been taken wrongly because the flash made by the photographer startled a man holding a screen. No one noticed it at the time, but Counsel should have pointed out that the flash would be over long before the screen could have been dropped. The exposure which resulted was not only that of a film! A tricky point for the Judge, was it not?

Too Dangerous

There seem to have been a sad number of railway accidents of late, and it is rather a reflection on civilisation that scientific methods should take so long to apply. Buildings burn down when almost fireproof methods are available. Trains could travel fast through fog if radar equipped. Animals do not run into each other in the dark because they have senses which indicate the presence of others. We, by living in cities, eating tinned food, wearing clothes and shaving (all very necessary so that we can think better), require mechanical aids to our senses, and I suggest quite seriously that in the very far geological future human beings will have no hair, no teeth, and very poor hearing. They will aid these senses electrically! Eyes will also be helped, and it seems very probable that legs will become atrophied. Indeed, I think it is best that we should try to forget our bodies, for the whole purpose of education, almost of life itself, is to improve our minds and forget our unpleasant physical attributes.

You will notice I do not speak of tabloid meals. They will come, but our stomachs at present must be worked mechanically as well as by their usual metabolism or else the works get rusty and the nasty diseases of civilisation appear. Even now we take a poor view of those who gorge red steaks, and we are a little ashamed of boasting that the sideboard was groaning with pieces of animals.

It will not be long before mechanical hearts and other parts become common. How fascinating to think that brains might live without all the comcomitant horrors which we now love for want of knowing better. We are still so savage that we can only communicate a thought by blowing air through a set of waggling lips.

False Impressions

I have mentioned before that things are not always what they seem, and now another terror has been added to life by the discovery of an eminent scientist that the impression of speed can be given by drugging certain localised parts of the anatomy. I rather like the idea of selling a bottle with every slow car, or it might be doled out to householders who are waiting for their homes to be re-built. It might also be used to study all the wasted motion used in laying bricks. But I doubt if they give enough attention to the fact that human beings can only put out a certain amount of effort by custom.

Motor-car drivers do not want infinitely variable gears, because they cannot be bothered to use them or to learn the right speed at which an internal combustion engine gives its best compromise between comfort and efficiency. Bicycles have often been designed with handlebars connected to chains so that speed could be increased. It is forgotten that when pressing upon the pedal one can pull on the handlebar, and thus use the energy from the unfortunate rider to its full.

The other evening I was dining in a restaurant and was told by a friend that some people can tell the difference between Empire wines and others (if they can get them). There seems to be some difference, for poisons of many kinds vary in the rapidity of their effect upon the stomach. I should not have mentioned this word, but I commonly think of the place where what I understand an "abominable belt" is worn. Now, poisons are interesting, because some of them seem to paralyse different parts of the body, and vary in the manner in which they preserve the body or respond to chemical reaction in the hands of the police.

The Vortex Box

Take any box about 8ins. long and the same in width. Glue some pieces of paper tightly over the open side and in the opposite part cut a hole 1in. in diameter. When filled with smoke you can send vortex rings across the room or put out a candle if the box is sufficiently large.

Portable X-Ray equipment is being used in a Clydeside shipyard for finding faults in electric welding. The illustration shows a welded keel in the shipyard being photographed by the X-Ray unit.

Inventions of Interest

Potato Peeler

THE peeling of potatoes is ordinarily a woman's job. It is natural, therefore, that an improved potato peeler should be the offspring of the brain of a member of the fair sex.

The invention is of the kind which includes a blade of channel shape in cross-section, having an outwardly projecting part sharpened to form a cutting edge.

In the conventional shape of this type the blade extends longitudinally. And the cutting edge of the projecting part likewise extends in a straight line.

Potatoes are of spheroidal shape. Consequently, when peeled by means of the existing appliance, as the peeler has a straight cutting edge, the paring is, under ordinary conditions, comparatively narrow.

The proposer of the new idea remarks that experience shows that by increasing the pressure on the cutting edge a wider paring results. But this is obtained at the expense of speed, since there is a slowing up of the peeling operation. This more than cancels out any advantage. In fact, peelers of the type with which the improved device is concerned are deliberately designed, so that the paring shall be as thin as possible. The object is not only to avoid waste but also to enable the peeling to be expeditiously performed.

A Useful Curve

IN order to effect a cut wider than normal, with consequent saving of time and without causing extra waste, it has been proposed to provide a blade-holder designed to accommodate a detachable flexible sheet-form blade in such a manner that the blade, when fixed in the holder, is bowed. As a consequence, there is a concave surface of the blade and a similarly shaped edge. These are presented to the convexity of the potato.

To improve upon the construction just mentioned is the aim of the new device. Its object is a potato peeler which, while equally efficient, is at the same time simpler to form and can be more cheaply made.

Self-exerciser for Invalids

THE invalid often is not only prevented from freely using his limbs, but those members naturally suffer owing to a lack of exercise which tends to atrophy.

A new apparatus for exercise for people suffering from weakness in arms, legs or back is the subject of an application accepted by the British Patent Office. This enables them to exercise their feeble parts without the assistance of another person.

This self-exerciser has a seat mounted in a frame, supported by legs provided with wheels or castors. The frame has one side which can be opened and closed to permit the patient to enter and leave. There are supports and members for exercising the limbs, and a foot-exercising appliance if the invalid is unable to walk.

Long Life for Tyres

AN unpuncturable tyre, like a nylon stocking that will not ladder, is still a desideratum, although a fortune beyond the dreams of avarice awaits the inventor of such a cover.

The originator of an improved outer cover points out that normally such a cover is made with an inner wall woven from cotton yarn, and its length of life is governed by the wearing quality of this fabric.

In ordinary use the heat generated contributes greatly to the failure, after a period, of the yarn, as cotton is made tender by prolonged exposure to high temperature.

Therefore improved heat-resisting is a characteristic of the new invention. The inner wall is woven from fibres of cellulose which have been partially acetylated whilst maintaining the original fibrous structure. The degree of acetylene corresponds to a combined acetic acid content of from ten to thirty per cent. The inventors contend that acetylated cellulose has a higher resistance to the adverse effect of heat than cotton.

New Hot-water System

WHAT is claimed to be an effective hot-water system is the subject of an application for a patent in this country. This system is of the kind in which water from a valve-controlled supply tank communicates with a hot-water tank connected with a cock-controlled heat exchanger.

The object of the invention is to furnish a hot-water system of this type which is simple in arrangement, effective in use and operates satisfactorily with a minimum of attention.

The device has a large-capacity bath water tank, fed by the supply tank and also by a cock-control with a medium capacity hot-water tank. This is heated by an electric immersion heater and from it a supply pipe from the hot-water tank delivers under separate tap controls hot water to domestic ablution appliances such as a wash-basin.

Instant hot water can be drawn directly from the medium capacity tank by cutting off communication with the bath water tank. Therefore, ordinarily, communication between the two tanks is cut off but is established when bath water is required.

The water supply for the bath water tank and for the medium capacity tank is from a self-regulating supply from the main, such as a cistern having a ball-valve and feeding into the bath water tank, which freely supplies water to the medium capacity tank.

A turn-cock prevents hot water flowing back into the bath water tank. Consequently, only water in the medium-capacity tank is heated. However, a separate container for drinking purposes may be provided in this tank.

There is always cold water communication between the two tanks. If a container is used there is a separate main supply into this container.

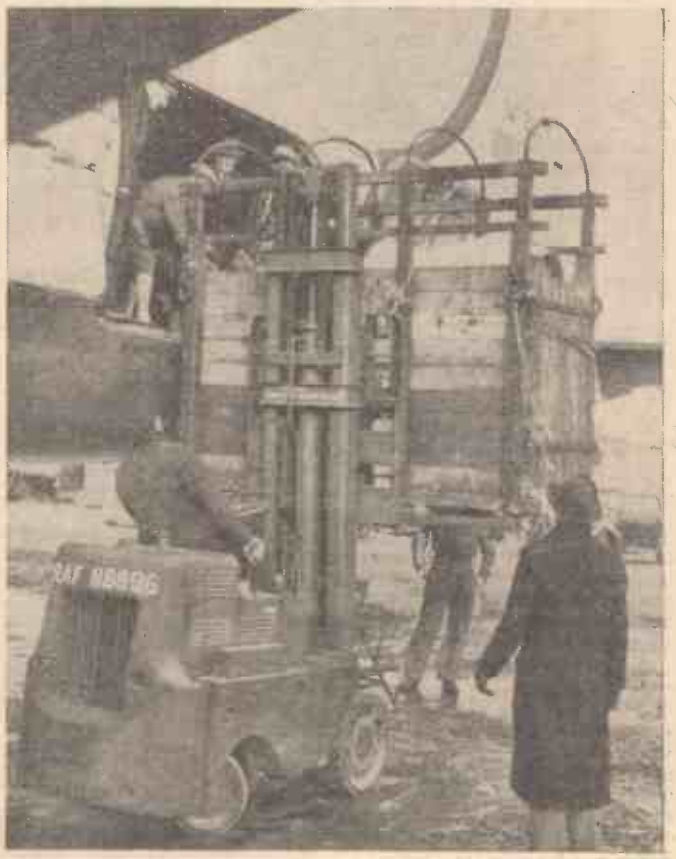
Only when bath water is required is a cock turned on to put the two tanks into hot-water circulation.

Adjustable Bathroom Mirror

A DRESS mirror is indispensable in a bathroom. The complete specification concerning a device of this character has been accepted by the British Patent Office.

This invention includes a looking-glass with means for adjustably supporting it from a wall fitting or cabinet. It is capable of being moved outwards so as to take up a convenient position for use.

If the mirror serves as the door of a cabinet, it is arranged to give access to the contents. The supporting means also is such as will allow the mirror to be tilted. The door moves in a vertical or horizontal plane, and when not in use it will return flat to the cabinet.



Six British racehorses were recently flown from London Airport to the United States in an American Overseas Airways Skymaster. A special hoist was built at the airport for loading the horses, which were insured for £70,000. The horses, secured with a safety belt, had to stand all the way on their thirty hours' flight to Burbank, California, via New York. The illustration shows one of the racehorses in the special hoist, being loaded into the 'plane.

THE WORLD OF MODELS

Models at the Shipwrights' Exhibition : Swiss Model Railway : Model Liners at the Mariners' Museum at Virginia, U.S.A.

By "MOTILUS"

Fig. 2.—Bassett-Lowke ¼in. to the foot scale model of the T.S. "Arnhem." A new turbine cross-channel vessel built by Messrs. John Brown, of Clydebank, for the L.N.E.R. service to the Continent via Harwich and Hook of Holland.

ALTHOUGH I dealt with some of the models at the Shipwrights' Exhibition in the March issue, I feel that there was so much interesting work displayed there that I must make a further reference to it. The general opinion expressed at the Exhibition is that there never has been such a wonderful collection before of high-class models of ships at any exhibition held in England.

Remarkable Ship Models

Acknowledged to be one of the finest exhibits was the four models made by Messrs. Vickers-Armstrong, Ltd., Barrow-in-Furness, of the famous ships that they have built. These were the battleship H.M.S. *King George V*, a magnificent piece of work, an even more attractive model of the aircraft-carrier H.M.S. *Indomitable*, and two modern merchant ships—the P. & O. *Strathmore*, and the *Orion*, of the Orient Line, in her attractive modern livery. Imposing in their appearance, uniform in their workmanship and excellent in their detail and finish, these four huge models, all to the same scale—that of ¼in. to the foot—were the first exhibit which attracted attention on entering the large hall.

Despite the magnificence of the stand of Messrs. Vickers-Armstrong, Ltd., the prize for the best exhibit went to Messrs. Swan, Hunter & Wigham Richardson, Ltd., of Newcastle-on-Tyne, chiefly, I would say, on account of the variety of the type of vessels featured. Two of their models, H.M.S. *Anson* and H.M.S. *Vindex*, were mentioned in my last contribution, and as it is now permitted to publish photographs of these ships, this close-up of H.M.S. *Anson* (Fig. 1) shows some of the excellent details of this replica of one of Britain's latest battleships. Their exhibit also included several models finished in the traditional style of silver- and gold-plated fittings—a style adopted by many model-makers until quite recently. Although attractive from an exhibition point of view, it lacks the realism of a model that is finished in the actual colouring of the ship itself, and thus in the eyes of many ship lovers the modern style is preferable. These included two train ferries—*Chiangkiang* built for the Ministry of Railways of the Republic of China, and the *Twickenham Ferry* used for the English Channel, together with two very attractive models to a scale of ¼in. to the foot; H.M. Telegraph Ship *Monarch*, and the first-class passenger ship *Duntroon*. The ice-breaker *Kosma Minin*, built for the Russian Government, modelled in the scale of ¼in. to the foot, showed an unusual design, while a sectional model showed the interior construction of a tanker's ribbing and plating, being centrally illuminated. Altogether this exhibit was a most comprehensive display of the scope of the work of Messrs. Swan, Hunter & Wigham Richardson, Ltd., and fully deserved the prize it was awarded.

Fig. 1.—An interested person watches a skilled craftsman assembling some of the metal parts used in the construction of the model of H.M.S. "Anson," built by Bassett-Lowke, Ltd., for Messrs. Swan, Hunter and Wigham Richardson, Ltd.

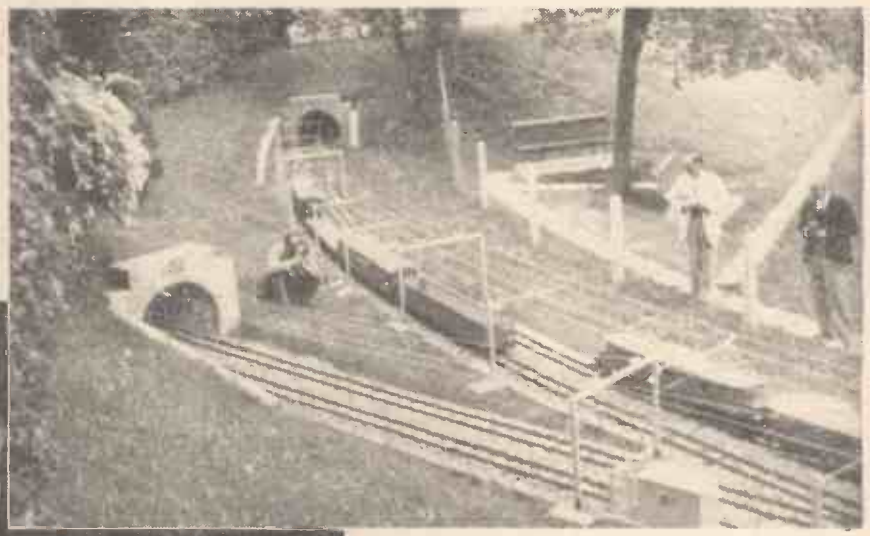


Fig. 3.—Two tunnels of the Dietschiberg Model Railway.

Doubtless, those who frequent the cross-channel route were pleased to see the model of the new cross-channel ship the *Arnhem*

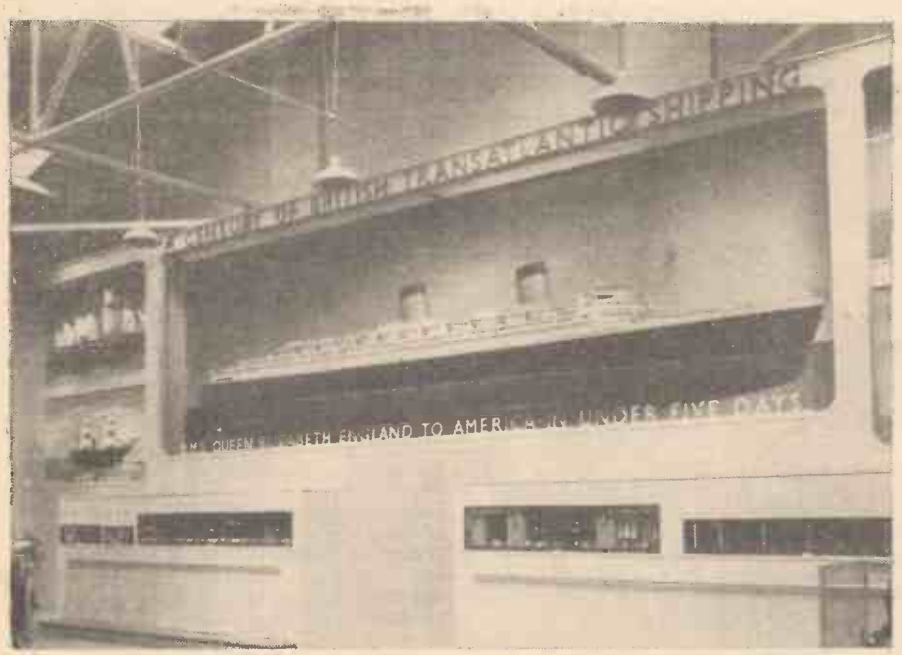


Fig. 4.—Part of the British Shipping Exhibit, Main Room, The Mariners' Museum. By courtesy of the Mariners' Museum, Newport News, Virginia, U.S.A.

(Fig. 2) exhibited by the L.N.E. Railway, who will operate this ship on their well-known and popular service Harwich-Hook of Holland. This vessel is up to date in every respect, and should certainly be one of the most popular of the cross-channel boats. It is expected to be in service towards the end of the year.

Swiss Exhibition

Switzerland is a country which appeals to many varied interests of the travelling public, perhaps mainly because of its attractive scenery, good hotels, excellent service, and its friendly and industrious people. Also, as has been mentioned before in these pages, it has a very definite appeal to those interested in railways and models of railways. This year, Switzerland will have an added interest for those who are model railway enthusiasts, because it marks the celebration of the centenary of the Swiss Federal Railways. Many interesting functions have been organised, and a travelling exhibition is to tour the country from April to November. Five complete model trains, to a scale of 1 : 10, built to show the progress made during the last 100 years in the history of Swiss railroading will form part of the exhibition, and apart from their historical interest I am sure they will be a praiseworthy example of the usual workmanship of the Swiss model-maker, as these are all being made by members of the various enthusiastic clubs of Switzerland. The actual opening of the railway took place on August 7th, 1847, when the locomotive "Aare," a 4-2-0 built by the firm of Emil Kessler, of Karlsruhr, and designed by the well-known Swiss engineer, Nicolas Riggertsbach, drew the first train to run entirely on Swiss ground on the track from Baden to Zurich. On the anniversary of the opening date this year, a full-size reconstruction of the first train will again run over the same track which made Swiss railway history 100 years ago, at the speed of the original train, and this same train will be in service at the various places where the exhibition is staged throughout the year.

Dietschiberg Model Railway

An attraction which should not be missed by any model railway enthusiast who visits Switzerland is the famous Dietschiberg Railway above Lucerne, as I understand that this is now in operation again (Fig. 3). Constructed in beautiful scenery, the layout is complete with stations, buildings, tunnels, bridges and all lineside features, and is reached by trolleybus from Lucerne. Built to a scale of 1 : 10, the railway has about 500yds. of permanent way, to a gauge of approximately 5⅜in. It is electrically driven by overhead trolley working on 220 volts A.C. The locomotives are fitted with 65-volt motors and each engine carries its own 220/65 volts transformer. Some idea of the extent of this railway is realised when the fact that a normal passenger train weighs over 13cwt., while the average goods train weighs more than a ton. The express train, shown in the illustration on page 245, consists of three coaches—first-class, second-class and baggage-van, hauled by a 2-4-4-2 locomotive with four motors with individual axle drive. The goods train, which has a variety of types of rolling stock, is also drawn by a 2-4-4-2 locomotive operated by two motors.

Model of R.M.S. "Queen Elizabeth"

It may be of great interest to readers to know that the famous 32ft. half model of the Cunard White Star Liner *Queen Elizabeth*, which was built specially for the New York World's Fair, is still exhibited at the Mariners' Museum, Newport News, Virginia, U.S.A. (Figs. 4 and 5). Surrounded by models of the *Sirius*, *Great Western*, *Britannia* and *Great Britain*, some of the early steamships which crossed the Atlantic, the *Queen Elizabeth* model is shown as part of the display "A Century of British Transatlantic Shipping" in the main hall. I am told by the Director of the Museum, Mr. Frederick F. Hill, that this display has drawn a tremendous amount of interest since it was shown in 1940. Established in 1930, the museum is situated in an extensive park, its chief aim being the culture of the sea and its tributaries, its conquest by man, and its influence on civilisation. Not being confined in its scope, it is devoted to the display of maritime accomplishments of all times and of every nation, and in its many and varied rooms the ship lover could spend hours of contentment. Keeping pace with the material exhibits, the nautical library contains more than 23,000 volumes devoted to maritime subjects, as well as thousands of photographs. Among the items exhibited are oil paintings, old manuscripts, navigational instruments, and fittings and actual parts of ships of every description. A large courtyard between two of the main building's wings affords shelter for an exhibit of actual small craft, and in another room is an interesting display of scrimshaw, the artistic skill of the days of Moby Dick. It numbers in its collection more than 300 full models, rigged or otherwise complete, and about 200 half models. What a treasure trove!

Museums of ship models are certainly found in out-of-the-way places, and I am hoping that some day there will be a guide-book of some kind published so that ship lovers, when travelling, can find out where they may enjoy beautiful models.

Fig. 5.—Main Exhibit Room, one of the four exhibit halls, The Mariners' Museum. Centre: Eagle figurehead from U.S. steam frigate "Lancaster," 1858. Wing spread, 18ft. 8in. By courtesy of the Mariners' Museum, Newport News, Virginia, U.S.A.

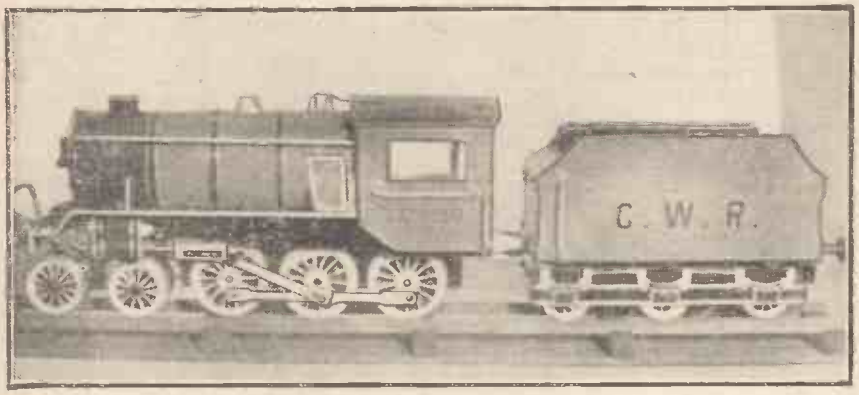
Letters from Readers

A Model Locomotive from Odds and Ends

SIR,—From time to time I have felt very envious of the many fine models illustrated in the pages of PRACTICAL MECHANICS. I doubted my ability to make such a model with my limited tools, but eventually I decided to try my hand at building a model from scrap. The accompanying illustration shows the result of my efforts.

First I salvaged two "Slippery Elm Food" tins for the boiler; the bands round it were made from strip metal taken from disused packing cases. The anti-splash gadget, found on most kitchen taps, when cut in two supplied both chimney and dome, while the safety-valve made the connecting rods, and the cylinders are two pieces of copper tubing soldered together. The undercarriage is composed of strip steel costing a few coppers, and brass rods made the handrails. From an old gramophone the speed-regulating handle was salvaged to make a neat handle for the boiler door. The overall length is 2ft. 3in.

A set of wheels from Messrs. Kennion Bros., and a second-hand 12 to 24-volt motor geared down with gramophone motor wheels, housed in the tender and driving the rear wheels, completed this realistic model of a steam loco. The same dealer supplied a transformer, and I finished the job by painting the



A Model G.W.R. 4-6-0 locomotive made from scrap materials by J. R. Hornbuckle, of Mapperley.

is simply two dome-headed nuts. The cab and tender were made from the metal of two flattened 7lb. jam tins. Angle aluminium from a previous model served as stiffeners for the frame of the tender and the engine. Spring curtain wire made the couplings and the brass buffers were made from scrap material which resembled closely the real thing. Old hack-saw blades stripped of teeth model in green and black within a total time of three months, at an inclusive cost of £3 15s.

My "blueprint" was a photograph of a 4-6-0 "1,000" class G.W.R. engine published a few months ago. I am now working on a track to run 60 yds. round my garden, and this should cost about £1, as the metals are made from ¼in. square iron, with a live rail made from copper wire.—J. R. HORNBUCKLE (Mapperley).

P.M. Battery-driven Clock

SIR,—I thought perhaps the result of the struggles of a non-practical reader to build the PRACTICAL MECHANICS Battery Clock might interest other readers.

It was in 1933 that I first saw the article in PRACTICAL MECHANICS, but it was almost ten years later that I started to build it.

Some of the parts I made and re-made several times; the "suspension" unit," and the "trailer finger" were the worst. Strangely enough, the bob and magnets were O.K. the first time of using. Incidentally, the whole affair cost me 6s. only—5s. for the dial, and 1s. for shellac to varnish the case. An old alarm clock, the bottom half of a brass fire extinguisher (for the shilling), and sundry pieces of hardwood for the case, bits of brass, odd nuts and bolts, I had in the junk box. I also made a relay to switch the clock on to a dry battery when the current (mains) fails. Normally, the magnets are energised from an 8 v. trickle charger. The case is a "granddaughter." I have fixed the back piece to a substantial piece of wood, and the whole affair stands on the floor; levelling is done by four bolts let into the baseboard. And it goes! What is more, it has kept excellent time for more than twelve months.—W. J. VIGGUS (Cardiff).

Air Compressor

SIR,—With reference to the article in the February issue of PRACTICAL MECHANICS on making an Air Compressor from a motor-cycle engine, I would point out that for serious work at least a ¾ h.p. motor would be required. Most professional spray guns require a minimum of two cubic feet of air at 40lb. pressure.

When used as a tyre pump it will also be necessary to use a special connector made for the purpose which incorporates a central rod which lifts the tyre valve from its seat. Although this might not be necessary if the reservoir was cut out, and the tyre connected direct to the cylinder head of the compressor. —A. R. TURPIN (Banstead).

Club Notes

Radio Controlled Models Society

THE next meeting of the above Society, will take place at 3 p.m. on Saturday, March 29th, at the Y.M.C.A. Peter St., Manchester, when Mr. Peter Hunt, Technical Editor of Model Aeronautical Press Ltd., will lecture and demonstrate on Radio Controlled models. All those interested will be welcome. —J. C. Hogg, Hon. Secretary, 24, Springfield Road, Sale, Manchester.

Model Railway Club Exhibition, 1947

THIS exhibition, which is organised by the Model Railway Club, Ltd., is being held during Easter Week from Tuesday, 8th April to Saturday, 12th April, 1947. It will be open daily from 11 a.m. to 9 p.m. (except Tuesday, 8th April, when it will be open from 2 p.m. to 9 p.m.).

It will be open to the public, admission—adults, 2/3; children under 12, 1/-. It is not held for financial gain. Light refreshments can be obtained at the exhibition at moderate prices. A lounge or rest room will be provided.

The Model Railway Club, which was founded in 1910, caters for all those who are interested in the making of models of railway subjects. Amongst its members may be found those who are interested in all branches of the hobby, including the making of models to so small a gauge as 3.5 mm. to a foot, the owning and operating of complete track layouts, the construction of stations, signals and the building and operating of large scale steam locomotives capable of hauling 20 or more adults.

The object of the club is to help those having difficulties or problems in their hobby; to provide for the exchange of ideas and knowledge gained from experience; to advise members as to the correct design of their models and the railway-like operation of the railways and where necessary the proper use of tools and drawings.

There will be a representative collection of models of locomotives, coaches, wagons of the four railway companies—G.W.R., L.M.S.R., L. & N.E.R., and S.R.

Models of all types and gauges will be exhibited, including some of the larger steam locomotives in operation on the club track. In addition, there will be models of track-work, signals, stations, and many other items of railway interest.

Loan Collection

This consists of interesting models kindly lent by model-makers or owners who are not members of the club.

Trade Section

The model-making industry is well represented by leading firms who display their latest products, including advanced samples of their future productions.

It is felt that the exhibition of models made by amateurs, and the consequent exchange of ideas, will not only benefit the actual model-makers, but will materially foster and help the model-making craft generally.

The Sheffield and District Society of Model and Experimental Engineers

OUR 1947 Exhibition is to be held on the four days Wednesday, April 9th, to Saturday, April 12th, inclusive, and we are anticipating a great success, with many thousands of visitors.

During the four days of the 1946 Exhibition, almost 8,000 people visited the show, and undoubtedly this figure will be surpassed this year.

The Council of the Society has considered the question of Trade Stands, and has come reluctantly to the conclusion that, owing to lack of space, we shall not be able to accommodate our Trade friends this year, in the Exhibition Hall.

We propose, however, to have a table for the display of leaflets or brochures.—W. J. Hughes, 87, Hopedale Road, Frecheville, Sheffield.

OUR COVER SUBJECT

IN spite of the fuel crisis, work is proceeding at the Airspeed Experimental Factory at Christchurch, Hants, to complete the prototype Airspeed "Ambassador," a new twin-engined 40-seater air liner. Intended for short-range work at high speed, it is a high-wing monoplane with tricycle undercarriage to facilitate frequent loading and unloading. The whole of the fuselage is ventilated and heated, and the aircraft can be built in two versions, pressurised or unpressurised. The latest developments and safety devices are being incorporated in this new British air liner and, when it is put into service, it is anticipated that the fare per seat-mile will be lower than first-class travel between London and the neighbouring Continental capitals. The illustration shows work in progress on the high three-fin tail section of the "Ambassador."

QUERIES and ENQUIRIES

A stamped addressed envelope, three penny stamps, and the query coupon from the current issue, which appears on back of 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.

Dyeing Bone Objects

I SHALL be glad if you will give me any information on the method of dyeing small bone objects.

I have tried many different dyes, both water and spirit, but all seem to come off with handling, as the dyes do not penetrate.—B. Palmer (Dublin).

BOIL the bone material gently in water for an hour so as to soften its surface a little. Then immerse the bone in a concentrated hot-water solution of the dye. Dye for at least half an hour at the boiling point. A little Glauber's salt added to the dye bath (say 2 per cent. of the weight of the water) will promote level or even dyeing. A little soap may be used in place of the Glauber's salt, if preferred.

Spirit dyes may be used in spirit solution for the dyeing, but, even when applied hot, they do not penetrate well. Prolonged dyeing in hot or boiling water and with concentrated solutions of dyes is the best way of overcoming the bone-dyeing difficulty. The same applies, also, to the dyeing of ivory.

It might help also if the bones were steeped for two or three days previous to dyeing in a 10 per cent. solution of tannic acid (i.e., 10 parts of tannic acid in 90 parts of water), since any absorbed tannic acid would aid in the fixing of the dye.

Crackle-finish Enamel

CAN you please tell me of a non-stoving enamel or paint which will leave a non-reflecting surface with a crackle finish suitable for darkroom apparatus? If this is unobtainable, what would be the heat required to use a stoving enamel? Also, would you name any firms where I could obtain either of these finishes? As an alternative is it possible to make crackle enamel in small quantities?—E. H. Witts (Fulham).

THERE is no non-stoving enamel which will give a crackle finish. Indeed, crackle-finish enamels are not commercially obtainable, although they are much used by manufacturers who, often enough, employ secret formulæ.

You can make a crackle enamel by adding about 5 per cent. of aluminium stearate (obtainable from Messrs. A. Boake, Roberts & Co., Ltd., Stratford, London, E.15) to black enamel, dissolving it without heat. After application, the enamelled object is at once baked in an oven at a temperature of 110-115 deg. F. until the "wrinkles" have been formed. Thereafter, the temperature of the oven is taken up to 300 deg. F. to harden the enamel film. This higher temperature baking takes about three hours. This is also the temperature at which an ordinary stoving enamel is baked, but with an ordinary stoving enamel the temperature should be maintained at 160 deg. F. for about half an hour before allowing it to rise to the 300 deg. mark.

Messrs. Johnson & Sons, Ltd., Manufacturing Chemists, Hendon, London, N.W.4, supply some very good black instrument finishes in glossy and dead-black form. It is very probable that one of these would fit your needs admirably.

Silver Emulsions

I AM desirous of making my own photo plates for a camera, and I would be obliged if you could inform me as to how one puts the film solution on the glass plate.

Can the solution be bought, and where?—A. K. Smith (Willesden).

IF you have chemical skill and experience and if you care to make tedious experiments with silver emulsions, you can undoubtedly prepare your own sensitive emulsions, in which case refer to any good dictionary of photography. But the fact is that it is not ordinarily practicable for the average photographic amateur to obtain success at emulsion making, especially in view of the fact that *all* commercial emulsions, as used on plates, papers and films, are made to secret formulæ.

Hence, your best plan is to obtain a bottle of a ready-made sensitive emulsion, such as "Emulsol," which may be obtained from any large photographic dealer, such as Messrs. Wallace Heaton, New Bond Street, London W.1. Have the glass plate scrupulously clean and merely coat it lightly with the emulsion, as directed in the printed instructions; the whole operation, of course, being conducted in a darkroom.

The glass plate must be cleaned with soap and water, rubbed down with a paste of whiting and water, rinsed, rubbed over with weak ammonia and finally rinsed in water (preferably distilled).

Freezing Mixture

WOULD you kindly advise me on the following: I require to know the ingredients of a suitable freezing mixture to keep half a gallon of ice cream for about two days.

I possess no special utensils for the process of preserving ice cream.—K. N. Brooks (Brighton).

THERE is no chemical freezing mixture which could economically and effectively keep half a gallon of ice cream at freezing point for two days. Chemical freezing agents are, in the main, of only short-lived efficiency and they can only be applied economically to small amounts of material.

You will, therefore, have to rely on broken ice (which you ought to be able to obtain locally) or, as an alternative you might be able to use "Dricold," which is solidified carbon dioxide gas, a transportable commodity which is normally obtainable from Imperial Chemical Industries, Ltd., Millbank, London, S.W.1, although whether it is yet available for non-industrial uses we are unable to say.

Capacitor Motor Starter Switch

I HAVE an A.C. 230 v. ½ h.p. motor having three terminals. It has to have a 20 mfd. condenser across one of the windings, but unfortunately I am not sure how to connect up to the switch. Could you oblige me with the circuit?—T. Wodlett (London, N.).

IF the motor is a capacitor motor, as distinct from a capacitor-start motor, the starting windings are designed to carry current continuously. The motor can then be connected as indicated in Fig. 1, and started by a plain double-pole switch and protected by a pair of fuses. If it is a capacitor-start motor, the starting winding and condenser should be switched out

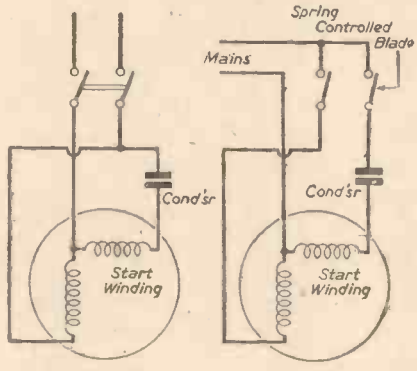


Fig. 1 Fig. 2

Diagrams showing starter windings and switching for capacitor motors.—(T. Wodlett.)

of circuit when the motor has speeded up at starting, otherwise the starting winding may burn out. A twi-knob switch would then be suitable. This has two blades, one of which springs open when pressure on the knob is released. This blade should be in control of the starting winding, as in Fig. 2. This switch is manufactured by A. P. Lundberg & Sons, of 491-493, Liverpool Road, Holloway, N.7. It is possible they will only supply switches for essential work, and you may then have to use a separate single-pole tumbler switch to disconnect the starting winding and condenser.

Treatment for Dry Rot

WILL you please inform me of some methods of combating dry rot in building timberwork?—M. R. Durman (Oswestry).

DRY rot is a mould or fungus which feeds on wood and completely destroys it. It is propagated by means of invisible seeds or "spores" which float about in the air and thus, in time, settle on woodwork. If the woodwork and its surroundings are dry, the spores cannot develop, but if the timber is damp and is situated in permanently damp surroundings, the fungus spores will develop rapidly and a new infection of "dry rot" will thus commence.

The name "dry rot" is applied in view of the fact that, under the influence of this fungus, the wood crumbles away to a dry, brown powder.

Badly affected woodwork should be cut away completely. There is no other method of dealing with it. The surroundings of the woodwork must also be improved as regards dryness and ventilation, otherwise the fresh woodwork will become infected.

One of the best specifics against dry rot is creosote. This remedy is effective and cheap. Apply creosote oil (preferably warm) to the woodwork liberally, particularly to the sawn ends. Do not be afraid of using plenty of it. Dry rot fungus cannot possibly withstand the action of creosote, for which reason telegraph poles are pressure-impregnated with creosote, as are, also, wooden railway sleepers.

If you are the owner of your own residence it will always pay you to go over the structural timber of your house with the creosote brush. The smell of the creosote is, admittedly, a disadvantage, but this is counterbalanced by the knowledge that creosoted timber cannot possibly perish from dry rot.

Surfaces which are to be painted must, of course, not be creosoted, for the creosote which is absorbed by the wood mingles with the paint and sometimes discolours it badly. Fortunately, painted woodwork is not usually subject to dry rot. It is the rough, unprotected timberwork which falls a prey to this insidious pest, and it is just this type of woodwork which responds the best to the creosote treatment.

Creosote can be obtained from any builder's merchant or ironmonger.

Enlarger Lens

I HAVE an Ensign horizontal enlarger, which I have put on a stand and so converted to a vertical model. I find that I could do with more lift to get the desired magnification. Could I use a spectacle lens for the purpose and, if so, what diopre, please? The focal length of my lens is 125 mm. and stop f 6.3.—S. Murray (Lancaster).

AN ordinary spectacle lens would not suit your purpose, since it would result in faulty definition in the enlargements. You could get over the difficulty to some extent if you could use an enlarging lens of shorter focal length than the one you are using at present, always assuming that the lens of shorter focal length is able to "cover" the area of the negative. Alternatively, you could use a supplementary lens, slipping it over the front lens of the enlarger. These used to be available, but we understand that they are now only obtainable secondhand from firms of dealers such as Messrs. Broadhurst, Clarkson and Co., Ltd., Farringdon Road, London, E.C.4, to whom particulars of the focal length of your existing lens should be sent.

There is an approximate rule which will be useful to you for finding the focal length of the supplementary lens. It is: Multiply the desired focus of the enlarging lens by its actual focus and then divide the result by their difference. This will give you the necessary focal length of the supplementary lens. Remember, of course, that you will require the enlarging lens to operate (by means of a supplementary lens) at a shorter focus or focal length than it does at present.

Notwithstanding the above, the best way of getting out of your enlarging difficulty is, by one means or another, to raise the height of the normal lens above the paper. This will then give you the extra size of image; it will not interfere with the optical performance of your enlarging, and you will get better definition than the use of any supplementary lens can bring about.

Spray-painting

I SHALL be very grateful if you will give me the following advice:

(1) Is there any sprayable paint which can be used over the top of existing lead-paint or enamel? If not, is there any setting liquid which can first be applied to prevent surface breaking, which seems always to occur when enamel or similar paint is applied on cellulose and vice-versa?

(2) I wish to redecorate the interior walls of my house. Is there any *matt* surfaced paint obtainable now which could be sprayed over the existing distemper? If not, would it be possible to spray distemper (the ordinary oil-bound variety), instead of the laborious method of hand-painting it on?—E. F. Amos (Tenterden).

(1) Any good quality paint is capable of being brushed or sprayed over an existing lead paint. If the surface of the paint layer breaks or becomes streaky as a result of this operation, the trouble is either due to a poor quality (and possibly contaminated) paint, or, more likely, to a dirty, greasy paint surface to which the fresh paint has been applied. Even in the case of a layer of cellulose paint, we think that if you will give the base paint a good washing down with a solution of common soda before spraying the new paint the trouble will be overcome.

(2) Distemper cannot usually be sprayed owing to its high solid content and the rapidity with which settlement takes place in the paint. We believe, however, that there have been claims respecting the spray-ability of ordinary oil-bound distempers, and if you would care to write to the Walpamur Company, Ltd., Darwen, Lancs, you would receive first-hand information on this point.

Any ordinary oil paint can be made to give a matt or eggshell surface merely by diluting it with turpentine, or a mixture of turpentine and raw linseed oil.

Chromium and Copper Plating

I SHALL be glad if you will inform me what chemicals to use and the right amount to a gallon of water for chromium plating? Also, what anode to use, and does this go on the positive or negative side? How many volts and amps are necessary? I would also like to have similar information about copper plating.—W. H. Wood (Hillingdon).

CHROMIUM plating is not easy to carry out by the ordinary amateur, and many attempts at it may result in disappointment. However, for your information, the following is an average chromium plating bath:

Chromic acid	.. ..	250 parts (by weight)
Chromium sulphate	..	3 „ „
Water	..	1,000 „ „

Chromic acid is very corrosive and must only be contained in glass vessels. The amperage of current must be 100 for every square foot of surface which is being plated. An E.M.F. of 4-6 volts is sufficient. The anode must be a lead strip, it being the *positive* electrode of the plating bath.

You can only effect chromium plating on copper or on nickel—preferably the latter.

Copper plating is much easier than chromium plating. There are two types of copper-plating baths in general use, the "acid" bath and the "alkaline" bath. The latter is generally preferable, but since it contains the highly poisonous potassium cyanide (which you would not be able to obtain) you will have to use the acid type of bath, a typical formula of which is the following:

Copper sulphate	.. ..	2lb.
Water	.. ..	1 gallon.
Sulphuric acid (concentrated)		4-6oz.

For this bath, use a copper strip as the anode or positive electrode, the work undergoing plating constituting the cathode or negative electrode of the bath. An E.M.F. of 2-4 volts is sufficient, the current-density being 15-20 amps. per square foot of surface undergoing plating.

Note that the objects to be plated must be very carefully cleaned and degreased previous to plating, otherwise very bad results will accrue.

Electro-plating chemicals may be obtained from Messrs. W. Canning and Co., Ltd., Great Hampton Street, Birmingham.

Silvering Glass

CAN you please tell me the method used to silver-plate glass? I wish to make mirrors out of some plate glass I have, size approximately 2ft. by 1ft. 6in.—J. White (Peckforton).

GLASS is not "silver-plated" in the sense that a metallic surface is plated. Rather, it is silvered by chemical action. The process can be operated by an amateur, but it is a tricky one, being messy and calling for considerable skill and experience.

The following is an outline of the process.

First of all clean the glass thoroughly by swabbing it over with a dilute solution of soda and by washing it well in water. Then immerse the glass sheet in clean water until the silver bath is prepared.

The silvering bath is prepared as follows:

Three separate solutions are necessary:

Solution 1.

Silver nitrate	½ oz.
Water	2½ oz.

Solution 2.

Caustic potash	½ oz.
Water	2½ oz.

Solution 3.

Glucose	¾ oz.
Water	2½ oz.

A quantity of solution 1 is poured into a clean mixing glass and ammonia is poured into it drop by drop until the precipitate which first forms *just* re-dissolves. The same quantity of solution 2 is now mixed with the liquid and the resulting precipitate is again *just* re-dissolved with ammonia as before. A few drops of solution 3 are next added to the liquid, but only sufficient to produce a slight permanent milkiness or turbidity in the liquid. Finally, the same quantity of solution 3 as was taken of solutions 1 and 2 is now mixed with the liquid, and the mixed liquids are immediately poured on to the cleaned glass sheet which should be resting face upwards in a shallow dish. The silvering action begins almost immediately and is usually completed within a few minutes. The solution may be diluted, in which case the silvering will take longer. The liquid is useless after the silvering and may be thrown away.

The separate solutions will keep indefinitely, but after mixing they will not keep for more than 10 minutes.

After silvering, the glass is gently washed and then placed in a rack to dry. Heat must not be used for drying.

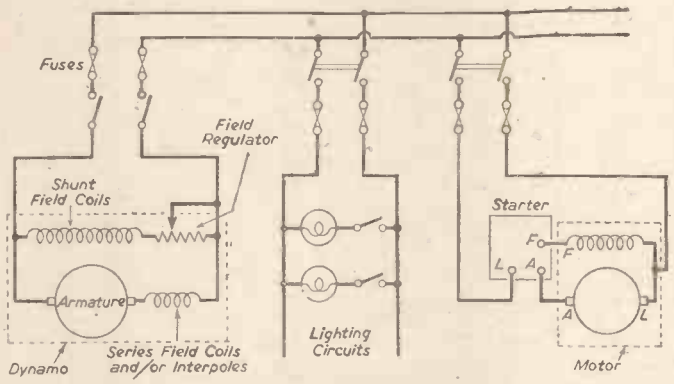
Throughout the silvering process, the most scrupulous cleanliness of dishes must be observed. The slightest grease off the hands may be sufficient to spoil the process.

It is a good tip to immerse the glass sheet immediately before silvering in a solution made by dissolving 10 parts of tin chloride (stannous chloride) in 90 parts of water. This is supposed to be a "trade secret."

Turbine-driven Dynamo

I SHALL be obliged if you will advise me on the following matter. I have a water turbine which drives a thrashing mill. I would like to drive a 250 volt D.C. dynamo, direct from the turbine, to give me a few lights and also to drive a 1 h.p. electric motor, which is to drive a milking machine.

Is this possible without the use of a storage battery? Could you also advise me on what type of motor to use and how to wire it up to the starter and dynamo?—A. Macalpine (Kilmarnock).



Circuit diagram for running a motor from a dynamo, which is also used for lighting.—(A. Macalpine.)

ASSUMING you do not require to use the lights or motor when the dynamo is not running, no battery will be necessary. It is, however, important that the speed of the dynamo should not vary more than about three or four per cent. above or below its normal speed if good lighting is to be obtained. If you can achieve this result we suggest that you use a compound dynamo, preferably one having interpoles. The dynamo output required to drive the motor would be about 1 kW., with 1 kW. extra for each 10 lamps of 100 watt capacity and so on. It would be best to get a dynamo slightly larger than the calculated value, rather than one slightly smaller.

If you cannot maintain a fairly constant speed it will be necessary to use a governor or an automatic voltage regulator to control a variable resistance connected in the shunt field circuit, so that the shunt field current can be increased when the speed is low to increase the voltage. In this case you would need a dynamo giving about 300 volts at normal speed so as to avoid overheating the field coils with the increased current necessary when the speed is low. You could use 3/0.029 V.I.R. or lead sheathed cable between the dynamo and motor. We suggest that you use a shunt or compound motor to drive the milking machine, protecting this with a fuse designed to melt at about 10 amperes.

Removing Stains from Etchings

I HAVE some black and white etchings in some first editions which I am very anxious to preserve. Unfortunately the etchings are stained a rusty colour, and I have been told this may be due to dampness at some time having worked on the components of the paper. Is it possible to remove these marks by bleaching or otherwise without damaging the print?—W. James (Reading).

WE take it that your engravings or etchings have become discoloured with little brown spots known as "foxing marks." These are due to the action of bacteria on the paper under the influence of dampness. The paper becomes weakened in the area of these marks. If the markings are more extended, they may be due to some contamination with iron-bearing water.

However, the marks can be removed, but the task is one which calls for some care and experience. You should therefore practise the process on an unwanted print before applying it to the valuable prints.

First of all, with a clean sponge wipe the entire surface of the print over with strong hydrogen peroxide and then place the print in strong sunlight. If you are lucky, three or four of these peroxide applications will completely remove the rusty markings, after which the print can be ironed (on the back) and returned to its frame. Note, however, that exposure of the print to sunlight is essential.

If this process fails, the print will have to be chlorine bleached. This process is safe, provided that you handle the print carefully while it is in the wet state.

Proceed as follows:

Support the print on a sheet of glass (preferably plate glass) and sponge it over with a solution made by grinding a heaped teaspoonful of chloride of lime into a tumberful of cold water. Note that all the chloride of lime will dissolve, and only the clear solution resulting from straining the liquid through cloth should be used.

After the above solution has been in contact with the print for one minute, sponge over it an acid solution made by mixing 1 part of acetic acid with 3 parts of water. (Hydrochloric acid can also be used in this proportion, but acetic acid is safer.) If the print is not completely bleached after this application, repeat the process.

After the print has been bleached, it must be washed in running cold water for *two hours*. This washing is essential in order to remove every trace of the bleaching agents. Do not, therefore, attempt to cut down this washing time.

After washing, the paper will be soft and woolly. It will now require sizing. This is done by allowing it to become semi-dry and then by immersing it for half a minute in a solution made by dissolving 4 parts of cooking gelatine, ½ part of white soap and ½ part of common alum in 100 parts of warm water. The solution can be sponged over the print if preferred.

After this sizing, the print is hung up to dry for 24 hours. It must not be allowed to dry in contact with the glass, otherwise it will stick to the latter. Neither must the sized print be dried by heat. Slow drying in a cold room is the best.

When thoroughly dry, the print should be ironed (from the back). It will then be ready for framing.

If, after this treatment, the print is too white, it may be toned down a little by sponging strong coffee over it.

Preserving Flowers

CAN you state the ingredients of any substance into which I could dip flowers, thus leaving them coated with a thin preserving transparent coat? If amyl acetate is suggested, how could it be tinted? —R. Vincent (Lymington).

THERE is no really satisfactory substance for the purpose you mention. In nearly every case, despite the transparent coating which may be laid on the flower, its stem and leaves, the whole structure gradually loses water and contracts, so that a progressive shrivelling takes place.

A simple coating liquid consists of a solution of hard white wax in petrol. This must be used very thinly, otherwise the coating will be white and opaque.

Another solution may be made by dissolving clear scrap celluloid in a mixture of approximately equal parts of acetone and amyl acetate. This is painted on to the flowers and leaves. The solution must not be too thick, the more delicate flowers and leaf structures requiring a thinner solution than the thicker structures.

Perhaps the best solution of all is collodion, which is made by dissolving nitrocellulose ("gun cotton") in a mixture of about equal proportions of alcohol (rectified spirit) and ether. Collodion is a commercial article and no doubt your local druggist may have a quantity for sale.

Collodion may be tinted by dissolving a trace of a spirit-soluble dye in it.

The celluloid solution may be tinted by adding to it a small proportion (about 2 per cent.) of a solution of a spirit-soluble dye in rectified spirit.

Re-enamelling a Bath

COULD you please tell me how to recondition the surface of a cast-iron bath of the "painted" variety? The existing surface, which is a good quality enamel, refuses to wash clean and is now chipping in several places. It also lost its gloss after being used only a few times. —J. A. Brotherton (Lancaster).

WE are surprised to learn that the good quality enamel which you applied to your cast-iron bath has not proved satisfactory. Did you give it a sufficient time to harden? Also, did you well clean and degrease the surface to which it was applied?

However, your best plan now is to remove as much of the enamel and underlying paint as possible. This is best done by dissolving 1 lb. of caustic soda (purchasable from your local branch of Boots the Chemists) in a bucket of water, and, with the aid of a long-handled scrubbing brush, by vigorously scrubbing the surface of the bath with this caustic liquid. The paint will be removed fairly readily, after which it should be well washed away.

To the resulting clean surface (which should be made as even as possible) apply two thin coats of ordinary white paint, allowing the first coat to dry before applying the second. Finally, apply two coats of a high-grade gloss bath enamel, again allowing the first coat to dry before putting on the second. Give the second coat plenty of time to dry (a week or more) before using the bath.

THE Cyclist
Editor: F. J. CAMM

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Comments of the Month

By F. J. C.

Damaged Bicycles

THE transport of bicycles by rail in this country is nothing short of a national scandal, and efforts have been made by the national bodies to persuade the railway companies to provide hooks so that bicycles may be suspended in luggage vans. This idea is, of course, practised in France and Belgium, and the International Touring Alliance has asked that all European countries should follow suit.

The Minister of Transport, however, has turned the idea down, and this has evoked the following letter, signed by the chairman of the National Committee on Cycling with the approval of the C.T.C., the National Association of Cycle Traders, the National Clarion Cycling Club, the National Cyclists' Union and the Road Time Trials Council:

"The Minister of Transport states that British railways do not consider they would be justified in providing hooks for hanging up bicycles in luggage vans.

"The idea, as Mr. John Parker, M.P., told the Minister, has already been adopted in France and Belgium, and the International Touring Alliance asks that all European countries should follow suit. The need for the device will be obvious. At present, bicycles are so jammed into luggage vans that the damage done to them runs into thousands of pounds a year.

"The fact was not denied by representatives of all the British railways with whom the National Committee on Cycling discussed the question last September; nor could they deny that the carriage of bicycles by passenger train in Great Britain is the worst, and its cost the highest, of any country in Europe.

"The railways may feel that they are 'justified' in continuing to damage the property of cyclists. But this is more than a cyclists' grievance: damaged bicycles must be repaired, and the wanton waste of replacement parts, at present in short supply, is not defensible. Nor should the question of attracting touring cyclists from Europe be ignored. The numbers of them have never been impressive, even compared with the flow from this country to the Continent before the war; and, should they now be persuaded to come to Britain, they will certainly not come back when they find their bicycles treated like old iron."

The Paris-London Road Race

A PROPOSAL was made to run a Paris-London road race which was to be backed by a leading London morning newspaper. This proposal had the approval of the U.C.I. and of the N.C.U., which is the only body in this country recognised by the U.C.I. Now the R.T.T.C., which controls road sport over here, has no international status, but it has a working arrangement with the N.C.U., which has no power over road sport.

The fantastic and almost Gilbertian situation arose in that the R.T.T.C. would not approve the running of the English part of the race unless it was run under their rules.

The R.T.T.C. issued the following statement on the subject:

"Early in the year the *News-Chronicle* applied to the R.T.T.C., as the controlling body for time trial sport, for permission for the English section of a race from Paris to London—this section to be run on time trial lines. The Council gave permission for the event, adding, as it was compelled to do, that this permission must be subject to the observance of the Council's rules and regulations, which have been found essential to the continuance of time trial sport in this country. The permission was given after very careful thought, for in the past permission to promote time trials has been given only to cycling organisations, and not to commercial concerns.

"After due consideration, the *News-Chronicle* decided that very little purpose would be served by pursuing the matter any further. The Council feel that if the *News-Chronicle* were unable to sponsor an event in accordance with the Council's rules and regulations, they acted properly in abandoning their plan, rather than follow a course which would have a disruptive effect on the sport.

"We are now informed by the National Cyclists' Union that they have made application to the U.C.I. for a permit for an inter-country road race. By Clause 2 of the agreement between the N.C.U. and the Council 'the N.C.U. recognise the Council as the controlling body for time trial sport on the roads in the area administered by the Council,' and therefore the N.C.U. are still bound to ensure the observance of our rules and regulations in any time trial held in this country. So far we have had no confirmation from the N.C.U. that these conditions will be observed. We have informed the N.C.U. that if the event is to be run in accordance with the Council's rules and regulations we will give the fullest co-operation.

"While it is understandable that a commercial body might, for publicity reasons, wish to depart from the unobtrusive methods prevailing in our sport, such considerations cannot apply to the N.C.U. if, as they claim, the promotion is necessary to provide a purely sporting purpose. In this connection it should be pointed out that both the world's championship and Olympic road events are to be held on closed circuits, so that they do not resemble either of the sections of the proposed inter-country event.

"Since its inception, the Council's policy has been aimed at ensuring the goodwill of the authorities towards our sport by avoiding any possible interference with the public amenities. Any promotion which ignores this principle may have serious consequences for all concerned.

"The Council reiterate that there is no reason why the proposed event should not take place providing that the Council's rules and regulations are observed."

B.L.R.C. as Controlling Body?

AFTER further consultation between the R.T.T.C and the N.C.U., certain conditions were considered which, if accepted, would allow the English Section of the race to be held under R.T.T.C. rules and in accord with the joint R.T.T.C./N.C.U. agreement.

The prestige of the National Cyclists' Union has, of course, fallen to a very low ebb in international circles, for it is felt that its attitude towards the race has been decided by its attitude towards the B.L.R.C. They suffered a severe setback at the U.C.I. when the B.L.R.C. made application for recognition as the controlling body for cycle road racing in Great Britain.

In passing, has not the R.T.T.C. been remiss in not making application itself years ago? The B.L.R.C. application was correctly submitted to the U.C.I. on July 15th, 1946. On January 2nd, 1947, Victor Breyer, the secretary general, wrote that the application had been too late for inclusion on the Agenda. A protest was made against this excuse that was too transparent to be taken seriously.

When the election of the secretary on the U.C.I. came up at the 74th Congress many complaints were voiced in criticism of V. Breyer. After a full discussion, when the matter was put to the vote, Breyer was defeated and R. Chesal was elected the new secretary, the voting being 58 to 16, which indicates the feeling of the meeting.

Immediately following the overthrow of Breyer the president raised the question of the B.L.R.C., and the delegates promptly agreed that a commission be appointed to examine the League's claim, such commission to consist of representatives of Denmark, France and Holland.

Considerable concern was expressed by the delegates present at the unsatisfactory state of British cycling affairs, evidenced by the report to the Congress that the R.T.T.C., which is internationally unrecognised, had vetoed the approval of the body which is recognised, namely the N.C.U., for the Paris to London race.

Naturally, this has caused the N.C.U. to lose considerable prestige, and it has advanced the cause of the B.L.R.C.

The Government cannot, of course, frame any Act banning massed start racing unless it also bans time trials. If time trials are, therefore, banned, as well as massed start, cyclists can blame the N.C.U. for it.

Paragrams

A Good Sign

SINCE the reorganisation meeting of the Doncaster Clarion Cycling Club the membership of the Club has been trebled. This club, with Doncaster Wheelers and other local clubs, are receiving good support, and members are showing a keen interest in club activities.

No Paint, No Garage?

DURING a discussion at the meeting of Brigg (Lincs) Urban Council Housing and Town Planning Committee, reference was made to the erection of garages and cycle sheds for private houses. The planning authority has stipulated that a garage for which plans have been passed must be painted green, which led a member of the committee to enquire whether a man is prevented from putting up his shed or garage if he cannot get the proper colour of paint.

Late Starter

MR. JOHN THOMAS, of Immingham, Lincs, who has just celebrated his 94th birthday, did not become a cyclist until he had given the matter very careful consideration. He first learned to ride when he was 70. For many years he worked at Immingham as a stationary engine driver, but when he was 70 he was transferred to Waltham and he got himself a cycle so that he could ride the 12 miles or so to his work.

Road Safety Experiments

HOLLAND (Lincs) County Council is in touch with the Ministry of Transport, and plans to carry out experiments with "cats' eyes" on 16 miles of main road in the Lincolnshire Fen country. If the Ministry agrees, the experimental "cats' eyes" will be placed on selected stretches of the Boston-Spalding and Sutterton-Sutton Bridge roads which have recently been re-surfaced.

Taking No Chances

SEEING a large red glow moving along the road near Stowmarket, Suffolk, a police inspector decided to investigate. He found that a conscientious cyclist whose rear light had failed had borrowed a red road warning lamp and had fixed it to his machine, where it was, according to the inspector, "showing red to the front, the side and the rear." The cyclist was later charged at Stowmarket Police Court with the theft of the lamp, but the charge was dismissed on his explaining that, because it was such a foggy night, he merely borrowed the lamp to avoid being run into from the rear.

More Work for Police

AT its first meeting at Spalding, Lincs, the Holland Road Safety Council resolved that the Ministry of Transport should be asked to see that legislation was brought in to force all cyclists to have efficient brakes and to keep their machines in road-worthy condition. The council also protested strongly against the danger to other road-users caused by motorists who do not dip their headlights, and by the indiscriminate use of glaring spotlights on cars. The council will ask the Ministry that lighting regulations should be tightened up to provide uniformity in the setting and dipping of headlights and the distance of the beam.

New Peterborough Trophy

IN a speech at the annual meeeting of the Peterborough Cycling Club the president, Mr. C. Slater, announced his decision to present to the club a special trophy to commemorate the safe return from the Forces of his three sons. Having successfully weathered the war years, the club now has a membership of 80. The hon. T.T. secretary reported that 1946 was a peak year in competitive cycling and he hoped that some first-class speed riders would be found among the new club members.

St. Neots Club Progresses

GOOD progress during 1946 was reported by the secretary, Mr. C. H. Paget, at the annual meeting of the St. Neots (Hunts) and District Cycling Club, which now has an active membership of 48. Mr. Paget has regretfully decided that, after having served the club as racing secretary for 10 years and having held other offices during the war years, he will be unable to continue during 1947, owing to pressure of other work. The new secretary is Mr. T. Garton.

Lifetime in Cycle Trade

MR. ALFRED FURNISS, whose death took place suddenly at Barton-on-Humber, Lincs, had spent the whole of his business life, with the exception of his service in the 1914-18 war and the last war, in the cycle and motor trade. For some time he was area representative for the Elswick-Hopper Co., Ltd., of Barton-on-Humber, and he was well known in trade circles throughout the country.

Changes in Doncaster Wheelers

MR. F. J. FLINTOFF, general secretary of Doncaster Wheelers, and Mr. R. R. Annis, racing secretary, who have done good work since they were appointed in the early days of the war, have now resigned. The new general secretary and treasurer is Mr. W. Smedley, with Mr. N. Kinsey as racing secretary.

Not That Sort!

A FIRM of manufacturers, in Leicestershire, who wrote to a Government department, enclosing a form of application for a licence to purchase "six 10 h.p. motors, 440 volts, three-phase cycles," received the reply: "Licence enclosed. Application must be made on a separate form for the cycles."

Canadian Wedding

MR. A. J. H. CAUSTON, of Huntingdon, well known in the town and district for his cycling activities, has gone to Canada for his wedding with the girl he met while he was serving in Canada with the R.A.F., during the war.

Still Thriving

PETERBOROUGH Cycling Club, which was founded in 1874, and claims to be the oldest active cycling club in England, has just celebrated its seventy-second birthday. About 80 club members and their friends were present at a dinner held at the Bell Hotel, Deeping St. James, Lincs. Following the dinner there was the usual distribution of prizes.

Humber Bridge to Wait

AT a conference between the Ferry Committee of the Ministry of Transport and representatives of Hull Corporation and Lindsey County Council, it was stated that the towns on the Lincolnshire and Yorkshire sides of the Humber will have to wait some time yet before the existing ferry service is replaced by a bridge or tunnel. The Ferry Committee admitted that the ferry service across the Humber could do with some improvement and this is to "receive consideration."

Those Fast Girls

AT the annual dinner of the Central District Ladies' Cycling Association, which covers Grantham, Nottinghamshire, Leicester and Derby, Mr. Jack O'Conner, well known in Grantham and district as a racing cyclist, said the days when men could leave the girls behind on fast rides were over. The girls are now as good as the men riders, he said, adding that on a training ride he himself was once left behind by Miss Marion Spiby, a fine all-round girl champion.

Any Takers?

THE Rev. George Thomas Allpress, who now lives at Stratford, E., and was formerly in the Peterborough district, will be 89 next October, and claims that he is not an old man yet but could easily cycle 50 miles under normal conditions in a single day. He has issued a challenge to the whole world "to find a man who drinks beer at my age to race me, thanks to the advantage of total abstinence from alcoholic drinks."

Indoor Races Planned

AT their annual meeting held in February, members of Grantham Road Club considered the possibility of arranging an indoor open cycle-racing competition on rollers and it was agreed that such a competition should be part of the club's programme. The club is also drawing up a scheme to attract new members.

Midland Sports Plans

COUNCILLOR F. W. MORGAN, Mayor of Tamworth, has made good progress with his scheme for establishing a Midlands sports centre in the town. The council have approved plans for a six-acre arena below the castle, with accommodation for about 18,000. Stands and dressing-rooms will be erected when the building situation permits, but in the meantime there are to be laid down a cycle track and a cinder running circuit. Leamington Cycling Club, which is well supported in the town and district, has plans for a similar sports centre.

St. Neots Club Dinner

AMONG the many guests prominent in the cycling world who were present at the annual dinner of the St. Neots and District Cycling Club, held at St. Neots, Hunts, were Bert James, of the Vegetarian Cycling and Athletic Club, and Jack Simpson, of Hemsworth Wheelers. Mr. C. H. Paget, who has been associated with the club for many years and has held every office at one time or another, emphasised the need of the club for publicity to enable it to continue to prosper. The club president, Mr. E. J. Bass, presided. Mr. Bass joined the club in 1893 and during his racing career has been the winner of over 300 prizes.

Healthy Bedfordshire Club

A MEMBERSHIP of 153 was reported at the twenty-fourth annual meeting of the Bedfordshire Road Cycling Club, held under the chairmanship of the president, Mr. W. Haylock. The "Old Timers' Association" of the club was formed during 1946 in order to retain the help of long-standing members, whose experience is of value to the club. For some time a club hut has been one of the club's ambitions, and this has at last been obtained and will be ready for use in the racing season of 1947.

Chance for the Girls

LADY members of Kettering Amateur Cycling Club will be eligible to compete in a road time trial event of five or ten miles, to be held this year for a silver cup which, when won, will become the permanent property of the winner. The cup was last presented at a meeting held in 1938, at Wicksteed Park, near Kettering.

A Fast Woman!

MRS. ANNIE J. ROWE, whose death has taken place in a Bedford nursing home at the age of 82, was the first woman ever to be seen riding a cycle in Leighton Buzzard, her home town. The fact that a woman on a cycle was, in those days, considered as much of a spectacle as a circus procession did not trouble her in the least and she retained her interest in cycling for many years.

Back To The Bicycle

SPEEDWAY riders who were present at the Grimsby Motor Club's dance held at Grimsby Town Hall took part in a "race" on the dance floor on a variety of bicycles, some without handlebars, some without pedals, some tiny models and some outsize. There were a few spills and the riders failed to reach their usual speeds, but there was plenty of fun and the event was one of the most popular of the evening.

Disgraceful, Sir!

OLD fox-hunting men must have turned in their graves when two racing cyclists led the hunt at the first meet held at Neath, South Wales, since before the war. The last straw would have been the sounding of the "Gone Away" on a bicycle bell, but apparently this enormity was not committed.

Congratulations

MR. G. P. MAIN, of Park-road, Loughborough, Leics, who has just celebrated his diamond wedding anniversary, has taken a considerable part in the development of cycling in the town and district. Many years ago he opened his first cycle agency and repair shop in Loughborough, and several of the cycles he built could be seen on the road up to a year or two ago. Later he became commercial manager of the Loughborough Cycle Company and then entered the wholesale side of the trade. For over seven years he was agent for the Standard Roller Bearing Company, Philadelphia, and represented the company in England, France, Belgium and Germany. Mr. Main has a number of patents to his credit, among them being an extension pedal which was purchased by a Birmingham firm, and a combined stand and luggage carrier which could be fitted to any cycle. Many thousands of these stands were sold throughout the country and the War Office ordered 5,000 pairs for fitting to the front and rear of cycles used during the South African War. As his business developed, Mr. Main opened branches in Leamington, Warwick and Leicester, in which latter city he carried on business for 35 years. His brother, Mr. Tom Main, has been in charge of the branch at Leamington for some 50 years. Mr. Main and his wife are now both 81 years of age.

Around the Wheelworld

By ICARUS

The Ealing Comes of Age

ALTHOUGH it came at the tail end of the social season the coming-of-age celebration of the Ealing C.C. was none the less a lustrous affair. This club which in the space of 21 years has done so much to promote a new spirit in cycling circles, and whose strength is measured by the amount of opposition to it, ranks high in clubdom, chiefly due to the unremitting endeavours of Jimmy Kain. At the 21st annual dinner, prize distribution and concert, held on February 27th at the Park Hotel, Greenford, many celebrities were present including the Mayor of Ealing and the Mayoress (who presented the prizes), S. M. Vanheems, former secretary of the R.R.A., the President of the Ealing Chamber of Commerce, the Chairman of the Ealing Youth Organisations, W. J. Mills, and F. J. Camm. Jimmy Kain, President, was in the chair.

A special feature of the evening was a film show of club activities, including shots of the international Dover to London Road Race, 1946, as well as the Classic Brighton to Glasgow Six-day Road Race. The commentator was Mike Peers of the Manchester Coureurs Road Club. There was an excellent musical programme including some splendid singing by Brenda Gayle.

Mr. F. J. Camm in responding to the toast of the club said that it bore the brand of Kain, a hallmark in cycling circles. He referred also to the National Shinwell Union —people who remain in office but do not deliver the goods. He went on to criticise the subterranean underhand methods adopted by certain opponents of massed start racing and referred to the discreditable efforts in the same direction of some who were not associated with national bodies but who were linking up with them. It was a most successful evening.

S.R.R.A. Annual Dinner

THE annual dinner of the S.R.R.A. was held at the Café Royal, Croydon, on February 20th, when the President of the Association, Mr. J. Dudley Daymond, was in the chair. The annual dinner of this association, which does not, of course, promote events, but exists to homologate records made on its territory, is the only occasion on which its members can meet and it is always a lively affair. This was no exception to the rule. Almost 100 members and guests sat down to dinner. The toast of the Association was proposed by Albert Lusty of the Midland R.R.A., and he dealt at some length with the foundation and history of the S.R.R.A. The response came from Percy A. Huggett, the hon. sec. and treasurer who took over from Arthur Whinnett. Bearing in mind the many years' service Whinnett gave to the association it is likely that a presentation will be made to him in the near future although he was a notable absentee on this occasion. The record breakers were toasted by George A. Reeder, with responses from Frank Southall and Charles B. Roberts. The chairman was toasted by Mr. F. J. Camm.

A plaque and certificate was presented to C. B. Roberts (Addiscombe C.C.) for breaking the 12-hour bicycle record with a mileage of 242¾ (previous holder L. Kain).

Bidlake Memorial Trust

THE Bidlake Memorial Plaque for 1946 has been awarded to Albert E. G. Derbyshire for his outstanding series of road rides during 1946 at 50 miles, 100 miles and 12 hours, which gained for him among other honours four national championships.

S.C.C.U. Good Friday Meeting

AT the S.C.C.U. Good Friday meeting the following amateur riders will compete:

Cor Bijster, National Sprint Champion of Holland, the rider who knocked Reg Harris out of the world's championship at Zurich.

Ray Pauwels, National Sprint Champion of Belgium. He has also beaten Harris during the winter season, and also every other sprinter of note, including Oskar Plattner, the world's champion; is, in fact, the most improved rider since the world's championship.

Ric Van Kerckhove, National Road Champion of Belgium, who was also third in the world's championship.

Jan Gieseler, 19-year-old boy wonder, who has beaten all comers in pursuit races this winter, including the world's champion, Rioland. He is the new flying Dutchman and a great favourite on the Continent. Is no sprinter, but rides flat-out and gives all he has got, with a big smile, all the time.

Both Van Kerckhove and Gieseler are contemplating riding in an English time trial during the Easter holidays. At the meeting they are both riding in a 10 min. pursuit race against six of our fastest road riders, and also in the B.S.A. Gold Column 5 Mile Race.

R.T.T.C. News

AT a meeting of the National Committee, A. E. Armstrong was unanimously re-elected Chairman of the Committee and S. Amey reappointed National Secretary.

The following sub-committees and delegates were appointed for 1947:

Finance: Messrs. A. E. Armstrong, A. V. Jenner and M. C. Newton.

B.B.A.R. Competition: Messrs. B. W. Best, A. V. Jenner, F. Slemen and W. Townsend.

N.C.U./R.T.T.C. Joint Committee Messrs. B. W. Best and W. Townsend.

Central Council for Physical Recreation: Mr. J. W. Rossiter.

National Committee on Cycling: Mr. B. W. Best.

Levy: The levy was fixed at 3d. per entry for 1947.

1947 Handbook and Dates List: The 1947 Handbook will be available from March 1st, and will be distributed only through Club and District Council Secretaries. The Handbook will contain the current Rules, Regulations, etc. Dates of all open and semi-open events held under the Council's Regulations, and those of the S.A.C.A. In addition to details of past champions and best all-rounders, the winners and times of 1946 events are given.

Club secretaries are invited to send their orders, together with the necessary remittance (1s. per copy), to S. Amey, "Wynfrith," Inwood Avenue, Old Coulsdon, Surrey.

The "Cycling Record"

CONGRATULATIONS to the B.L.R.C. in producing its own journal, the "Cycling Record." It is of newspaper format, and costs 6d. a month. That this new go-ahead body should have done this must cause the national bodies a great amount of chagrin.

Guests at the S.R.R.A. Annual Dinner.

An Invitation from Shropshire

IT came the other day . . . a letter from an old cycling friend who would like me to join him, this summer, on a little tour in Salop . . . county well known to me, and much beloved. County of the fine Clee Hills and of fair Ludlow, proud of that ancient and ornate inn "The Feathers"; county made more widely known by the charming writings of Mary Webb . . . who gave us those exquisite novels "Precious Bane," "Gone to Earth," and "The Armour wherein he trusted." I should like to cycle again in Shropshire . . . although I had thought of a tour in Dorset . . . with the delights of Corfe Castle and the Hardy country as special lures. But the call of Shropshire is strong, and, maybe, on a morning in July I shall head for the border-country and see again the quaint streets and houses of Shrewsbury town. . . .

Wayside Thoughts

By F. J. URRY

The Coming Time

WE are past winter and are now looking forward to the Easter break, that beautiful holiday time of creamy blossom and shy hedgerow decorations promising so many fine things to follow. As the seasons roll by I seem to think each in its time of coming is the best, but always there is the promise in spring, the certainty of some golden days, even in a summer like 1946 when the sunshine never made us seek the shade, and indeed scarcely brought a film of dampness to my brow. The chances are we shall enjoy an improvement this year of grace, and even if it happened, as some pessimists aver, that we are slowly slipping back to an ice-age, I'm going to make the best of the interregnum "twixt now and the final freeze-up." Taking all things into consideration I've had a fairly comfortable winter even though my journeys have never been of long duration, for week-ends in mid-winter and with a fuel shortage in being, to say nothing of sparse feeding, are not likely to be recommended unless you know the warmth of the domestic hearth will match the welcome. On several occasions I have had a hasty lunch in unwarmed shelter, and the experience is not quite comfortable, for in these latter days I like my cycling adventures to possess something of the old amenities, and a fire to warm my feet is among them.

Whither Away?

THERE was talk at home of making the Isle of Wight headquarters for a family holiday at Easter, if the island folk will take us. That would suit me admirably, for it must be a decade since I was ashore on that little isle and crossed "old Ashey Down to see the Solent's flashing blue." Wight is a very good place as a centre for cycling, for everywhere on the island is within easy reach of a day's ride out and home. Nevertheless the journeys can be made quite strenuous if you go delving among the roads and tracks that climb and fiercely fall among the downlands. As Wight is the land of my fathers I suppose it is natural I should feel an affinity for that plot of earth, though you can take it from me that if I do go my time will not be spent in looking up relatives for the purpose of staring at each other and wondering what line of conversation to start.

A Real Gale

THERE are many ways for me to ride to Wight, and which I shall take depends on the time at my disposal and to some extent the weather. In any case I shall not be in a hurry, for the time when I made Southampton in a day and came home with the sunset at Sandown or Shanklin has departed. I like to see things on the way, to sit occasionally, smoke and contemplate the scene, and perhaps to spend an hour in Winchester's fair before making the last leg of the journey. It was not ever thus, but as you grow older you discover the spirit of contemplation is very comforting and adds another charm to the pleasant pastime of cycling. I remember riding to Southampton on the Friday of Easter week, 1899, on the wings of a north gale, the kind of wind it would have been almost impossible to ride against. We were a party of four young men, a tandem and two singles, and the gale was so fierce that long before we reached Oxford we had twice tightened our chains for fear the crank end should pick up the slack and cause a nasty accident either to the rider or the bicycle, or both. Remember in those days there were no free-wheels, and that we youngsters scorned the old spoon brake, so we were dependent on back-pedalling to check speed, and with that gale behind us the job was harder than the forward travel. We went over the ridge of the Edge Hills to the Chipping Norton plain at a speed I have never equalled since, except in a car, and were in Southampton long before our schedule, for that gallant gale levelled the hills and made the going so rapid that we tired of pedalling, the only time I remember being weary of the circular whirl of my feet without a touch of tiredness in the propulsive muscles. That was a ride to remember; but I would not like to wish for myself such a helping gale if I go to Wight this Easter, for the sake of the people who would be going north.

Not so Good

I HAD thought that on my work and home journeys I had detected a happier relationship between motorists and other road users. For many weeks that had been my reaction, and I was happy about it, particularly in view of the fact that the steady increase in traffic was filling the roads faster than I had expected. Then came a week of disillusionment. On a dozen occasions or more I saved myself from peril by the instinct that the man behind me meant coming through whatever the risk. I gave way to save my skin, and, like most people, who are the victims of vulgarity, felt very cross about it. Another aspect of exceedingly bad manners I met in the period under review was the reckless way some motorists pass the cyclist, and in the space of 20 yards or less pull up dead in front of him, causing the necessity for quick retardation—which may mean skidding on a wet road—or risk swinging into the oncoming traffic stream. Only rarely has one the chance of a word with the people who practise this form of thrusting, and, curiously enough, when it does occur they are surprised at the suggestion that their manners are at complete variance with the highway code. Once I stopped at a crossing to allow a rather perturbed old lady to pass over in safety. A lorryman was close behind me at the time, and, presumably because he had to pull up, put his head out of the window and wanted to know why a couple of adjectival old fools were holding up the city traffic. Yes, that was rather a bad week, and at the end of it I was in sympathy with the stricter conditions I understand are to be imposed on driving tests. Yet it seemed to me then, and subsequent thought has rather confirmed the opinion, that it isn't driving tests we need so much as a course of good manners, in which consideration for the other fellow is dominant.

Crude But Sound

I NOTICE there are patterns of chain wheels and cranks on the market rejecting the old and tried values of the cotter-pin fastening, and very neat and attractive they are. I have not had the opportunity of testing the inventions, but no doubt that will come in due course when new bicycles embodying several minor improvements become available. For a long time many riders have wondered why the cotter-pin fastening has held its own, for it is rather crude and ugly when compared with most other bicycle refinements. Years ago we had the Rudge cotterless crank and special axle, and it was good, for I rode an Aero Special so fitted with a ½in. pitch chain many thousands of miles and it served me well. But if it did go wrong it was a problem to fix a roadside repair until one could contact a Rudge agent, and even then the proper adjustment or replacing took time and cost quite a lot of money. It is true that the crank anchorage to axle so widely practised is not ideal; cranks work loose, and far too frequently owners of such bicycles are either too lazy or too ignorant to tap the cotter home and tighten the nut. Listen for the regular creak of the loose crank on the way home any night of the week and you will surely hear it rounding the cut keyway on the axle, and in time—and not a very long time either—making a perfect adjustment impossible. I have just changed a very neat cotter fitting flush with the crank side, because it would not drive home any farther to make a perfect fit. This was a case where the expediency of neatness did not obtain the desired results, except for a comparatively short time; and I'm rather afraid some of the cotterless crank fastenings I have seen recently may fail in this important matter of stability and sound construction. Neatness can be bought at too great a risk to the efficiency, and it seems to me a long test is necessary before pronouncing on these inventions.

What Else?

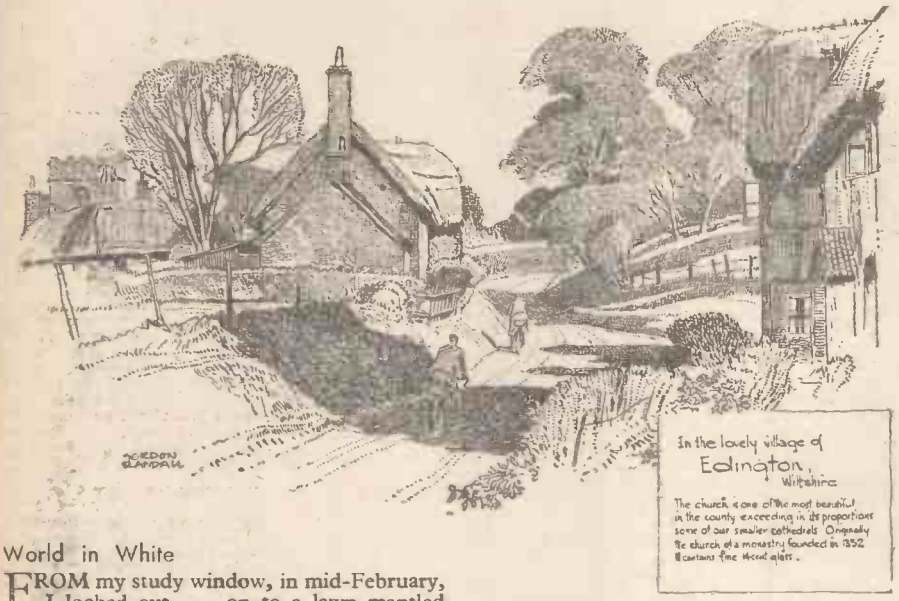
DURING those days when floods were abounding I went out one Sunday morning to see how the countryside was faring. It was a horrible morning according to common opinion, for it rained in volume and with that steady persistence that made the fowls of the air wear a sad and subdued look. Enveloped in decent macs I rode thirty miles in three and a half hours, and except for the edges of my coat and damp feet, due to paddling through a flooded lane (which I ought to have ridden but could not guess its depth because of the muddy water) was as dry as a bone when I arrived home for lunch. And I ask, what else could I have done on such a morning in the way of exercise and recreation? That is another value of cycling, you can make experiments with such weather and thoroughly enjoy it, rather remarkably discovering that rain is more unpleasant to the inside than the outside people. We have no big rivers adjacent to Birmingham, but many little tributaries scarcely noticed in normal times as the wanderer passes over them. That morning they were torrents singing the pæan of their importance as they rushed the bridges or overflowed the roads, and one so seldom sees our tiny rivulets in a raging mood that I thoroughly enjoyed my little journey. Some cyclists I know hate rain and eschew the game when the skies are weeping; I don't blame them, for they are merely following a public convention that dislikes the damp day but on occasions will bend the knee and pray for rain, which should remind them of its dire necessity.

Style!

I WAS reading an ancient volume the other day on "The Art of Cycling," by Lacy Hillier and A. J. Wilson, champion riders of their time but names almost unknown to the present generation, even though they were heroes of my boyhood. And one chapter was devoted to ankling, which these authorities on the ordinary and the tricycle tell us is the most important of the muscular flexities concerned with the pastime, and adds one-fifth to the propulsive power of the individual who excels in the action. The authors arrived at this 20 per cent. increase in power by a complicated system of diagrams and calculations beloved of the early eighties, and while I cannot vouch for the accuracy of their figures I do know the flick of the ankle before and after the main pressure of the down stroke of the pedal makes the stylist, whether he uses the correctly acquired action for ease or speed. The thruster should note these remarks, for ankling adds so much to the joy of pleasure cycling under all conditions, and to the speed of the would-be racing man, that its perfection is worth the trouble of acquisition.

CYCLORAMA

By H. W. ELEY



In the lovely village of Edington, Wiltshire

The church is one of the most beautiful in the county exceeding in its proportions some of our smaller cathedrals. Originally the church of a monastry founded in 1352 it contains fine wood glass.

World in White

FROM my study window, in mid-February, I looked out . . . on to a lawn mantled in snow; so hard was the weather that seagulls swooped to the bird-table where, in more normal times, only the starlings, and sparrows, and finches and robins pick the crumbs; the dark green of the yew-tree was in sharp contrast to the white everywhere around. Winter indeed! And in the village men were toiling to clear a way over the fields for the float which takes the milk to the cross-roads, there to be collected by the giant lorry which takes it to the station . . . en route for London and the bottling plant. No weather for cycling, but ideal weather for musing upon past tours and trips and for mapping out the route for that first tour of the Spring.

So We Wait for the Show!

AFTER announcements that there would be a Cycle Show in this year of grace and fuel shortage, we learn that the industry has decided to postpone it . . . with hopes that it may be staged in the autumn of 1948. Probably the decision is a wise one, for difficulties are many and great, and it is no use having a show unless it can be up to standard and worthy of our great cycle industry. So we must be patient and trust that next year will see us clear of many a problem and many a shortage. Meanwhile, let us turn out the bikes!

Statues and Memorials

JUST before the recent arctic spell set in, I had a pleasant ride into Buckinghamshire and enjoyed the beauty of the lanes where, in spring-time, the mighty beeches give shade. I love the country . . . and when riding along its by-ways always people it with the good spirits of the past . . . those gentle spirits like Cowper, and Gray, and William Penn; and in a little inn nestling under the Chilterns I talked with two cyclists, and somehow our conversation got on to the topic of statues and memorials to famous men. And we chatted about Kirkpatrick Macmillan, the inventor of the bicycle. Of course, we knew of the plaque which was placed on his birth-place in Scotland, but it was the view of my companions in the inn that a great national memorial should be erected to this benefactor of the human race. And I must say that I agreed with this view—all too little has been done in this respect. The bicycle stands unique as a boon conferred upon us all, and it is but fitting that some worthy and suitable memorial should be erected. What does the National Committee on Cycling think about it?

Cycle Tyres

EVERY cyclist is grateful that they are in more plentiful supply . . . but it is not yet possible to purchase many of the well-known and trusted "named brands" which were so familiar before the war. We have to wait for these, and it is natural and obvious that the tyre manufacturers have many post-war problems still to face and overcome. But the ardent rider always had his own particular preference for a given named tyre . . . and naturally he will welcome their return.

Do Dealers Lack "Display Sense"?

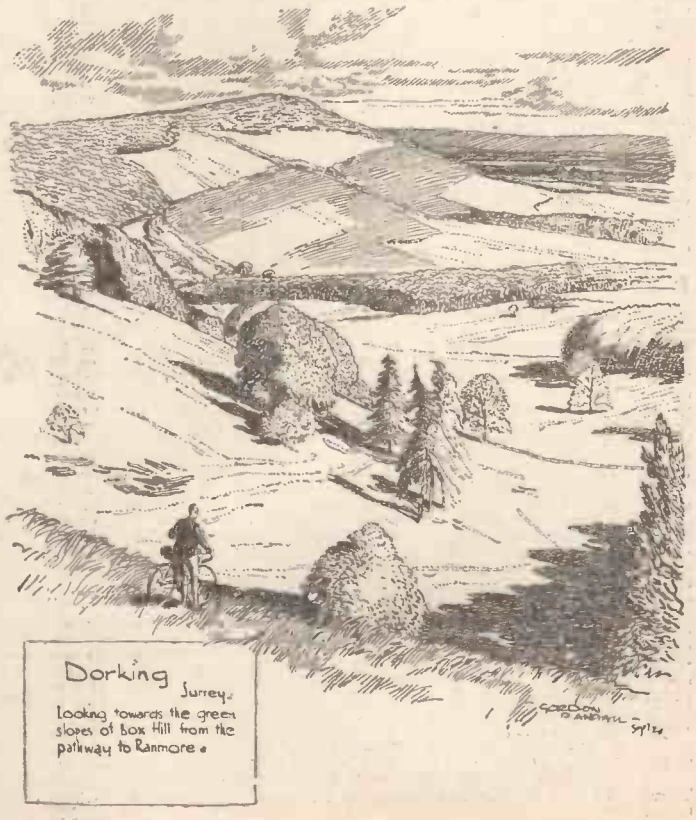
FOR my own part, I fear that many of them do. I was in a cycle dealer's shop the other day, buying some trifling item of equipment, and I was struck by the "higgledy-piggledy" way in which the various goods were set out. It was a cycle-cum-radio-cum-gramophone shop, and there was a fair stock of goods. But they were not displayed with any sense of salesmanship. Difficult to get at from the shopkeeper's point of view; difficult for the purchaser to see and select. It is so important . . . this question of shop display. There is need for the education of dealers in this matter, and the National Association might well consider "courses" or lectures for the better development of this vital side of the business. The purchaser is affected, as well as the dealer—and in the strenuous days to come, when real competition will again be the order of the day, we shall need to be efficient in every branch of retail business.

A Picture from the Past

I'M always fascinated by old photographs, and miss no opportunity of looking through albums in efforts to discover pictures which will send me racing back along the years to more pleasant and peaceful times than we now enjoy. A few days ago, browsing among some old books, I came across a page evidently torn from some old bicycle catalogue . . . and I saw a picture of King Edward the Seventh, standing beside a bike. Underneath was the legend "His Majesty with his Beeston-Humber bicycle!" What a "flash-back!" What memories it conjured up of quiet Edwardian days—of sunlit lawns where croquet was played with quiet decorum; of women's quaint cycling costumes; of music-hall nights, when all the stars twinkled at the Tivoli and Oxford. Just a faded photograph, but the gateway to a gay and care-free period . . . before the gods of war had shown us just how destructive they could be! A "Beeston-Humber"—a noted machine, and a name that will live long in the annals of cycling.

Cycle Oil is Not Rationed

BUT one might think that it was—from the sparing use of it by some cyclists, who seem to love squeaks and groans from their mounts, in preference to smooth silky running. Not a bad idea, now that the roads make riding very difficult, to give the old bike a thorough overhaul, and use a spot of oil . . . and thoroughly clean that chain, and go round the tyres . . . and use the pump. Nothing like being properly prepared for the spring, when the sun beckons you out again on to the highroad, the birds greet you from the hedgerows, and the trees display their new green buds.



Dorking Surrey.

Looking towards the green slopes of Box Hill from the parkway to Ranmore.

My Point of View

By "WAYFARER"

National Shortcomings

THE efforts which are being made by a rather elaborate body of expensive gentlemen to create a greater volume of "tourism" in this country, and to attract foreign visitors, are rather pathetic—or, perhaps, amusing. On economic grounds such visitors are urgently desired; on aesthetic grounds the plan is a good one, because we have so much of beauty, if in miniature, to show foreigners. But there are drawbacks. From the holiday-maker's point of view, we possess a desperately unreliable climate. From the accommodation point of view, our system leaves much to be desired. From the supply point of view, well, what have we to offer visitors so long as rationing endures and the tin-opener flourishes? Cubes of bully-beef, drowned in warm gravy and provided with a French name, deceive nobody—except the mentally deficient!

As to our hospitality system the Mayor of Westminster has just (at the time of writing) dwelt on "the need for more politeness in this country, especially in hotels, if we wish to encourage tourists. We must raise our standards of politeness." In my opinion, more than politeness is required. We need geniality; we need to get rid of our cold-shoulder policy; we should exorcise our off-handed methods—our take-it-or-leave-it ideas. And even more than that is desired. We need efficiency. Here is a current example of what is lacking in this respect: On a recent Friday afternoon I telephoned to a first-class country hotel some 60 miles away from home, in order to book night accommodation in connection with a forthcoming business journey. The reply was that a reservation could not be made because the Manageress was out, and would I write. I wrote at once, and 10 days later I am still awaiting a reply! Needless to say, I have since made other arrangements, and that first-class hotel knows now exactly what I think of it and its methods.

Remembered Places

HERE is an extract from a review of a new book called "Mountain Prospect": "Stone walls do not a prison make, nor barbed wire a cage, when the mind can travel unfettered to remembered places. Such was the solace found by Mr. Scott Russell during three years of captivity in Japanese hands." I discovered the same joy in remembrance during the first World War, when a savage wound confined me to bed for exactly half a year. What a delight it was to transport myself to those "remembered places" which the bicycle had shown me in days gone by!

This reminds me that the other day I called on a cycling pal who was recently overtaken by an illness so serious that the possibility of his never being able to ride again must be faced. He was very cheerful about his unenviable condition. "You have your memories," I suggested, and he agreed, whereupon we fell to talking of our exploits along the road and about particular touring districts, and it was good to see his face light up at the mention of familiar names. I came away from his house feeling that the mere thought of those "remembered places" makes cycling worth while for anybody. In point of fact, they are but an added joy to all the other delights and advantages of our pastime.

The Dog Menace

THERE are really only two dangers of the road which cause me the slightest perturbation. They are both completely unnecessary and avoidable; they both arise from selfishness and thoughtlessness. One of those dangers—I am not going to discuss it on the present occasion—is in connection with the off-side door of motor-cars, so often flung open, without warning, by people who must rank as social pests. The other danger relates to the menace set up by the licence to wander which is automatically granted to dogs.

I have said before, and I now repeat a truth which is indisputable, that there is no room in the modern scheme of things for dogs which are allowed to run wild on the public highway, particularly in built-up areas. Many people who profess an affection for the canine race (an affection which I share) show their feelings in a curious way—by allowing their dogs to wander at will, and uncontrolled, in the maelstrom of traffic. I hate to see a dog killed or maimed; I hate, far more, to see a brother cyclist thrown from his machine, or even jeopardised, by these imponderable canines. I am not personally interested in this aspect of the matter, but the damage done to motor-car tyres, through the sudden necessity of furious braking in order to avoid hitting a dog, is a point for the concern of many road-users. That is a form of waste—to put the thing at its lowest—which ought to be prevented. As a cyclist, however, I am becoming increasingly nervous in connection with the dog menace. Being thrown violently on to the roadway is no longer a hobby of mine, and the possibility of damage to one's clothing in these couponed days is quite serious.

Full Head of Steam

THE girl cyclist who sat near me at lunch the other Sunday was furiously voluble on the subject of rear-lights, mainly because of the poor quality of the batteries she had been buying. On the previous evening, she said, she had been let down, the battery in position failing her, and two spares providing a similar negative performance. She characterised the sale of such rubbish as an act of obtaining money by false pretences; and I fancy that she felt better when she had finished blowing off steam. Personally, I have had my share of battery trouble, but feel that the quality of the goods supplied has improved within recent months, though it still falls short of perfection.

I am now hoping to obtain longer life, and fewer failures, through a slight alteration in my technique. My bicycles are stored in a rather cold place, and my impression is that batteries prefer a warmer climate. After a ride, therefore, I unship the essential part of the container and lodge the battery on a shelf in the back-kitchen, where the always-burning fire provides a certain amount of heat. It is also my impression that a battery is all the better for being kept out of its container. I do not know where that idea came from, but, in case there is anything in it, I make a point of keeping the two units apart.

Asking the Way

THE frequency with which one finds, on asking the way, that "I'm a stranger here" is notorious. In my experience there are two equally helpful variants to be expected. The first is the doddery old gentleman who tells you that the place you want is just a mile ahead, and, as he is going in that direction, he will show you the way. So you settle down to dawdle along at a mile an hour—unless you are strong minded and suddenly discover that you are in a tremendous hurry. The second variant is that the man from whom you seek information stammers badly—poor chap!—and you have to exercise all the patience you possess while he tells you what you desire to know.

A new experience came to me one day recently when I was looking for a house I wanted in the country. The woman who was unloading information on to me may have known what I required: she certainly lacked the skill to give it to me. At last I tried to tie her down thus: "When I reach the main road at the end of this lane, which way do I turn—*left* or *right?*" She answered "Yes"—and I disappeared over the horizon as fast as my wheels would carry me!

Disservice

A RECENT issue of this periodical contained a paragraph relating to the recalcitrant attitude of certain Loughborough cyclists who apparently persist in the belief that they are immune from the rules and regulations regarding the use of one-way streets. If such immunity were a fact, then cyclists—in Loughborough and everywhere else—would be equally free to ignore pedestrian crossings, halt signs and automatic signals, thus reducing to chaos all measures for the control of traffic and the safety of road-users. It need hardly be said—however unnecessary it may be to say it—that cyclists are not accorded any special privileges in the respects indicated above, and a moment's thought would reveal the utter absurdity of any suggestion to the contrary. Moreover, the deliberate flouting of these regulations by a small minority of cyclists constitutes a profound disservice to the cycling movement as a whole, and I, for my part, would welcome—and encourage—police action to put an end to such reprehensible and inexcusable behaviour on the part of a few members of the pedalling brigade.

Financial

ON meeting a friend one evening just before Christmas I mildly criticised the price of 2s. which had been charged on a Sunday club-run for a poor specimen of an eighteenpenny tea. He disarmed me, momentarily, by saying that he had ordered for 14, while only seven turned up, and he thought that something should be done, financially, to compensate the caterer. I said no more, but it struck me later that the position was rather ridiculous, the clubmen who supported the fixture being penalised on account of those who stayed away! While the cash involved was quite immaterial, the principle is important and, if carried out on a large scale, might tend to destroy club life.

The remedy is a simple one and is observed by a number of clubs through the medium of a fund which is set up and fed by a penny levy at all fixtures. Thus money is always available to compensate a caterer on those occasions when there is a serious shortage in the attendance on a run due to "bad" weather, or otherwise. This seems to me to be a wise plan and to remove the possibility of an awkward position being created. At the same time it should be borne in mind that a payment, in respect of absentees, of something less than the normal charge is called for, seeing that the caterer remains in possession of the food which would otherwise have been consumed. Nevertheless, it is better to err on the side of generosity, thus recognising that the caterer has been given some trouble to no purpose.

The Quickest Way

AN early December day produced for us in the Midlands one of the worst fogs I remember. I happened not to be cycling—it was a mid-week affair when I was busily engaged in my office—but a couple of days later I was talking to two friends who had been awheel, if only to the extent of riding home from work. One of them—an old racing cyclist—said that he had gone to business in his car that morning, but was not prepared to return by the same method. Not having a bicycle available at the works, he "got one together" and rode it home, making very good time. The other friend said that he had cycled home, as usual, and that the journey took him only a very few minutes longer than the usual time required. So, you see, the bicycle occasionally represents the quickest way of travel, and the most convenient.

The Unexpected

PARADOXICAL though it may appear, the unexpected is actually among the things which may be expected to happen to cyclists from time to time! One Sunday morning last summer I was en route for my usual country rendezvous for lunch. In a busy suburban road I observed a boy amusing himself by jumping between the road and the kerb-stone. As a precaution, and because there was not room to manœuvre, I tinkled my bell, and the lad leaped to the sidewalk. Failing to secure his balance, however, he fell back to the road in an upright position just as I was passing, and my left pedal caught him on the calf of the leg, fortunately without bringing me down.

That very evening, as I was quietly making my way home through secluded lanes, I was suddenly struck on the top of the head by a fair-sized pebble. Inquiries showed that one of the village lads made a habit of roaming the fields and lobbing stones on to the road. Seeing red, in various intense shades, I went in search of this human menace, and—fortunately!—failed to find him. I saw his mother, however, and she promised that his father would deal faithfully with the miscreant on his return, though corporal punishment had so far failed to break a very unpleasant and dangerous habit.

On another occasion—a Saturday afternoon—I decided to get out of town by a quiet route which would enable me to avoid the traffic. Vain hope! Rounding a curve, I came upon two boys who were manipulating a plank on wheels. As I passed, they turned the contraption into me, causing me to hit Birmingham for six. In fact, when the matter was investigated, it was found that I had collected no fewer than 13 wounds (unlucky number, 13), while my jacket was ruined and my handle-bar was bent.

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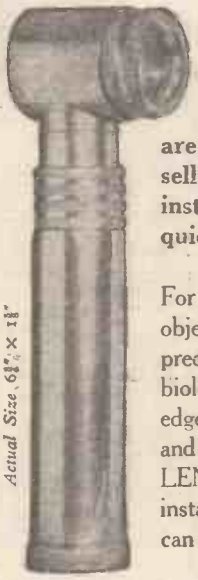

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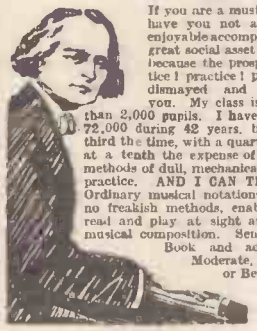

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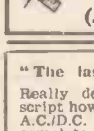

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