Steam Catapults for Aircraft

NEWNES

PRACTICAL MECHANICS

1/-

EDITOR : F.J.CAMM

APRIL 1955

LET THE WORKER *See* ... FOR A BETTER JOB

THIS IS HOW ANGLEPOISE LIGHTS UP THE JOB IN STRONG RELIEF— SAVING EYESTRAIN AND FATIGUE

Down a little! *Still nearer!* *Right on the job!*

Where a high degree of accuracy is called for, the call is equally for ANGLEPOISE. This fine lamp throws its clear, shadowless concentrated light right on the work only. This light 'follows' the job by the slowest of degrees by finger tip control. It takes any angle and 'stays put' until a finger touch moves it as required to a new position. Watch output go up with ANGLEPOISE in position.

Every machine-room, every workshop, every drawing office should have its battery of Anglepoise Lamps, with its finger tip obedience, its 1001 angles, as an aid to accuracy. Write today for fully descriptive Booklet P.M.

Sole Makers: HERBERT TERRY & SONS LTD
REDDITCH • WORCESTERSHIRE • ENGLAND

TERRY ANGLEPOISE LAMPS

Pat. all countries

SOME ALTERNATIVE BASES FOR ALL MODELS

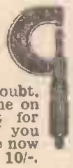
HT9

ALL MAINS THREE

Build yourself a handy midget A.C./D.C. 3-valve mains receiver giving powerful reception over long and medium waves. All component parts, including valves, coils, resistors, etc., but not loudspeaker and cabinet (available if required), will cost you only 19/6 plus 1/6 post—data available separately 2/-, post free.

19/6

1in. MICROMETER



Exceptional purchase enables us to offer a 1in. precision micrometer at the very low price of 10/-. A micrometer is an essential part of an engineer's equipment. You, no doubt, will have found the need for one on many occasions in the past for measuring wire gauge, etc. If you act quickly you can acquire one now at the remarkably low price of 10/-, post free.

"CHIMELITE"

It is a hall light as well as a double chime and you can make it in a couple of evenings for the total cost of only 19/6 including instructions, post, etc., 2/—data available separately, price 2/-.

19/6

THE TWIN 20

This is a complete fluorescent lighting fitting. It has built-in ballast and starters—stove enamelled white and ready to work. It is an ideal unit for the kitchen, over the work-bench, and in similar location. It uses two 20-watt lamps. Price, complete less tubes, 29/6, or with two tubes, 39/6. Post and insurance 2/6. Extra 20-watt tubes, 7/6 each.

AMAZING LITTLE MAINS RADIO

uses a 4-valve circuit with high-efficiency coils—covers long and medium wave bands and fits into the neat white or brown bakelite cabinet—limited quantity only. All the parts, including cabinet, valves, in fact, everything, £3/19/6 plus 2/- post. Constructional data free with the parts, or available separately 1/6.

SENSITIVE ALTMETER

These contain aneroid barometer movement and useful gears.

Price 7/6 plus 1/- post.

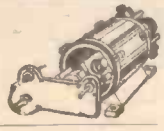
Note.

Also a few Mk. XVIIa unused and in good working order available at 22/6.

COMMUNICATIONS RECEIVER R1155 YOURS FOR 30/-

The R1155 is considered to be one of the finest communication receivers available today. Its frequency range is 75 kc/s to 18 Mc/s. It is complete with 10 valves and is fitted in a black metal case. Made for the R.A.F. so obviously a robust receiver which will give years of service. Completely overhauled and guaranteed in perfect working order. Price, £9/19/6, or will be sent on receipt of deposit of 30/-. Balance by 12 monthly payments of 16/3. Carriage and Transit Case 15/- extra. **Mains Power-pack £5/10/-.**

MULTI-SPEED MOTOR



Works off A.C./D.C. mains; fitted with gear box gives any speed from 1 r.p.m., 22/6, post and packing 1/6.

ELECTRICIAN'S TOOL KITS 37/3 DOWN

This is as illustrated and contains 55 fine tools arranged on 5 trays in an automatic steel tool-box. The tools are all that a practical electrician needs, including tenon saw, ratchet brace, hack-saw, chisels for wood, brick and steel, pliers, side cutters, hammers, spanners, socket wrenches, pad-saw, etc. Price, £12/10/-, or H.P. if required, Deposit 37/3, and 12 monthly payments of 20/5, carriage 7/6 extra.

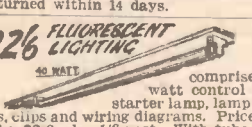
2-VOLT ACCUMULATORS

Made for the Forces by one of the most famous firms in the world. 15 amp.-hour, size approx. 6 x 12in. square in ebonite case, pre-charged, only need filling with acid, 2/9 each, plus 1/- post and insurance.

SCRAMBLER — TELEPHONE EQUIPMENT

As used by Ministries and Forces for holding secret conversations. Works in conjunction with normal telephone equipment.

Items available, all new and unused, are: —Frequency Changer, Type 6AC, Ref. No. YBO2700, price £20. Standard G.P.O. desk type instrument with scrambler switch, complete with lead and junction box, price £2 10/-. Hand-ringing generator in wooden box, 15/-. Junction box with three multiple relays and cable strips, 35/-. Bank of three drop indicators in box, 15/-. Instruction book £1 refunded if returned within 14 days.



Complete kit comprises 40-watt control unit, starter lamp, lamp holders, clips and wiring diagrams. Price, less tube, 22/6, plus 1/6 post. With tube, 30/-, plus 3/6 carr.

BATTERY 3-VALVER 19/6

Good reception on both medium and long waves — all the parts including valves, resistors, tuning condensers, in fact everything except loudspeaker, cabinet, and metal chassis (you may already have something suitable, from an old receiver for instance), will cost you only 19/6. Data available separately price 1/6.

ELECTRONIC PRECISION EQUIPMENT, Ltd.

Post Orders should be addressed to:
DEPT. I, RUISLIP, MIDDLESEX.

Personal shoppers, however, should call at any of our following branches:
42/46, WINDMILL HILL RUISLIP, MIDDX. Phone: Ruislip 5780 ● **29, STROUD GREEN ROAD, FINSBURY PARK.** Phone: Archway 1049 ● **152/153, FLEET STREET LONDON, E.C.4** Phone: Central 2833
and 249, KILBURN HIGH ROAD, KILBURN, LONDON, N.W. Phone: MAIda Vale 4921.

INTERESTING BARGAINS

SATISFACTION OR REFUND

REV. COUNTERS

BRAND NEW. Calibrated 1,000/5,000 r.p.m. 3½in. lum. dial. COMPLETE WITH 48in. Flex Drive. 4:1 ratio. **25/-** post free. With 24in. Flex Drive, 20/-.

COMPASS P12

for bulkhead mounting, the fully adjustable mirror gives a clear view of grid ring and filaments from any position without parallax. Makers' price £36. OUR price £3, carr. paid. In well made transit case. We have an interesting list of other compasses and items of marine interest free to all sending S.A.E.

BUBBLE SEXTANTS MK IX

A precision instrument of enormous interest to the student of astro navigation and the amateur astronomer. Provided with illumination of bubble and scales for night observations. In handsome carrying case complete with illustrated instructions, 35/-, post free.

ELECTRIC GYROSCOPIC SPHERES

3in. diameter, 24v. A.C. Weight 2 lbs. **27/6** P. & P. 1/6. The top half of this beautifully balanced piece of mechanism revolves at an incredibly fast speed.

Transformer to operate from mains, 22/-. There are many developments requiring a fast smooth running motor which can be adapted from this gyro.

NO PHYSICS LABORATORY CAN AFFORD TO MISS THIS BARGAIN

PRESSURE GAUGES

Boost	...	-6— +24 p.s.i.
Air	...	0— 80 p.s.i.
Air	...	0— 500 p.s.i.
Air	...	0—1,000 p.s.i.
Hydraulic	...	0—1,000 p.s.i.
Air	...	0—2,000 p.s.i.

6/- post free.

INERTIA SWITCHES, an interesting piece of mechanism devised to operate a circuit when an aircraft crash lands, capable of various adaptations, brand new **5/-** p. & p. 1/6.

QUICK RELEASE STRAPS

Two 22in. pieces of 2in. webbing with a buckle which whilst absolutely secure flies apart at a light pull; of interest to frogmen, **3/6** pair.

POLYTHENE

The new plastic TUBULAR Film. Layflat tubular widths:

2in. 4d.	12in. 1-	36in. 3/-
4in. 6d.	18in. 1/6	48in. 4/-
6in. 9d.	24in. 2/-	

Prices per yard, add 6d. p. & p. to total order. Tubular film opens up to double above widths., thus 48in. tubular makes 96in. sheet. Heat sealing. Of interest to all. S.A.E. for free sample.

WEBBING, 1¼in. wide, white art silk, very strong, 50 yds., 25/-.

NYLON ROPE, 1in. circ., 7½d. per yd.

NYLON CORD, ¼in. diam., 222lb. breaking strain, 6 x 13ft. lengths, 5/-.

ELASTIC, ¼in. diam., 1/6 yd.

SEWING PALMS, 2/6.

SAFETY BELTS, for climbers, lumberjacks, steeplejacks, window cleaners, etc., 10/6.

PLUMBERS' WIPING CLOTHS, 36 x 10in., 3/-.

BLACK STRAPPING, plastic covered, 5/16in. wide, very strong, 12/- gross yards.

All above post free.

MYERS & FOULKES

PHONE LEY 1013

DEPT. P.M. 188/187 THE ARCHES, GROVE GREEN ROAD, E.11.

Black & Decker ELECTRIC TOOLS ON EASY TERMS

UTILITY TOOLS

5in. PORTABLE SAW ATT. FOR USE WITH ¼in. DRILL.

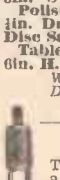
CRAFTSMAN'S LATHE AND ¼in. DRILL.

1001 jobs can be tackled with these high quality tools. Save money by "Doing it yourself." Every item fully suppressed and guaranteed. Build up your home workshop stage by stage. Write for free full catalogue and easy terms schedule.

	CASH PRICE	8 Mthly Deposit	of
¼in Drill	£5.19.6	14/8	14/8
¼in. Stand ...	£3. 7.6	8/3	8/3
Craftsman's Lathe	£5. 5.0	12/10	12/10
5in. Portable Saw Att. ...	£3. 5.0	8/-	8/-
Lathe Saw Table	£2.15.0	6/9	6/9
¼in. Drill	£12. 7.6	30/3	30/3
¼in. Stand	£5.10.0	13/6	13/6
5in. Sander/ Polisher	£8. 7.6	20/6	20/6
5in. Sander/ Polisher Kit ...	£9.17.6	24/2	24/2
¼in. Drill Kit ...	£11.17.6	29/1	29/1
Disc Sanding ... Table Att.... ...	£1.12.6	3/11	3/11
6in. H.D. Saw ...	£17. 5.0	42/2	42/2

When ordering please send Cash Price or Deposit and state Mains Voltage. All items are post free.

1" MICROMETER



This precision instrument is offered at a fraction of the normal price and is BRITISH MADE. Simple to operate, and essential to schools, garages, students, the general handyman and model makers. This is what you have been waiting for at a price to suit your pocket. **10/-** *Packing and Postage 6d.*

THE "I & G" UNIVERSAL SAW

Fits any electric hand drill. Will Jig saw, Cross cut, Rip Saw, Hack saw, etc. Complete with attachments and two extra saw blades. Send for leaflet.

Cash Price **49/6** *Post Free.*

NO Vibration —Robust —Light

OR EASY TERMS **6/-** deposit & 8 monthly payments of 6/-.

"I & G" LATERAL SANDER-POLISHER!

The first lateral sander to be produced in this country at such low cost. Works on a vibratory principle at approx. 12,000 strokes per minute. 200/240v. A.C. only. Ideal for sanding Wood, Plastics and burnishing metal, Polishing Cars, Furniture, Leather, Silver, etc. Complete with flex, sandpaper and polishing cloth.

75/- OR **5/-** deposit & 8 monthly payments of 10/-. *Post Free.*

AUTOMATIC BLOWLAMP

Self pressurising. Burns Methylated Spirits, weighs only 7 ozs. 5½in. high. Attains temperature of 2,000 Deg. F. Will Soft Solder, Silver Solder, Strip Paint, Bend Glass, etc. *Packing & Postage 9d.* **12/6**

THE MAIL ORDER HOUSE FOR PROMPT ATTENTION

KINGSWOOD SUPPLIES (Dept. P.M.8) 2, 3 & 4, SALE PLACE, LONDON, W.2. Telephone PAD 8189

Handles with many times the life of wood and blades of Shffield steel chromium plated to prevent rust, combine to make screwmasters that will last a life-time. Fully insulated to 5,000 volts.

STEAD

PLASTIC & AMBER HANDLED

Screwmasters

Manufactured by **J. STEAD & CO. LTD., SHEFFIELD, 2.**

• LOWER DEPOSIT!

• LOWER CHARGES!

Our new streamlined OUT OF INCOME TERMS are more favourable than ever before. Study them carefully and compare them with similar schemes.

SEE HOW MUCH LESS YOU PAY FOR CREDIT FACILITIES BY ORDERING FROM

A. J. REEVES and COMPANY

EXAMPLES :—	Cash Price	Deposit	Monthly payments 12M.	18M.	24M
MYFORD M.L7. Bench Lathe with standard equipment	**£48.5.0**	£7. 5.9 £7. 6.1 £7. 5.9	74/1 — —	— 51/5 —	— — 40/-
MYFORD SUPER 7 Bench Lathe with standard equipment	**£73.5.0**	£12. 5.9 £12. 5.1 £12. 6.5	110/3 — —	— 76/7 —	— — 59/5
FOBCO STAR 0-½in. bench drill with Jacobs chuck, A.C. single-phase	**£35.8.9**	£5.18.9 £5.19.9 £5.18.9	54/2 — —	— 37/2 —	— — 28/4

WE PAY CARRIAGE OUT

If you wish to pay a larger deposit we shall be pleased to quote you ; charges will, of course, be reduced by reason of the lower balance remaining after deducting the deposit from the total cash price. LET US KNOW YOUR REQUIREMENTS—detailed quotation by return post.

Illustrated literature gladly sent. All goods despatched fully insured against loss or damage in transit. A 1/- stamp will bring you a copy of our comprehensive illustrated catalogue of blueprints, castings and materials for many "L.B.S.C." designed small steam loco's, workshop equipment, etc.

A. J. REEVES & CO.

416, MOSELEY ROAD, BIRMINGHAM, 12

Grams : "Reevesco, Birmingham." Phone : CALthorpe 2554

"THE CHOICE OF EXPERIENCE"

IT IS EASY TO MAKE THESE LUXURIOUS ELECTRIC BLANKETS

★ **NEW EXTENDED RANGE**

DRAWINGS AND INSTRUCTIONS : for Single Heat Blanket. 60in. x 30in. Price 1/6. Post Free.
Or with 27 yds. Heater Cable. Price 20/-. Post Free.

DRAWINGS AND INSTRUCTIONS : for Three Heat Blanket. 60in. x 30in. Price 2/-. Post Free.

Or with 2 x 27yds. Heater Cable, 2 Temp. set thermostats, 1 3-Heat Switch, 18in. Triple, 23/36 Flex, and 3 yds. twin 23/36 Flex. Price 45/-. Post Free.

For personal use, or as a much-valued gift, an electric blanket is the ideal thing, and it's so much cheaper to make one from the materials we supply for it. When made, your blanket is equal in all respects to those costing many times more in the shops. Current consumption is negligible and the benefits it gives are beyond measure. Absolutely safe. Easy to make. This blanket is a boon to health and comfort.

DRAWINGS AND INSTRUCTIONS : for Single Heat Blanket. 60in. x 50in. Price 1/6. Post Free.
Or with 30 yds. of Heater Cable. Price 30/-. Post Free.

DRAWINGS AND INSTRUCTIONS : for Three Heat Blanket. 60in. x 50in. Price 2/-. Post Free.
Or with 2 x 30 yds. Heater Cable. 2 Temp. set thermostats, 1 3-Heat switch, 18in. Triple Flex and 3 yds. twin 23/36 Flex. Price 55/-. Post Free.

DRAWINGS AND INSTRUCTIONS : for Single Heat Heating Pad. 16in. x 12in. Price 1/6. Post Free.
Or with 8 yds. of Heater Cable, 3 yds. twin 23/36 Flex, and ON/OFF switch, 2 Temp. set thermostats. Price 22/6. Post Free.

DRAWINGS AND INSTRUCTIONS : for Three Heat Heating Pad. 16in. x 12in. Price 2/-. Post Free.
Or with 2 x 8 yds. Heater Cable, 3 yds. twin 23/36 Flex, 18in. triple 23/36 flexible and 1 3-Heat switch. 2 Temp. set thermostats. Price 27/6. Post free.

SUPPRESSIT

(TELEVISION SUPPRESSOR KIT)

For the suppression of Domestic Motor Driven Appliances. Comprises two chokes, and two condensers mounted on a card with wiring instructions. Ideal for Vacuum Cleaners, Hairdriers, Sewing Motors, etc., up to 1 Amp. Price 3/6. Post Free.

REPLACEMENT ELEMENTS

FOR DOMESTIC ELECTRICAL APPLIANCES

We stock over 200 types of element replacements for Fires, Irons, Ketties, Hairdriers, Toasters, and Boiling Rings.

WE HAVE A REPUTATION FOR HIGH QUALITY THERMOSTATS AND LIST SOME OF OUR STOCK ITEMS HERE :

THERMOSTAT. CS. Convector Thermostat for Space Heaters and Low temperature Ovens. 15 amps., 250 volts A.C. 40/80 deg. F. 25/-, post 5d.

THERMOSTAT. MB. for control of Electric Immersion Heaters up to 3 KW. 90/190 deg. F. 15 amps., 250 volts A.C. £2/0 0, post 9d.

THERMOSTAT. PF. Room Thermostat, 15 amps., 250 volts A.C. 5in. x 1¼in. x 2in. A beautiful instrument. Temp. ranges 30/90, 40/100, 40/80, 60/100 deg. F. as required. £2/0/0, post 6d.

THERMOSTAT. BW/1. 3 amps. 250 volts A.C. For control of hot-plates, vulcanisers, etc. 50-550 deg. F. 15/6, post 4d.

We are only too glad to send illustrated leaflets on any of these Thermostats if you will send a S.A.E. stating which model interests you.

AMMETERS

Moving Iron. A.C./D.C. 0/5 amps., 1¾in. dial, Projection mounting. Price 18/-. Post 1/-. As above but 0/10 amps. Price 18/-. Post 1/-.

GREENHOUSE THERMOSTAT

Type ML. Constructed especially for the amateur gardener. The scale plate is calibrated "High-Medium-Low," and has a temperature range of 40-90 deg. F. Current-carrying capacity is 10 amps. 250 v. A.C. Differential, 4 to 6 deg. F. Dimensions : 4½in. x 2in. x 1⅝in. Price 35/-. Post 6d.

Model PJ. Miniature Thermostat for control of domestic Electric Irons and special purpose machines where space is limited. Capacity : 5 amps. 250 v. A.C. ⅜in. x ⅜in. x 11/16in. Single screw fixing. Price 9/3. Post 3d.

Model SN/40. 1 amp. 240 v. A.C., 50-250 deg. F., 5/6. Post 3d.

FIRE BARS

No. 41. Bowed. 3in. x 9½in. 7/6 ea.
No. 42. Bowed. 3in. x 7½in. 7/4 ea.
No. 43. Bowed. 3½in. x 8½in. 7/6 ea.
No. 44. Bowed. 3½in. x 8½in. 7/6 ea.
No. 45. Flat. 3in. x 9½in. 7/6 ea.
No. 46. Flat. 2⅞in. x 7in. 7/4 ea.
No. 47. Bowed. 3in. x 9½in. 9/- ea.
No. 41. Suitable for Sunbeam, Revo, Belling, Dudley, Swan.
No. 42. Suitable for Small Revo and various types.
No. 46. Suits Belling, Brightglow.
No. 47. Suitable for Creda.

SPIRALS

No. 70.	Spiral,	1,500 w.	2/9 ea.
No. 70a.	Spiral,	1,000 w.	2/2 ea.
No. 70b.	Spiral,	750 w.	1/10 ea.
No. 70c.	Spiral,	600 w.	1/5 ea.
No. 70d.	Spiral,	500 w.	1/4 ea.
No. 70e.	Spiral,	200 w.	1/2 ea.
No. 70f.	Spiral,	100 w.	1/1 ea.

CAR HEATER ELEMENT

No. 87. 6in. x 1½in., 200/250 v. 100 w. ... **6/3** ea.

ANEROID BAROMETER

AS SOLD FOR 5 Gns.
YOURS FOR 5/-
DEPOSIT

Balance by 5 monthly payments of 11/-
or 55/- CASH.

A well-made and accurate instrument of handsome appearance and great sensitivity. Offered at half the usual price. **BRAND NEW** and in perfect order. Make splendid gifts.

THE TECHNICAL SERVICES CO.

SHRUBLAND WORKS . BANSTEAD . SURREY.

POWER YOUR BOAT

with a BASSETT-LOWKE *Steam Engine*

The "Eclipse" Engine

This high-powered Steam Engine will drive boats up to 40in. long at high speed. Hard brass castings and non-rusting material throughout.

Specification : Cylinder 7/16 stroke by 7/16 bore. Height 3¾in. Base 2in. x 1¾in. Weight 13 oz.

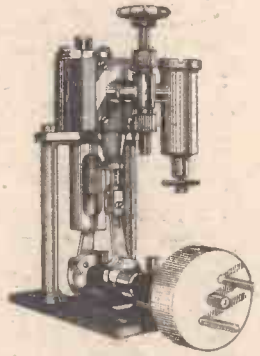
Price **£4.4.0**, including P.T.

The Streamlinia Steam Plant

This complete steam plant includes the "Eclipse" Engine, which is connected to a 2½in. dia. and 8in. long brazed copper boiler, fired by automatic control drip feed methylated spirit burner.

Length over-all 17in. Width 4in. Height 4½in. Weight 5¾ lbs.

Price **£16.2.0**, including P.T.



"Eclipse" High Speed Marine Engine

Write for your copy of "Model Shipping and Engineering Catalogue," giving full details of above engines and accessories. A manual of great help to every model engineer. Price 2/-, quote reference MS/12

MODELS BY BASSETT LOWKE

BASSETT-LOWKE LTD

Head Office : 23 Kingswell Street, **NORTHAMPTON**

LONDON : 112 High Holborn, W.C.1. **MANCHESTER :** 28 Corporation Street.

JOHN M. PERKINS & SMITH, LTD., BRAUNSTON, Nr. RUGBY

Telephone : Braunston 238. *Telegrams : Drills, Braunston Rugby.*

MAKE MONEY — making casts with VINAMOLD

A grand spare-time occupation

WITHOUT any previous experience you can mass-produce any object, from a chessman to a candlestick, statuette or model ship, in plaster, resin, concrete, etc. . . . with "VINAMOLD" the flexible mould that gives the *BEST* results. Easy to work, can be used over and over again. Needs *NO* special equipment, provides a profitable and enjoyable spare-time occupation with minimum outlay.

Write for full details and instructions. *Also available :* Illustrated booklet describing "VINAMOLD," methods of heating and melting, preparation of models and moulds, etc. Price 1/6 post free, from :—

VINATEX LTD. (Dept. P.M.3), CARSHALTON, SURREY

Portable—robust—all-purpose 8" Circular Saw *at a sensible price*

£46/10.0

(motor extra as required)

Each machine fitted with combination rip and crosscut blade. Also available are FINE TOOTH CROSSCUT, PLANER BLADE, CARBORUNDUM BLADE.

A precision machine for cutting wood, plastics, hardboard and asbestos.

SENIOR SLYKSAW

★ Automatic belt tension with single lever for raising and lowering saw ★ Table tilts to 45° ★ Totally enclosed drive ★ Ball-bearing spindle ★ Ball-bearing spring-loaded jockey pulley ★ Fine adjustment to fence ★ Rigid cast iron table machined on face and sides with machined slots for mitre fence ★ Sawdust chute at rear ★ Easily transportable for site work.

Push-button starter is included and built in.

Immediate delivery. Write for full details to :

J. & H. SMITH LTD

Dept. PMI, 16 Harrison Street, Leeds, 1.

Phone : 21561

PRACTICAL MECHANICS
The "Cyclist" and "Home Movies" are temporarily incorporated
VOL. XXII. No. 256 APRIL, 1955
Editor: F. J. CAMM

FAIR COMMENT

By

The Editor

Provisional Protection

IN the February issue I gave some advice to inventors and suggested that provisional protection of a patent did not give adequate security to the inventor. A well-known patent agent disagrees with me on this. He thinks that, whilst it is not uncommon for an inventor to be asked to wait until he can produce Letters Patent, this is often only a kindly excuse to turn down the many useless ideas which are submitted for consideration.

I agree that thousands of patents are granted for useless and unwanted devices. But even in the case of those which have value, few firms dealing with a stranger are likely to enter into negotiations until the inventor has established his proprietorial rights in his invention by producing Letters Patent. A manufacturer otherwise takes a grave risk. My correspondent, however, thinks otherwise. From his experience, he says that it is the exception to receive such reaction when an invention of any potential value is submitted to a suitable manufacturer. I can only say that it is not mine, and I am certain that many of my inventor readers would support me. Some manufacturers do indeed like to be kept informed of ideas which are the subject of provisional protection, not only with a view to developing them into a practicable and marketable form before the same idea occurs to others, but also so that they may advise a patent agent at the earliest possible moment, for a great deal depends on the patent agent to ensure that the invention is covered in its broadest terms and that the patent when granted will be valid.

It may be that the purpose of provisional protection is to enable an inventor to protect his ideas effectively and cheaply in their embryonic stage and to offer them to others who have better facilities for their development. It does not, however, work out that way in practice. I agree that where the inventor can afford it, he should seek the advice of a qualified chartered patent agent. It is more likely that he will have considerable knowledge of the subject and have on his lists clients to whom he is anxious to introduce new ideas in their line. For this introduction he usually seeks no fees, either from the inventor or the client, beyond what he may obtain professionally for work which is the outcome of such introduction. This advantage to the inventor more than covers the professional fees involved.

It is not generally known that a qualified patent agent not only sees to the formalities of filling in the Patent Office forms, drafting the specifications, and preparing the drawings, but also gives sound advice as to the probable novelty of the idea, its patentability, on the value of the patent when granted, on the drafting of an agreement with an interested manufacturer and the prospects of making any money out of it. Provisional protection is, of course, for 12 months, not nine.

Provisional protection does not include the right to sue, and so the inventor is left without that very important piece of protection. It *can* give protection in the case of would-be infringers. It is in effect a "trespassers will be prosecuted" notice. It is well known, however, that one cannot sue for trespass, as there is no such tort as trespass. A trespasser can, however, be sued for damage, and is also deprived of certain rights by his own act; for example, if he falls in a hole and injures himself whilst he is trespassing, he has no claim for injury.

By this same argument, a person who copies an article covered by provisional protection, though he cannot immediately be sued, can find himself in great difficulties. He may find himself landed with stocks which he cannot sell; stocks held by wholesalers and retailers will be returned to him. Moreover, users of infringing articles are also liable to be sued, and consequently, a manufacturer who has made the infringing articles, knowing they were covered by an application for patent, could be held liable in law to the ultimate purchaser, by misrepresenting that he would be free to use them.

Those holding provisional protection are entitled to inform others of their impending patent rights, presuming that they intend to file a complete specification. There is danger, however, in so informing third parties and in view of Section 65 of the Patents Act, professional advice should be sought to avoid liability of issuing "threats." It is an offence to threaten anyone with action for infringement in certain circumstances. Very few inventors know their rights or the risks they run in this respect, and there is a mistaken impression about this aspect of patent law.

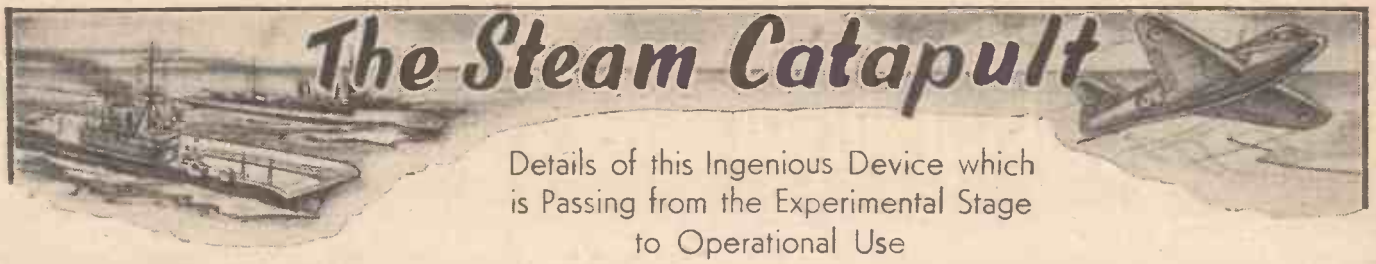
My correspondent tells me that not one per cent. of the inventions which proceed to completion through professional hands could be turned down—but not all specifications do proceed through professional hands. It is true that this one per cent. may not be worthy of further action because they have been anticipated. Gadget inventions often suffer such fate because it is a long job to make a reliable search and consequently the expense is seldom justified as the filing of the complete specification brings the result of an official search.

The fact is that the cost of developing a patent is quite often beyond the means of the average inventor, who is compelled at an early stage, usually the granting of provisional protection, to vend his idea. That stage does not provide the best bargaining point. If the idea concerned has world appeal it must be patented in most of the important foreign countries, and this again is a lengthy and costly business. This, coupled with the long time which elapses between the filing of a claim and the granting of a patent, often acts as a deterrent, and it is only the lucky few who finally have their ideas exploited and draw an adequate reward.

It is in the best interests of the country that inventors should receive greater encouragement, prompter service from the Patent Office, and greatly reduced fees.

—F. J. C.

SUBSCRIPTION RATES
including postage for one year
Inland - - - - 14s. per annum.
Abroad - - - - 14s. per annum.
Editorial and Advertisement Office: "Practical Mechanics," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2
'Phone: Temple Bar 4363
Telegrams: Newnes, Rand, London.



The Steam Catapult

Details of this Ingenious Device which is Passing from the Experimental Stage to Operational Use

THE first operational installation of the new steam catapults which are being produced and developed to launch the fast and large aircraft of the future from aircraft carriers will be in H.M.S. *Ark Royal*, the fleet carrier which was commissioned at Birkenhead recently. Similar catapults are also being constructed for H.M.S. *Hermes*, H.M.A.S. *Majestic* and H.M.C.S. *Bonaventure*, which are still under construction, and for H.M.S. *Victorious*, now undergoing extensive modernisation at Portsmouth. It is intended eventually to replace with steam catapults the existing hydro-pneumatic catapults in all other operational carriers of the Royal Navy.

Previous Types of Catapult

Since the first air-operated catapult for the Royal Navy was fitted in H.M.S. *Vindictive* in 1925 there has been a steady development to improve the efficiency of aircraft launching by this means. The air-operated catapult gave way to one operated by cordite, and this in turn was replaced by a hydro-pneumatic type.

The hydro-pneumatic unit, situated below the deck, transmits its power to the aircraft by means of flexible steel wire ropes passing round pulleys. These wires are attached to a small trolley, which pulls the aircraft along the deck by means of a towing bridle.

With the increase in the weight of the aircraft and higher launching speeds the power required has necessitated larger and heavier power units and correspondingly heavier wires and pulleys. It became evident that these had reached a size and weight which would make further improvement of this type impossible, because the entire mechanism would be too bulky and heavy to install in an ordinary ship. For this reason catapult experts in the Admiralty and industry sought to find an entirely new launching method.

Steam Catapult Details

In the steam catapult quite a different principle is employed in that the shuttle or trolley to which the aircraft is connected by its towing bridle is propelled along its track in the deck by two pistons which are directly connected to it and which slide in two cylinders placed side by side under the deck and extend the whole length of the track.

Steam pressure acts directly on these pistons and propels them along the cylinders so that the comparatively light pistons and the shuttle are the only moving parts of the catapult. Fig. 1 illustrates a typical layout in the ship and shows the power cylinders housed under the deck and the steam receivers, in which steam from the boilers is stored ready for the launch.

Launching

Fig. 1 also illustrates an aircraft secured by its towing bridle to the shuttle and held back by a " hold back " which is hooked in a suitable fitting on the deck. The function of the hold back, as its name implies, is to hold the aircraft back against the thrust of its own engines, which must be run up to full power prior to the commencement of a launch; when the accelerating force is applied to the shuttle, this additional force added to that of the engine thrust causes a calibrated breaking link in the hold back to break and leaves the aircraft free to move forward under the accelerating pull of the shuttle. When the aircraft is ready to be launched with its engines running at full power the launching valves are opened, which admits steam from the receivers to the after side of the main pistons in the power cylinders, and the force on the pistons generated by this steam breaks the holdback and accelerates the pistons, shuttle and aircraft to the required speed along the deck.

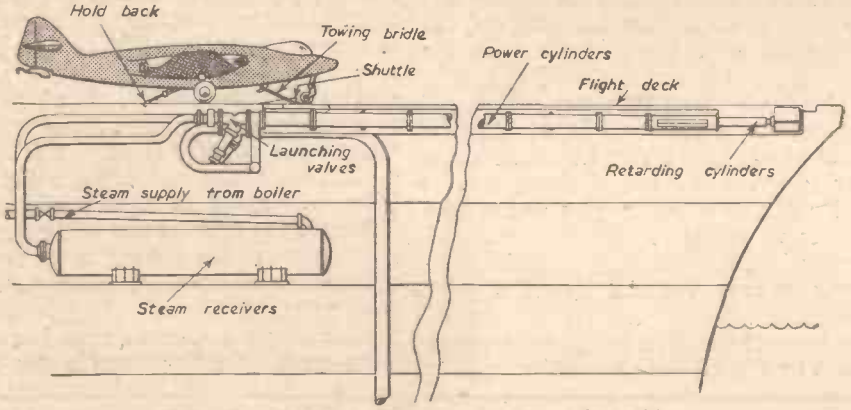


Fig. 1.—A typical steam catapult layout in a ship.

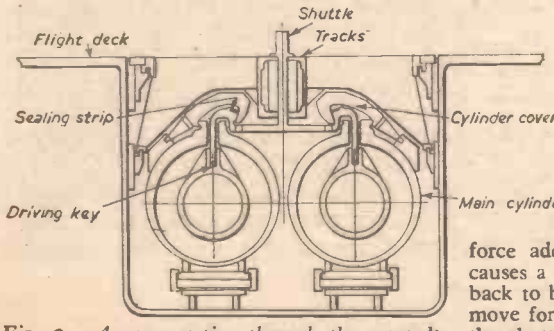


Fig. 2.—A cross section through the catapult.

The Pistons

Fig. 2 shows a cross section through the catapult and illustrates how the two power cylinders are installed side by side in the trough formed in the flight deck. This trough is closed by two portable tracks or portions of deck which carry the channel-shaped rails in which the shuttle runs upon its rollers. The body of the shuttle is in the shape of an inverted " T," of which an upper part projects through a slot between the two channel rails above the deck and forms the hook to which the towing bridle is attached. The flange of the " T " on the underside is furnished at each edge with projections or " dogs," which engage in corresponding dogs in the driving key attached to the piston. The two pistons and the shuttle are constrained to move axially, but have freedom relative to each other so that slight movement of the track or cylinders relative to each other is permitted by the dogs, which are provided with ample bearing surfaces.

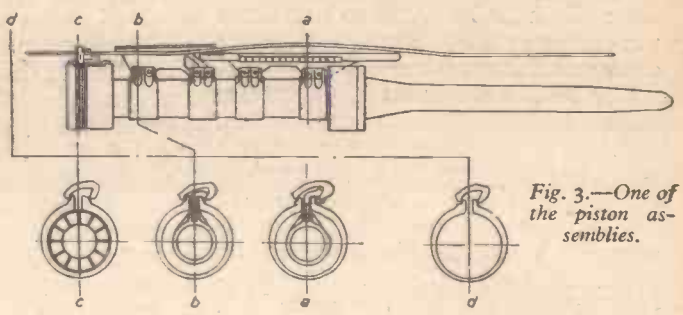


Fig. 3.—One of the piston assemblies.

Working Details of the Cylinder and Piston

Fig. 3 illustrates one of the piston assemblies, which consists of a main piston, piston distance piece, guide piston, retarding ram, driving key and driving iron. The main cylinder consists of a combination of three components, namely, the cylinder itself, the cylinder cover and the sealing strip. The cylinder cover is of a hook shape and at one end engages a rounded surface formed on the cylinder in such a way as to permit rotational or hinge freedom relative to the cylinder, while at the other end of the hook a gap is left between the cylinder cover and the top of the cylinder bar. Into this gap is fitted the sealing strip, a strip of steel of rectangular section, which is bent up and down over an arc of large radius by the piston as it moves along the cylinder.

Successive sections through the piston and cylinder are shown in Fig. 3: Section (a) shows a section through the driving key with the sealing strip lifted up by the driving key

and passing over it in such a way that it leaves the gap between the cylinder cover and cylinder open for the emergence of the tongue of the driving key which carries the dogs engaging with the shuttle.

As the piston moves forward, the sealing strip, which does not move axially in the cylinder, is guided downwards by the slope of the upper surface of the driving key and the under surface of the driving iron, which guides the strip right down into its position in the gap between the cylinder cover and the cylinder bar, as shown in Section (b). Section (c) shows the main steam piston with the component known as the sealing block mounted upon it, whose function is to seal the space in the cylinder cover and in the gap between the cylinder bars. As the piston moves forward it leaves the strip in the position shown in section (d). The steam pressure is acting immediately behind the main piston and the sealing block, and the effect of the steam pressure on the cylinder is to make it tend to open at the gap, but this tendency is resisted by the combination of the cylinder cover and the sealing strip, the latter acting as a strut transversely between the cylinder bar and the cylinder cover. In this way the cylinder under pressure becomes a stable structure and the compression loads on the sides of the sealing strip due to its structural function create an effective seal against the escape of internal pressure and form what is virtually a closed cylinder in the wake of the piston.

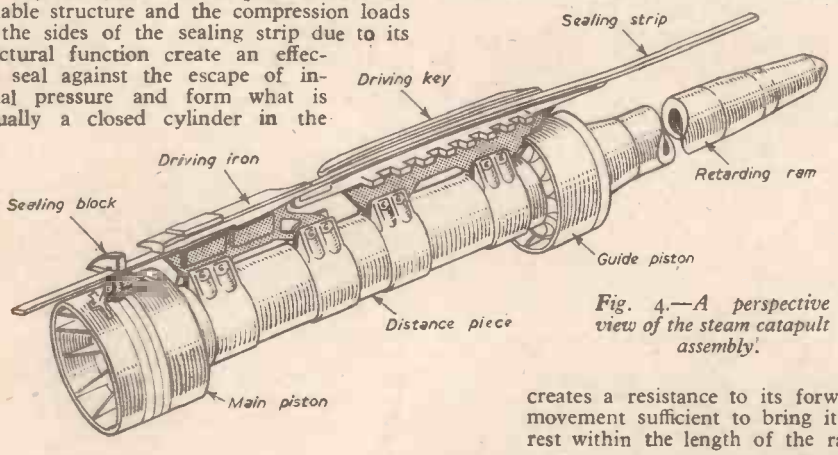


Fig. 4.—A perspective view of the steam catapult assembly.

It will be noted that the combination of cylinder cover and sealing strip restores the strength which was lost to the cylinder by cutting the gap in the cylinder wall and that no external bracing or other component is required outside the cylinder. This is one of the features which made the adoption of a catapult of this type possible in a ship, where an externally braced cylinder would absorb an unacceptable amount of space and weight. This design of cylinder and piston assembly is the subject of a patent.

Cylinder Length

The length of the accelerating stroke, and therefore of the assembled cylinder, is only limited by the length of the ship, but it is necessary to stop the piston assemblies and shuttle when they have reached the end of their available stroke. For this purpose two steel cylinders are positioned co-axially with the power cylinders bearing at their closed forward ends on a heavy structural member built into the ship's hull. Those cylinders, which are illustrated in Fig. 5, are open at their after end and kept full of water by pumping water through a series of nozzles in a nozzle ring positioned at the open end of the cylinder. The nozzles are inclined axially and tangentially so that the water emerging from them follows a helical path down the bore of the cylinder. When this flow of water reaches the closed end of the cylinder its rotation is arrested by vanes on the face of the end plug and the water thereafter flows axially along the centre of the cylinder and spills out through the centre of the vortex formed by the jets. By this means it is possible to maintain the cylinders full of water which is free of air bubbles. This method of filling and retaining the cylinder full is the subject of a patent.

Method of Retardation

The forward end of each piston assembly has fixed to it a retarding ram tapering from forward to aft, of which the largest diameter is slightly less than that of the bore of the choke ring fitted in the mouth of the retarding cylinder. As the piston assemblies, shuttle and aircraft are propelled forward by the steam pressure, the point of the retarding ram enters the open end of the retarding cylinder, and the water which it displaces from the cylinder is forced to pass at high velocity through the annulus formed between the bore of the choke ring and the surface of the retarding ram. Since the velocity of the water through this annulus is very high, the pressure in the water within the retarding cylinder is raised thereby and this pressure acting upon the area of the retarding ram creates a resistance to its forward movement sufficient to bring it to rest within the length of the ram.

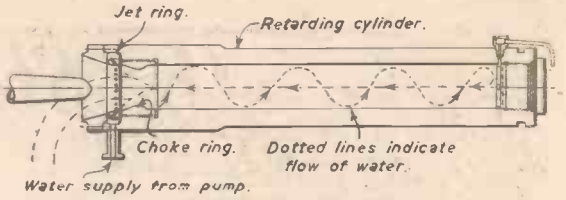


Fig. 5.—The retarding cylinder.

The energy of the water expelled through the annulus is further utilised in assisting to stop the piston assembly by causing it to impinge upon a curved annular surface or "bucket" formed at the base of the retarding ram. This form of retardation has been used by the Admiralty in catapults manufactured before and during the war.

Hydraulic Control System

For the operation and control of the various valves and ancillary equipment a separate hydraulic system is employed wherein the pressure is generated by a turbo-driven hydraulic pump. This hydraulic power is used for retracting the pistons and shuttle from the forward end of the catapult after a launch to the after end ready for loading on another aircraft, and this part of the equipment consists of a small hydraulic cylinder which through a multiple reeving propels a hook back and forward along the track, which hooks on to the shuttle at the forward end and draws it back to the firing position where it is released.

Two Control Positions

The controls of the catapult are centralised in a control console situated in the machinery compartment where the control worker operates all the functions of the catapult, the necessary indications and interlocks being provided electrically. A secondary control position is provided at the edge of the flight deck, where a second control worker operates a push button which fires the catapult after it has been made ready at the main control console.

An aerial view of H.M.S. "Perseus," showing the steam catapult, which was installed in this ship for trials in 1951.

How to make a Harpoon Gun

An Easy-to-make Addition to Your Underwater Equipment

By N. FROOME

TO present and prospective underwater or "skin diving" enthusiasts in Britain, there is a fascinating and exciting new sport to be opened up in harpoon fishing. Books on the subject have covered the warmer sections of the globe blessed with tropical heat and clear waters; but for those of us here in Britain who have to put up with the travesties of the English summer there is still ample scope for similar activities. Needless to say, we shall not give battle to the shark, barracuda or manta ray, but we can expect to have exciting exchanges with conger eel, bass, mullet, rockfish, etc. There is plenty of marine life here to satisfy the hunter.

The gun described here can be made for under £2 and is simple enough in construction to be within the capabilities of the most modest handyman.

Before proceeding further, the lethal properties of such a weapon must be pointed out, for in careless hands it could be more deadly at close range than a bullet. The hinged barb on the harpoon head prevents the shaft from being withdrawn after it has struck an object—fish or swimmer—and has to be pushed on through in order to get it out. The result of such a missile hitting anybody by accident can well be imagined! It is important, therefore, that the following simple precautions be taken: never leave the gun loaded on the beach and never point it in fun at anyone; do not load until in the water and always unload in the water before emerging. Keep clear of bathers; there is not likely to be a fish among them, so give them a wide berth.

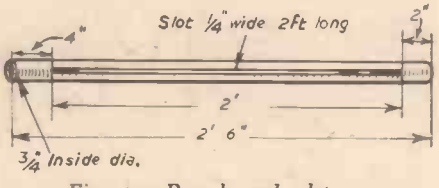


Fig. 1.—Barrel and slot.

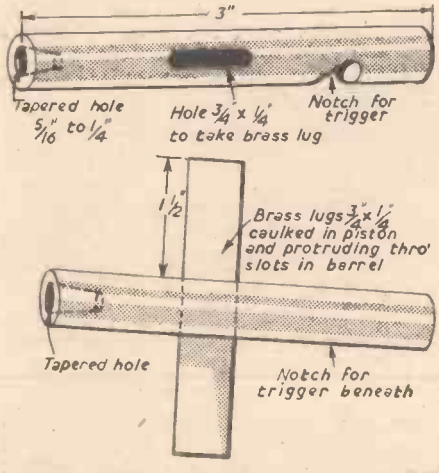


Fig. 3.—Side view and plan of piston.

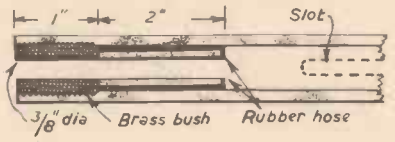


Fig. 2.—Brass bush and rubber buffer.

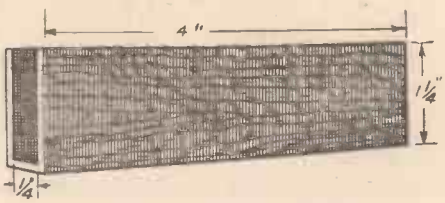


Fig. 4.—Trigger mechanism housing (3/32in. sheet brass).

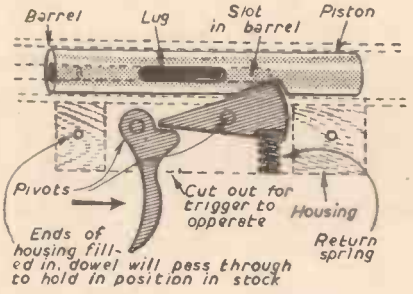


Fig. 5.—Trigger mechanism, showing engagement with piston in barrel.

The Barrel

This is made from a length of pipe, ¾in. inside diameter, 2ft. 6in. long, and of fairly heavy gauge. A chromium-plated towel rail is suitable and can be obtained from your ironmonger. A list of parts with approximate prices is given later. A slot, 2ft. long and ¼in. wide is cut through both sides of the barrel, leaving 4in. at one end and 2in. at the other uncut, see Fig. 1.

This is one of the most tedious parts of the whole construction and must be done with care to ensure that the slots are straight and true. Once they have been carefully marked, drill a couple of ¼in. holes right through the barrel at one end of the slots. When the metal between the holes has been removed, it will then be possible to continue with a hacksaw. Wrap a soft piece of material around the barrel to prevent the surface from damage when holding in a vice.

The 4in. of unslotted barrel will form the muzzle of the gun. Tap ⅜in. Whitworth threads in this end to a depth of 1in. and prepare a brass bush, bored to ⅜in. to screw into same. Behind this bush, insert 2in. of rubber hose with a ⅜in. bore; ⅜in. high pressure hosing is ideal as its external diameter is ¾in. and it thus fits snugly in the barrel. This is illustrated in Fig. 2.

The Piston

The piston is made from a 3in. length of ¾in. brass shafting, also obtainable from the ironmonger or nearest engineer. This must slide freely and smoothly inside the barrel.

Halfway along its length cut an elongated hole ¾in. x ¼in. through piston. Three ¼in. holes drilled in a row and chiselled out between is the simplest method of doing this. Through this hole, insert a brass strip ¾in. x ¼in. and 3¾in. long so that 1½in. protrude each side. Caulk in position with a chisel. Drill a tapered hole in one end of the piston, 5/16in. to ¼in. and ½in. deep. This hole is to take the end of the harpoon shaft and is tapered so that a slight twist and a push on the shaft will jam it in position and prevent the harpoon from dropping out when the gun is pointed downward. At the other end of the piston and underneath same, a notch is cut for the segment in the trigger mechanism to engage. This is clearly shown in Fig. 3.

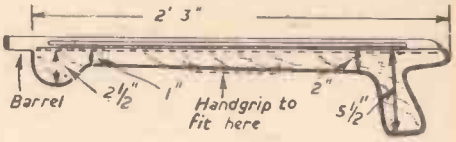


Fig. 6 (Above)—Mahogany stock.

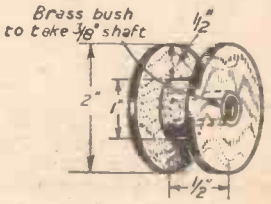
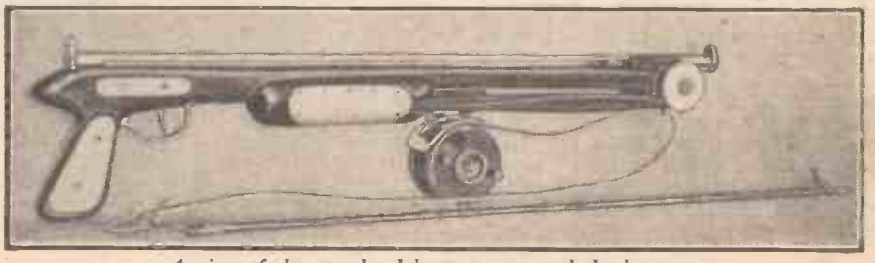


Fig. 7 (Right)—Beech rollers.

When the gun is fired, the piston thrusts the harpoon from the barrel and the rubber hose acts as a buffer when the piston reaches the end of its throw.



A view of the completed harpoon gun and the harpoon.

Rubber strands are attached to the piston lugs which protrude through slots in the barrel.

Trigger Mechanism

The shell to house the trigger mechanism is bent from 3/32in. brass sheet, 4in. by 2¾in. in the form of a U in section with flat base. The finished housing will be 4in. long by 1¼in. by ¼in. inside width (Fig. 4).

The mechanism itself consists of a triangular segment of brass ¼in. thick pivoted in the centre. An upward movement at the apex lowers the end of the segment in the barrel and thus releases the piston. Fig. 5 is self-explanatory. The trigger, also cut from ¼in. brass strip, levers the apex of the segment upwards, whilst a brass coil spring returns it after the trigger has been released. Pivots should be not less than ¼in. diameter.

That portion of housing left at either end of the mechanism should be filled in with ¼in. brass and riveted to hold it in position. When the housing has been countersunk into stock, a brass dowel (⅛in.) at each end will hold mechanism in place (Fig. 5). The bottom of the housing will have a suitable panel to cut out to allow the trigger to operate, and the triangular segment also notched to hold the return spring in place. A rectangular hole is cut in the barrel to allow the top of the segment to enter.

The Stock

Any hard wood is suitable, but mahogany is best for appearance. Cut the stock from a length 2ft. 3in. by 6in. by 1¼in. (rough) and shape as in Fig. 6. The rounded end is to take two rollers, one on each side, around which the rubber strands are guided. The top of the stock is grooved to fit the barrel the latter resting in it for a quarter of its diameter.

Two rollers, 2in. in diameter, can be turned from beech and a brass bush inserted to take a ⅛in. shaft (Fig. 7). The groove in the roller to guide the rubber strands should be ½in. by ½in. Shape a mahogany hand grip to fit the stock, about halfway along its length, 6in. by 2in. by 2in. and grooved to take the shape of lower edge of stock (Fig. 8). The grip is sausage-shaped and two opposed grooves, ½in. by ½in., are cut in the front end and extend for 3in. along same. It is through these grooves that the elastic strands are attached, passing over the rollers, and fixed to the lugs on the piston. The handgrip is screwed to the stock from

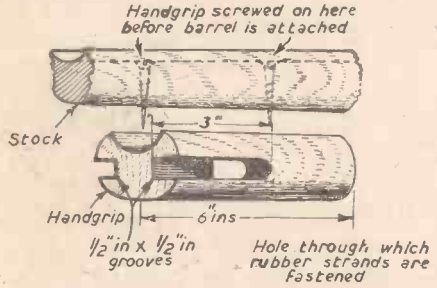


Fig. 8.—Handgrip.

above before the barrel is attached. A cream plastic finger-plate as used on doors is cut into suitably shaped panels and fixed flush into the sides of the handgrip to conceal the joint in the rubber strands. Panels can also be let into the sides of the pistol grip. The photographs illustrate this.

Sink the trigger mechanism into the stock so that the top of the housing fits flush with the bottom of the groove into which the barrel is fitted. A slot will have to be cut just in front of the pistol grip to allow the trigger to operate. Drill through the stock and insert a brass dowel at each end of the trigger mechanism as previously described (Fig. 5). Place the barrel in position, making sure that the cut-out panel in it allows the

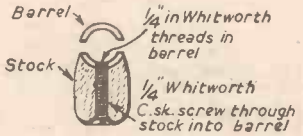


Fig. 9.—Barrel and stock assembly.

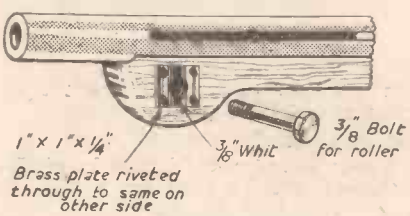


Fig. 10.—Bearing for roller.

trigger mechanism segment to protrude freely into it. This segment should stick up 3/16in. into the barrel and become flush with it when trigger is pulled.

Lash the barrel temporarily in position with cord. Drill at least six 3/16in. holes through the stock and barrel together, spaced out suitably along the length of the stock. (Fig. 9 shows a sectional view of one of the holes.) When this has been done, remove the barrel and tap ¼in. Whitworth threads in same. Enlarge holes in stock to ¼in. to give clearance to the screws.

In the centre of the rounded end of the stock, drill a ⅛in. hole and countersink two brass plates, 1in. by 1in. by ¼in., one on each side with holes tapped to ⅛in. Whit. Two brass bolts can then be screwed in, one on each side, for the rollers. Make sure they spin freely.

The brass plates are drilled in each corner (⅛in.) and riveted together through the stock (Fig. 10).

Assembly

The barrel is now replaced on the stock and screwed down with ¼in. Whitworth C:S. brass chrome headed screws of suitable length. It is important that the ends of these bolts do not protrude into the barrel when tightened, but finish flush so as not to impede the piston.

The piston is inserted into the barrel by springing the slot open in the centre and pressing it in sideways. Slide piston up and down. It should run smoothly, and when pulled right back, should click into the loaded position. Try the trigger, and piston should release at the end of its pull. A hair-trigger action must be avoided.

Grease the bearings in the rollers, insert bolts and screw into brass plates. Rollers should turn freely.

The rear end of the barrel can be plugged up, or left open as desired, but it should be levelled to the same line as the rear end of stock, Fig. 6 shows this. An extra wood screw here, through that part of barrel which is beyond the travel of the piston, and into the stock is advisable.

The heavy pull on the piston when the gun is loaded is apt to level the barrel away from the stock, so the extra screw at the end of the barrel is a wise precaution.

For safety's sake, make a trigger guard from ½in. x 3/16in. brass strip and screw into position.

Sights can be fitted to barrel, but are not really necessary.

Attaching Rubber Strands

Next, attach rubber strands. These are 10ft. of ¼in. square rubber and can be obtained from any model shop; it is usually stocked for model aircraft.

Attach one end to one side of the lugs protruding through slot in barrel. A reliable means of attachment is to bend rubber tightly round lug and serve it securely to itself with insulation tape. Serve tightly over tape with thin strong fishing twine.

Lead rubber over roller, back under the stock, through groove and hole in handgrip, over opposite roller, around opposite lug and back again to first lug in a similar fashion. Continue until you have three strands each side. The other end of rubber is then attached as described to opposite lug.

Loading the Gun

With the gun unloaded, i.e. piston at front of gun and against rubber buffer in barrel, the rubber strands should be quite taut, but not unduly stretched. To load gun, grip the

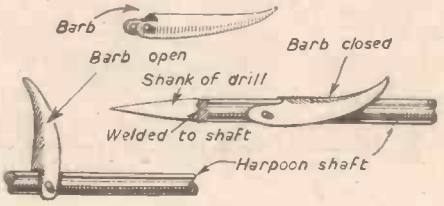


Fig. 11.—Hinged barb.

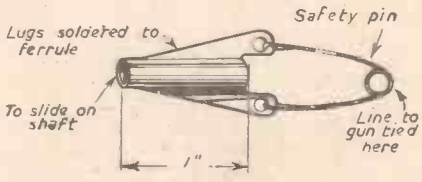
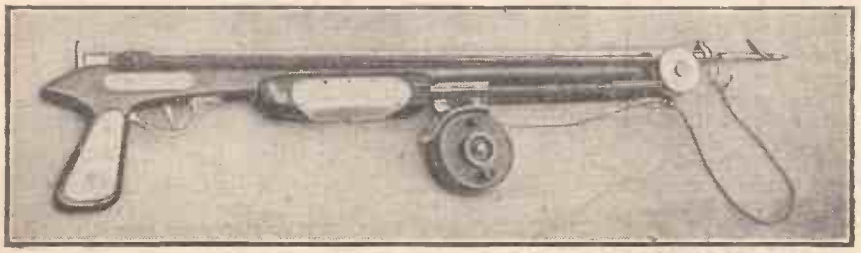


Fig. 12.—Sliding ferrule.

lugs—there should be just enough protruding beyond rubber to do this—and pull back until the piston locks in trigger mechanism. This requires a certain amount of strength, but a knack also, and with a little practice can be done easily and quickly in the water.

Finishing

Now screw the plastic panels on each side of handgrip covering hole and sides of groove, also panels on each side of pistol grip. The panels, especially if in cream, give the gun a handsome appearance and it is worth a little care in fitting them. The plastic can



A further view of the completed harpoon gun.

be cut to shape with a hacksaw, filed and sandpapered. If the surface is finished finally with metal polish it will remove any marks made by the sandpaper.

For a quality finish on the gun, it is well worth taking pains with the fashioning of the stock. When this has been completed and sandpapered, give several applications of button polish obtainable from your paint shop, with a light rub in between each coat with an old piece of fine glasspaper. This is soon done as the polish dries in a few minutes. After this, varnish—preferably in a warm room—and allow to dry.

If desired, the brass external fittings—lugs, trigger and guard—can be chromium plated very cheaply.

A reel is optional, but an inexpensive plastic one can be fitted, or a beech one can be turned at the same time as the rollers, in which case a brass stand will have to be made to accommodate it. The reel, if required, should be screwed to the stock just in front of the handgrip.

An eyelet should be screwed into the rounded part of the stock below the rollers. The line to the harpoon is attached to this, or, in the event of a reel being fitted, passes through it.

The Harpoon

A length of 5/16in. bright steel shafting 2ft. 9in. long is obtained from an engineer's store. At one end, weld on the shank of an old 5/16in. carbon drill. Grind to a gradual point and temper same.

The hinged barb is made from a small scrap of 18G steel sheet, shaped as in Fig. 11, and riveted through shaft about 1¼in. from point. It fits flush with shaft when closed, with a slight bend out at the tip, and it opens to 90 degrees.

A sliding ferrule, 1in. long with two lugs, opposed and soldered on to it, is run on to the harpoon shaft. A large stainless safety-pin with head and point removed is attached to lugs, see Fig. 12. The line to the gun is tied to the eye at the hinge of pin, and the ferrule is free to slide along the shaft. The two ends of the safety-pin are bent into small rings which pass through the holes in the lugs. This enables the pin to swing clear of harpoon shaft and gives a central pull to the line.

The rear end of the harpoon is tapered slightly so that it fits into the corresponding tapered hole in the front of the piston. As explained earlier, this prevents the shaft from dropping out of the gun.

Drill a ⅛in. hole through the end of the harpoon just above the taper and insert a steel dowel. Slightly spread the ends and file down until dowel protrudes 1/32in. each side of shaft. This prevents the ferrule from running off the shaft, but it must be ensured that dowel does not stick out so far that it catches on brass bush and rubber buffer at muzzle of gun.

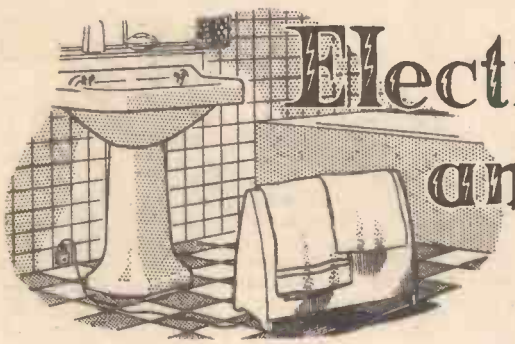
Sources of Supply

The following materials can be obtained from the ironmonger or engineer. Approximate prices are also given.

Steel or alloy towel rail for barrel	12s. 6d.
Brass strip and 3/32in. sheet for piston lugs, trigger and mechanism	4s. 0d.
4in. x ⅜in. brass shafting for piston and bush	2s. 0d.
Two ⅜in. brass bolts for rollers	1s. 0d.
2in. x ⅜in. brass shafting for roller bushes	1s. 9d.
Pair of cream plastic door finger plates for panels	2s. 6d.
3ft. of 5-16in. bright steel shaft for harpoon	1s. 9d.
Short length of ⅛in. round brass dowel for trigger mechanism	6d.
2in. rubber hose for buffer	6d.
Obtainable from Model Shop:	
10ft. of ⅛in. square rubber strand at 6d. per foot	5s. 0d.
From the Carpenter:	
Mahogany 2ft. 3in. x 6in. x 1¼in. (Rough)	6s. 0d.

The cost of lathework for brass and wooden rollers is difficult to assess as the handyman may have a lathe of his own, but the approximate price of parts given here is only 37s. 6d., thus the construction of a gun can be very reasonable indeed as far as finance is concerned.

Should it be desired that external metal parts be chromed or a reel fitted, the extra expense involved will mean that the total cost will be well under a quarter of the price of the factory-made article.



Electric Drier and Airer

By G. WELCH

THE small drying or airing horse described here is easily constructed and will be a boon to those living in rooms or flats where no proper drying cupboard can be provided.

The experimental unit as sketched is large enough to deal with dish or tea cloths, huckabuck towels or underwear; and is probably the smallest size of practical value. It is absolutely safe in use and cannot scorch even the most delicate materials.

For the size shown here a 150 watt electric light bulb can be mounted centrally on the bottom board, but a more uniform distribution of heat is obtained by using three 60 watt lamps and the central lamp can be connected to a cut-out switch for slow drying.

The wooden ends are of ¾in. deal, shaped parabolically to give stiffness to the No. 10 gauge sheet zinc casing, without battens. The sheeting is bent to follow closely this end-shape and is fastened with brass screws along its edges at 3in. centres.

The bottom board is also of ¾in. deal, screwed to ledges (door stopping) and should be made removable in order to renew the lamps when necessary.

All joints should be made as close fitting as possible to avoid loss of heated air. Economy can also be obtained by heat-insulating the ends and the bottom board with polished sheet aluminium fixed on the inside with small screws, backed by tap-washers to provide ¼in. air space between this lining and the wood.

On plugging in, the internal air temperature quickly rises to about 100°F. above room temperature and the zinc or drying surface attains the heat of an ordinary hot water radiator. Articles to be dried or aired are draped over this surface and can be safely left indefinitely or as long as necessary. No useful data can be given for actual drying times as this depends on the amount of moisture, but as a guide a damp tea cloth will be dry in about one hour or less.

It is found convenient and economical to plug-in and to put on the damp article at the same time. There seems no advantage in heating up the drier first.

It may be thought that by blacking the inner surface of the zinc sheet, so as to cut down reflected heat, more rapid drying would result; but this merely entails a more rapid heat transit and for faster drying a larger heat input, meaning more or bigger lamps, would be necessary. The outside of the unit can, of course, be painted with a paint that does not discolour due to heat.

Larger units can be constructed on the same principles and should give an equally good performance provided the lamps are well distributed and the electrical input is at least the rate of 40 watts per sq. ft. of zinc heating surface.

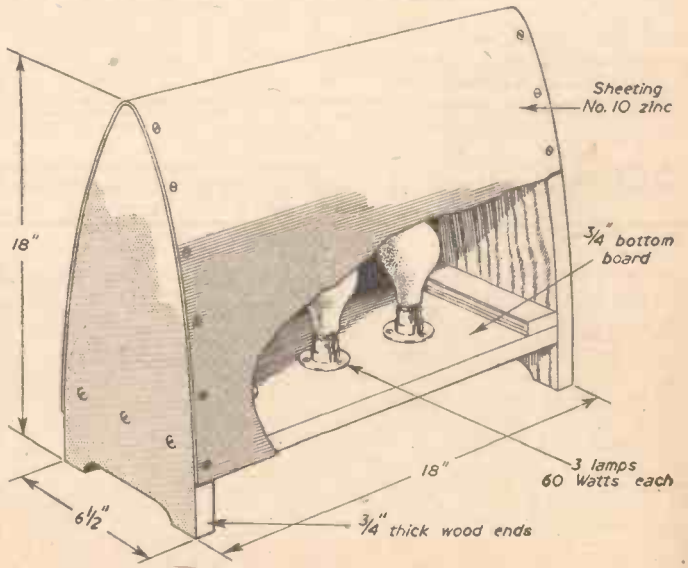
Materials and Cost

Cost of materials for the small unit here described are:

	s.	d.
No. 10 gauge zinc sheeting, 36in. x 18in.	7	0
Aluminium lining	4	6
¾in. flooring deal, 4ft. 6in. x 7in. } Door stopping 1ft. 3in. }	3	6

(Screws and washers, lamps and sockets extra)

If the cost of electricity is taken at one penny per unit per hour, the running cost of three 60 watt lamps is approximately one penny for six hours use.



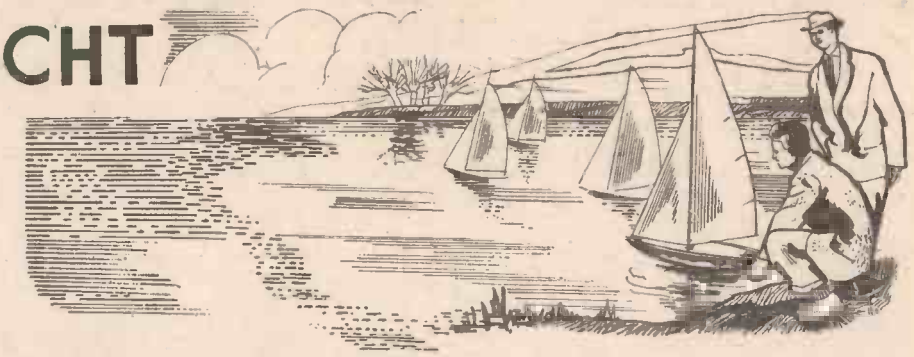
Constructional details of the drier and airer.

Making A THREE FOOT MODEL SAILING YACHT

Full Constructional Details of a 36in. Class Model Suitable for Racing Under Model Yachting Association Rules

By E. W. TWINING

(Concluded from the March issue)



IT is usual to make the skeg and rudder wood and the skeg is sometimes formed from the planks at the same time as the hull and keel other modelmakers mortise the skeg into the hull, but both skeg and rudder are very thin and there is no satisfactory way of making a joint between the rudder and the metal rudder post.

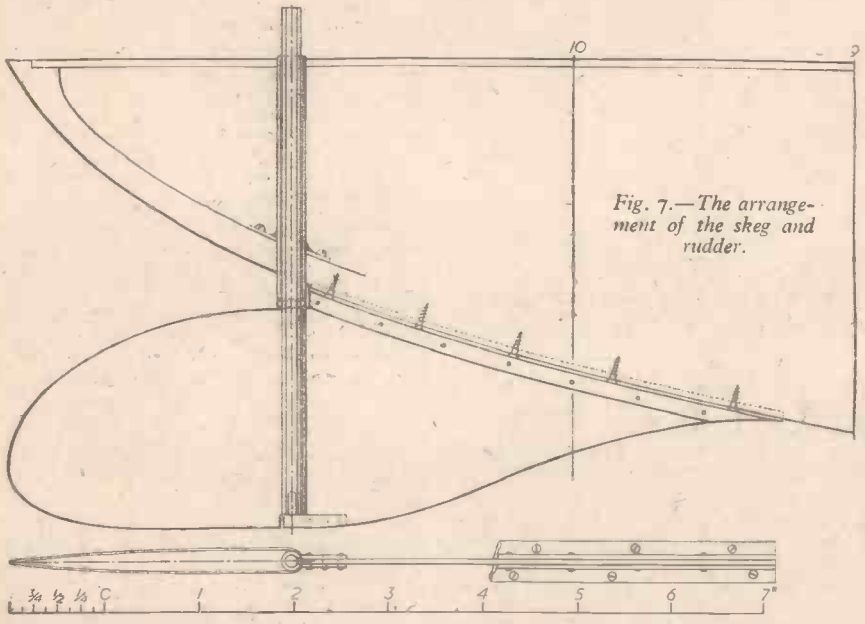


Fig. 7.—The arrangement of the skeg and rudder.

With all due respect to other designers of yachts I put forward the suggestion which I have illustrated in Fig. 7. Here the skeg is made from a piece of aluminium plate having at the top two aluminium angles by which it is screwed to the hull, and at the bottom a brass clip in which a pintle is soldered; this clip and the angles are riveted to the plate by rivets made from copper wire.

The rudder post comes right down to the pintle clip and rests upon it. A light gauge brass tube ¼in. dia. forms the rudder post and to this is soldered the rudder, which is hollow and beaten from copper foil. After beating to the section shown in Fig. 7 it is wrapped around the rudder post, soldered to it and the two sides, or halves of the rudder, are brought together and soldered all around the edge. Care must be taken in soldering to see that every tiny opening is sealed so that the rudder shall be watertight. The bearing in which the rudder post works is another tube making a nice working fit over the post. This tube is steadied at the top by passing through the deck and must make a tight fit in a hole, drilled on station eleven, through the hull. It is made secure by a plate soldered on it and through this two screws go into the hull.

Forming the Deck

The deck may now be cut out and fitted, but before it is screwed down the deck beams must be put in. One of these is shown in Fig. 3; there should be five placed at stations 2, 4, 6, 8 and 10. They should be 3/16in. deep at their ends, be straight along their undersides and curved at their tops to suit the camber of the deck; they are glued into recesses in the rebates at their ends. Some designers advocate that the deck shall extend to the extreme outside of the hull and be planted down on the top of the hull, but although it involves a little more work I think it looks better to recess it. For this reason in the cross-sections, Fig. 3, is shown a rebate all around the top edge of the hull. To get the true outline for the deck take a rubbing with blacklead pencil on tracing paper from the rebate on the model and then transfer the line to the wood for deck.

Deck Material

Most authorities seem to use or advocate yellow pine but it is a delicate job planing a board as long and as wide as our deck when the thickness is under ¼in. I favour plywood 2 mm. thick which is thinner than a pine deck could be. If this is used rebate the hull accordingly.

If the deck planks are wanted to show it will be best, after glasspapering and cutting out, to apply a coat of celluloid lacquer and then do the ruling with a draughtsman's pen and waterproof drawing ink, using the drawing board and Tee-square. The object of the lacquer is to prevent the ink from spreading in the grain of the wood. The finished deck will be screwed at its edges to the hull with ¾in. No. 2 screws at intervals of about 3in. Before screwing down, the underside of the deck and the whole of the inside of the hull, including the deck beams, should be given two coats of shellac varnish.

The Automatic Steering Gear

On this model the rudder is placed rather far aft, consequently it has been necessary to modify the Braine automatic steering gear: inasmuch as the elastic spring control is taken forward instead of aft. Fig. 8 shows the gear in plan and side elevation. Here it will be seen that the rudder post terminates in a curved quadrant in opposite sides of which two sheets are hooked. From the starboard side of the quadrant the sheet goes over to the port side, where it passes through an eye and then goes up to the boom, where its length is adjusted by a bowser. From the port side of the quadrant another sheet runs to another eye on the starboard deck and then, like the other, up to the boom. Underneath the quadrant there is a lever and both this and the quadrant are soldered to a sleeve which is pinned to the rudder post. The spring is simply a light rubber elastic band hooked at one end to the lever and at the other to a hook screwed to the deck.

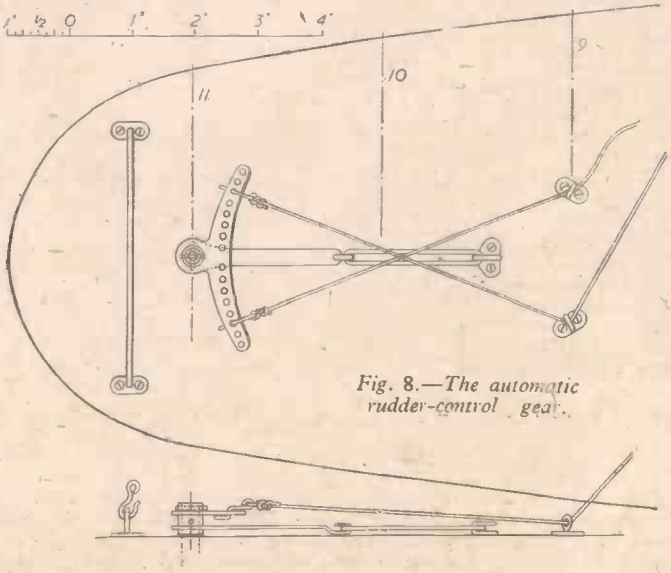


Fig. 8.—The automatic rudder-control gear.

The Braine gear cannot be used when sailing close hauled—only when the wind is abaft the beam—and for close sailing a sheet horse is provided; this is shown in Fig. 8 aft of the rudder.

Where the sheets have been taken through round eyes it is usual to fit pulleys around which the sheets pass, which pulleys are fitted in swivelling cases, pivoted so that they rise and fall according to the angle made by the sheet. That is what they are supposed to do, but they, in small sizes, call for such accuracy in making that they would probably seldom work freely on a 3ft. model; therefore the plain eyes and greasing the sheets where they pass through the eyes is suggested.

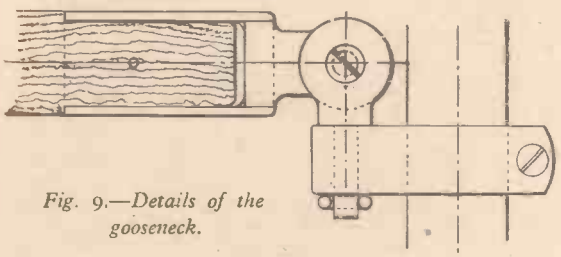


Fig. 9.—Details of the gooseneck.

The Mast

From the step to the truck this will be 57in. long; it will be ½in. diameter at its largest part less than halfway up, and will gradually taper with a curve to 7/16in. at the foot and ¼in. at the top. It should be straight on its after side, all the taper being on the forward side. The main boom will also have curved taper: from 7/16in. to bare ⅜in. The foresail boom, tapering likewise, will be ⅜in. diameter at the middle to ¼in. at either end. The main boom will be fitted with a gooseneck which is shown in Fig. 9. The pivoted joints must make nice working fits, not too tight. The boom sockets into a tube soldered on to the vertical swivelling piece. The main supporting piece is a band which is clipped around the mast, as shown.

The Sails

These should be cut from model yacht sailcloth; this is a finely woven white or cream Egyptian cotton which is both light and strong. The cloth is cut with the selvedge parallel with the leech of the sail, and cutting is best done on the drawing board with a razor blade. If scissors are used they should be sharp and care must be taken not to stretch the cloth. It must be hemmed all around and a narrow white tape sewn in with the hem. Pockets must be provided by tapes for three stiffening battens on the leech of the mainsail. These battens can be of any flexible material such as split bamboo, cane, whalebone or celluloid. The sewing should be done with silk thread or with waterproofed cotton or flax.

The head of the mainsail is usually provided with a headboard, which is cut from a plate of thin aluminium or celluloid as at A (Fig. 10), or it can be of bent wire as at B. This is the easier to make. The wire is doubled back on itself and soldered where it meets the sail and the upper foldback of the wire is filed with nicks into which the lacing thread is taken. The halliard is secured with a bowser and the free end is provided with a hook in the case of wire as B and with a wire loop as at A if a headboard is provided. C is an enlarged view of the hook. This sketch is made to show the round turn and two half-hitches with which all halliards and sheets should be made off where permanent knots are called for. Sketch D shows alternative shapes for bowsers.

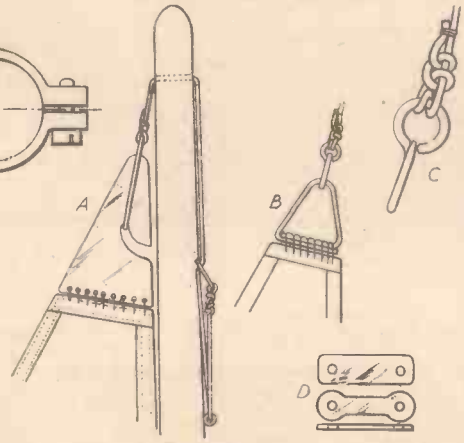


Fig. 10.—Methods of securing the head of the sail.

Although little is said regarding the rigging, it seems necessary to point out that the mainsail must be secured at the luff—the edge next to the mast—by one of two methods: one of these is to stretch a steel wire from top to bottom of the mast and encircling this wire will be little rings sewn to the luff of the sail. But this is not so good on a Bermuda rig owing to the great length of unsupported wire and it will be much the better way to let the rings be of larger diameter and encircle the mast. The rings can be made from copper wire and be spaced about 4in. apart. To enable the rings to pass up or down the mast without seizing they should have the wire ends taken one upward and one downward. These extensions of the rings at right angles to the planes of the rings will keep them square with the mast and with the sail in all directions. The feet of both sails will be free and will be secured only by the sheets at the outer angles, so there are no rings around the booms.

Finishing

After the hull is finished, and any final glasspapering completed, a priming coat of white-lead paint is applied. Artists' flake white, which can be obtained in tubes, provides an excellent paint for the purpose. As a priming it should be thinned with turpentine and a little Japan gold size added. When the priming coat is dry, look over the whole hull and see if any stopping is necessary: if it is, use the stiff flake white, from which the oil has been extracted by spreading it on an absorbent paper for a time and then scraping it up again, adding gold size to force the drying. With this fill in any cracks or faults in cutting. When the stopping is dry give a second coat of priming and then a third, glasspapering between each if necessary. Now you may either choose some good grade of enamel paint for the final coats or go on with artists' tube colours. If you decide upon the tubes the pigment will have to be converted into an enamel by mixing with a high-grade varnish such as a yacht spar varnish. Three coats should be given of the final colour, each one applied thinly and flatted down with pumice powder and water on a pad to remove irregularities. Finally, one more coat of colour and then two coats of varnish should be applied, which last should be carried over the deck and spars.

An Unusual Clock

CONSTRUCTION of a "molecular clock," which will not vary by more than a second in 300 years, has been announced by scientists of Columbia University, New York.

A Solar Radio Transmitter

RADIO transmitter, size of a pack of cards, operating from converted sunlight and with a range of about 35 yards, has been built in America.

Hungary's First Electron-difractograph

HUNGARY has made its first electron-difractograph for industrial atomic research. Dr. Ferenc Guba, director of the electron-microscope laboratory of the Academy of Sciences, said the apparatus will substantially improve the work of the catalysts and enable the laboratory to give great help to the organic chemical industry, the drug industry and the basic material manufacturing industry.

Britain-France TV Link

LAYING by G.P.O. of new Channel cable is expected to complete permanent Britain-France TV link-up in July. Extensions by relay to Germany and North Switzerland will follow in autumn.

Electron Microscope for Rubber Research

A NEW electron microscope has been installed in Dunlop Research Centre. The first of its type in this country, it will allow research workers to photograph rubber at magnifications of 100,000 or more and yet so clearly that they will be able to see the tiniest particles of carbon black in it.

Aluminium Funnel

THE new Cunard vessel, *Saxonia*, on its maiden voyage this winter, features a light aluminium funnel, as does its sister ship the *Ivernia*, also built recently on the Clyde. Use of the light alloy plate and extrusions permits a weight saving of about 50 tons over a steel funnel, thereby improving stability.

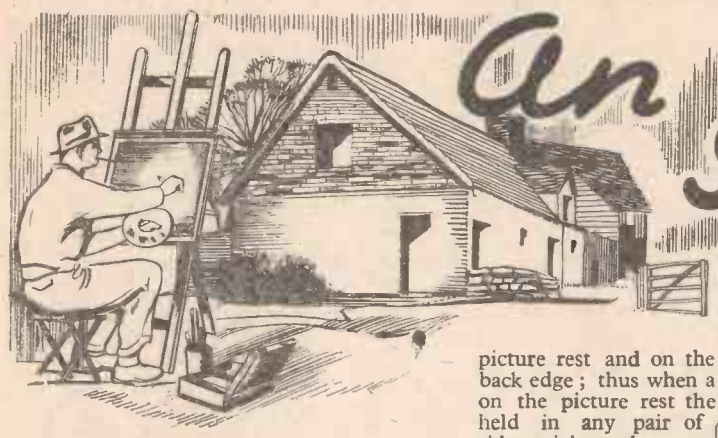
Drinking Water Produced by Solar Radiation

A FRENCH engineer, M. Henri Coanda, has suggested that low-cost parabolic mirrors be used to harness solar radiation for evaporating salt or brackish water to produce drinking and irrigating water. Plans for the construction of these mirrors from durable aluminium are reportedly being worked out by L'Aluminium Francais.

Apparently, the solar mirrors will evaporate the water at a low temperature, producing fresh water at the rate of 200 litres per day per square metre of mirror. In addition, there is said to be commercial value in the magnesium by-products.

An Aluminium House

A FACTORY built aluminium house has been especially designed for the Canadian climate by Shipstone Houses Ltd., of England. The Shipston House can be built to accommodate from three to eight people and has a light alloy frame with aluminium sheet outer walls. Erection requires unskilled labour only.



An Artist's Small Easel

A Home-made Accessory for the Painting Enthusiast

By "CRAFTSMAN"

THIS easel is for use indoors and is virtually a light studio easel. It was designed for drawing and painting in water-colours, but was soon found to be suitable for painting in oils as well, so much so that a professionally made heavy oak easel with its slowly moving screw rise and fall arrangement was abandoned in its favour. It is useful, convenient and occupies little space when folded; it will take any size canvas up to 3ft. by 2ft. 6in. or even a little larger.

The general arrangement drawing (Fig. 1) shows the easel complete with, in addition, a part elevation of the folding back leg. This leg can be extended to any convenient angle and when folded up against the front framing it is the same length as the two front legs.

Materials

My easel was made entirely of red deal with the exception of the long thin guiding strip which can be of 3 mm. plywood. Oak or mahogany could be used throughout, though deal is in every way satisfactory, provided it is straight in the grain and free from large knots.

All the main members of the easel, both for the front and back, vertical and horizontal, are of the same cross-sectional size, 1⅜in. by ⅞in. bare, which is 1½in. by 1in. before machining.

Apart from its compactness and the little space it occupies, the outstanding feature is the double rack formed by notches cut in the main side members and the pawl which engages with the notches. This pawl can be disengaged from both racks simultaneously by gripping with the fingers at any point along its length and so freeing it for lowering. For raising it is not necessary to disengage; the picture rest is merely lifted and the pawl-bar will pass over as many notches as it is required to do and will then drop by gravity into the notch where the upward movement has stopped. No springs are required; the weight of the pawl-bar and the angle at which it is hung on its hinges are sufficient. To raise or lower the picture only a second or two is required.

Constructional Details

Fig. 2 is an assembly of sketches, in perspective, of the several joints and working details. Each of these bears a letter, which has been repeated in the general arrangement, against the part to which the particular sketch refers. Taking these in alphabetical order, A shows the right-hand rack and the right-hand end of the pawl-bar. Here it will be seen that the pawl-bar is carried by two hinges, one at each end, which are screwed at about the centre of the width on the underside of the picture rest and on the pawl-bar at its back edge; thus when a weight is placed on the picture rest the pawl is securely held in any pair of notches in the side uprights and cannot accidentally become dislodged. The small plan view shows pieces on the

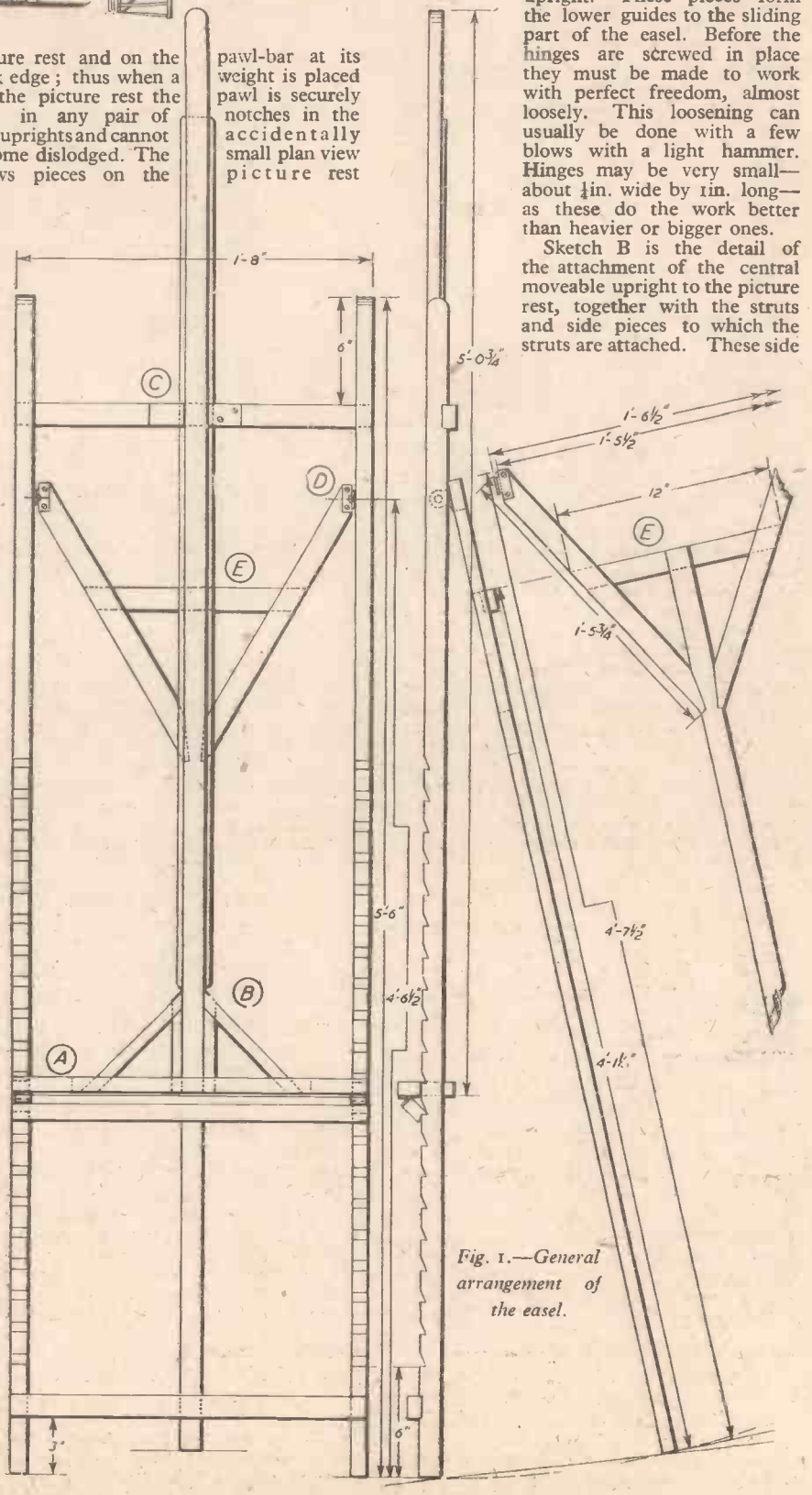


Fig. 1.—General arrangement of the easel.

which half embrace the side upright. These pieces form the lower guides to the sliding part of the easel. Before the hinges are screwed in place they must be made to work with perfect freedom, almost loosely. This loosening can usually be done with a few blows with a light hammer. Hinges may be very small—about ¼in. wide by 1in. long—as these do the work better than heavier or bigger ones.

Sketch B is the detail of the attachment of the central moveable upright to the picture rest, together with the struts and side pieces to which the struts are attached. These side

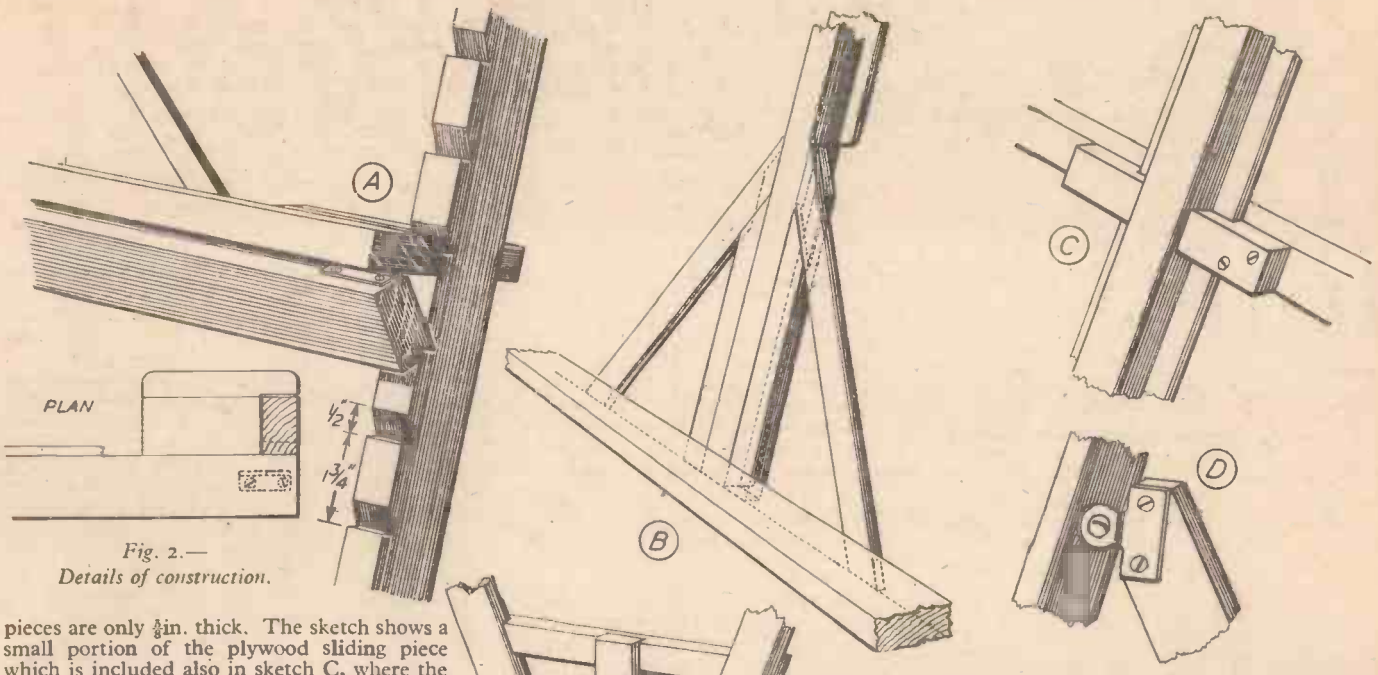


Fig. 2.— Details of construction.

pieces are only ¾in. thick. The sketch shows a small portion of the plywood sliding piece which is included also in sketch C, where the upper guides are fixed to the top crossbar. The block on the left can be glued and bradded to the bar, but the right-hand block may be screwed only. This is done in case anything goes wrong with the pawl or in any other part, so that it becomes necessary to remove the whole of the sliding part for repairs. The removal of the screwed block is the simple way of taking out the sliding bar.

D is the method of pivoting the back leg for swinging open the easel. Two mirror plates of brass are used. They are each bent to a right angle and two stout screws passed through the lugs, one screw through each, into the notched uprights.

Sketch E shows the top of the back leg. Only the 12in. crossbar is notched, at the centre to take the leg and at each end for the struts. Neither these struts nor the leg are cut. Then to transmit the thrust from the pivots through the struts to the back leg the struts are scarfed into the leg to a depth of ¼in.

Notching the Side Members

These notches must be cut before assembling the easel, but after the uprights are cut to length and tops and bottoms finished. Lay them side by side with their ends flush and carefully clamp them together; then, starting at 6in. from the bottom, mark off with dividers for 20 notches at 1¾in. intervals. Go over the divider marks with a square, making a clear pencil mark across both uprights at each divider mark. Now with a jeweller's saw or a slitting saw having a blade ¼in. wide, convert all the pencil marks into sawcuts, carrying each cut in to such a depth as will bring the back of the saw flush with the surface of the wood right across. Then again with the dividers set to ¼in., mark off spaces above each sawcut, draw these also across with pencil and square and you will then have the limits for the slope of each opening of the rack. With a ¼in. bevel-edged chisel convert these spaces into rack notches, letting each notch be carried down to exactly the depth of its sawcut. Unclamp and proceed with the construction. Apart from those through the hinges, only eight screws need to be used, all of which are shown in C and D. The joints at all points between the various pieces were made with glue and brads and panel pins.

Finishing

The easel may be left in the bare wood state but the reader can, if he wishes, treat it with some form of stain and varnish. Do not use oil-stain nor yet an oil varnish. Get a very small quantity of Vandyke brown crystals from a wholesale chemist or a hardware shop. Dissolve just under a teaspoonful of these crystals in a pint of boiling water and add a little size or glue. Paint this on to the wood with a brush. When it is thoroughly dry (very thoroughly) give a coat or perhaps two coats of shellac varnish, which is french polish made by dissolving brown shellac flakes in warm methylated spirit. Apply this with a brush.

A Low Pressure Acetylene Generator

By K. H. FLINT

IN the November, 1954 issue of PRACTICAL MECHANICS Mr. L. E. Roberts, of Romford, asked for details of a low pressure acetylene generator. The sketch shows a type I made and used myself. It was originally used as a small unit to supply light and cooking in a tent but I think, made on a larger scale, it would meet Mr. Roberts' requirements. For the outer tank a normal bucket was used. The inner tank was made from a dried milk tin. The calcium carbide container was an old cocoa tin. Care should be taken that the tap is airtight when closed, also that the joint between the carbide container and inner tank is airtight. If air can leak in through these points the generator will not function correctly.

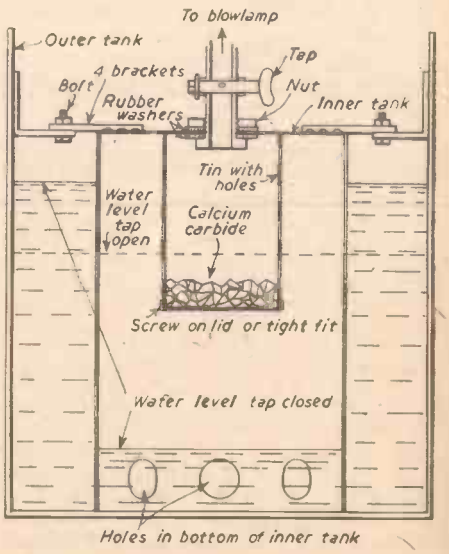
The carbide tin is mounted upside down in the inner container. A series of small holes having been punched (or drilled) in the lid and sides. Carbide is poured into the container and the lid replaced. (The lid must be a tight fit.) The inner container is inverted and placed into the outer container. This must be held down either by brackets or weights. Then making sure the tap is closed water is poured in until it comes nearly to the top of the inner container.

When gas is required the tap is opened and the air in the inner container is forced out by the pressure of the water. The water rises in the inner container and comes into contact with the carbide. Acetylene gas is given off. It should be allowed to run off for a short time to get rid of the remaining air.

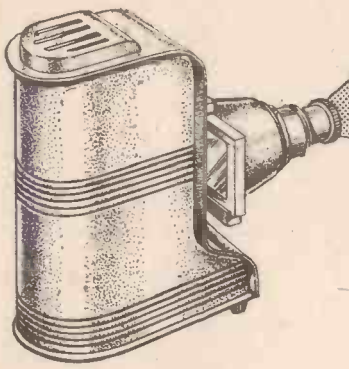
When the tap is turned off, acetylene will gradually build up pressure and force the water from the inner container. This stops the action between the carbide and water.

If the water does not flow into the inner container very quickly a few holes can be cut at the bottom to remedy this.

This generator can be used also to supply gas for cooking purposes in caravans, boats, etc.



Details of the pressure acetylene generator.



Making 35MM. BLACK&WHITE LANTERN SLIDES

Contact Printing : Printing by Projection : Slide Mounting

By A. H. TOMS, B.Sc., A.M.I.C.E.

IT was not till after I had worked with 35 mm. colour transparencies and had built a projector for this size of slide, that I tried making black and white slides.

My first attempts were contact prints on positive film and, though they lacked the "punch" of my subsequent efforts on lantern plates, they showed me what a lot of pleasure I had missed and aroused my interest in contact print slide making on lantern plates.

I use several cameras which produce negatives of various sizes from 3¼in. × 2½in. down to 35mm., and soon I felt the need to make 35mm. size slides from any desired part of any of the various sizes of negatives.

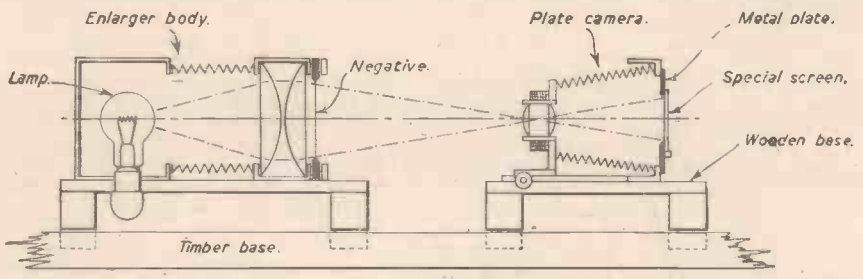


Fig. 1.—The arrangement for making slides by projection.

The following are the methods by which I accomplish this with maximum precision and at minimum cost.

Materials

For portraits or groups, landscapes other than snow, some sea scenes and certain other subjects for which cold tones are preferable, Ilford or Kodak warm tone 3¼in. square lantern plates should be used. These are cut into four pieces, each roughly 1⅝in. square which is just adequate to receive the normal 35mm. frame image. Cutting is done in fairly dim safelight with a tungsten carbide wheel glass cutter applied to the back of the plate, the procedure being as follows.

A box and small pieces of black roll-film backing paper, cut to about 2in. square as separators for the cut plates, together with a piece of black bromide paper wrapper, are prepared to receive them.

A piece of smooth fluffless white paper is then laid on a dead flat board (thick plywood would suit), and pencil lines are drawn on it to indicate the outline of a 3¼in. square plate and its centre line. The plate is then laid face down on the paper in this position and a wooden straight-edge is held firmly across it as a guide for the glass cutter. This is then drawn across the plate with a single firm stroke to make a fine but definite surface "cut." If the "cut" has been made properly, the plate will break in two cleanly when it is "bent" along the line of the cut with the back outermost. Repetition of this operation on the two halves of the plate should result in four pieces approximately equal in size.

Some precautions must be taken in this operation. The hands should be thoroughly washed and dried on a fluffless cloth and kept wiped at regular intervals throughout the job. Plates should be exposed to the safelight for the shortest time essential for the cutting, and each plate and the paper on which it is being cut should be dusted well with a camel hair brush to prevent contamination of the emulsion with glass dust. Both the uncut and cut plates should be covered with box lids to protect them against fogging while awaiting cutting or packing.

Printing by Contact

Lantern slide printing by contact is carried out in exactly the same way as for prints on paper, the piece of lantern plate being substituted for the paper. There should be no difficulty in using an ordinary wooden printing frame with a folding back.

As in the plate-cutting operation it is vital to remove all dust from the components of the frame, the negative and the plate. A small bellows might be found useful for this.

I have not used an "anti-static" polishing cloth, but I imagine this could be a useful aid. There is no doubt that dust is a very potent enemy when making slides free from blemishes, and I must confess that I have been singularly unsuccessful in trying to spot out "pin holes" caused by dust particles.

For normal landscape and portrait slides on the warm tone plates, develop in a recommended developer until development is virtually complete. Snow and sea scenes and some other subjects will look better on the black-tone plates.

Correct exposure for any slide is best determined by making a graduated exposure on a trial strip of plate, just as is done for a bromide print, but after making a few slides the right exposure may be estimated by comparing new negatives with those from which slides have already been made. Remember that it is the *range* of negative densities which counts; not the proportion of negative area occupied by lights and darks.

Using a 40-watt lamp at a distance of about 5ft. or 6ft. from the printing frame, exposures with normal negatives should be about one to five seconds.

It will be found that when the slide is developed and viewed by yellow safelight before fixing, it appears somewhat dark when looked at emulsion-side-up in the dish. When they are lifted out and the backs examined, the dark parts still show to a certain extent. After rinsing and fixing in normal hypo the slide should be examined by the light of an opal bulb or the light reflected from a piece of white paper. The final best density will depend on the power of the projector to be used, and a few slides should be tried in it before a large number are made!

Slides which have been over-exposed and in which there is too much density all over when fully developed can be rescued by being bathed in a mixture of dilute solutions of potassium ferri-cyanide and plain hypo. The ferri-cyanide solution should be quite a pale yellow and should be mixed with the normal hypo only when required for use and in the minimum quantities necessary. Immediately the reducing action has progressed far enough the slide is washed in clean water. Experience will soon show what strength solution to use and when to discard it. Thorough washing of the slide in clean water is essential after this treatment. Many workers put all slides in "ferri" for a few seconds to clear the high lights.

Slide-making by Projection

To anyone who uses cameras taking a variety of negative sizes, or even only one size, the limitations imposed by contact printing of slides will soon be apparent. I standardised my slides at 35 mm. (2in. × 2in. overall) to conform with my colour transparencies and also in the interests of economy in plates, cover glasses and storage space.

To those who possess vertical enlargers which have a good lens and adequate bellows extension, to permit reduction rather than enlargement, the simplest way of producing a lantern slide from any given part of a negative is simply to compose and focus the image on a piece of the smoothest white card

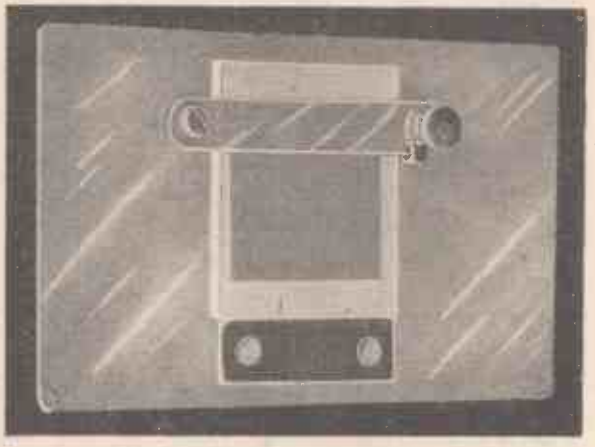


Fig. 2.—The back of the camera, showing the metal plate and special screen in position.

(backed to make it the same thickness as the lantern plate), using a hand lens or a reflex focussing device (such as the " See-Sharp ") in order to ensure dead sharp focus of the very small image. A print is then made on the piece of lantern plate as before.

I use a home-made horizontal enlarger which will take any negative up to quarter plate, the front half being a plate camera with double extension bellows, limited to 3½in. x 2½in. negative size; the lens is an f4.5 Zeiss Tessar. Since, when making slides by reduction, the lens would be working so far from its usual focus range, it would be better to reverse the camera. This led to the idea of separating the lamphouse and the camera unit, and making to fit the camera a special focussing screen which would be of 35 mm. frame size and accommodate, as an alternative to the ground glass, a 1⅝in. square lantern plate. This arrangement is shown in Fig. 1.

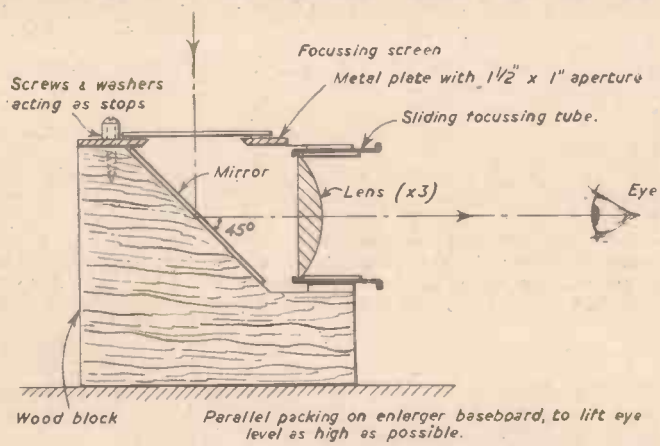


Fig. 3.—A reflex focussing device, half full size.

My enlarger body is mounted on four flanged wheels and runs along a piece of 3in. square timber as a sort of optical bench. On this is fixed a special wooden support for the camera, on which it is clamped with a screw into the tripod bush, so that the lamphouse and camera remain truly axial irrespective of the distance separating them, and the focussing screen of the camera is at a convenient level for viewing at close range with a hand lens.

Specially Masked Screen

An aluminium plate 1/16in. thick (see Fig. 2) is cut to fit the focussing screen slot and catches and this replaces the normal focussing screen. In it is cut a 1in. by 1½in. hole, and a ledge and spring clip are provided to locate and hold a small very fine-grained focussing screen or the 1⅝in. square piece of lantern plate.

Slide-making with this apparatus is as simple as by contact. A negative is slipped into the carrier—in my case I have a glassless one for all except the 3½in. by 2½in. size—and the lamphouse position and camera focus are adjusted until the required part of the negative appears on the screen and is brought into sharp focus.

The focussing screen glass only is then removed, the safelight switched on—and the enlarger and white light off, of course—and a piece of lantern plate is clipped into register, with the sensitive side towards the lamphouse.

The required exposure is then determined by giving a graduated exposure to a trial piece of plate, by means of a card moved in steps slowly across the front of the lamphouse.

Once the proper exposure has been ascertained for a range of typical negatives at given degrees of enlargement or reduction, the approximate exposure for any other negative may be found by matching it against the typical negatives and selecting the exposure from that of the one which is nearest to it in density range (due allowance being made for the relative proportions in the two of light and dark areas if using a photo-electric meter to measure the total light transmitted.)

It is realised that few people use horizontal enlargers, and that this method of slide making cannot be applied, as it stands, to a vertical one. However, after trying to focus the tiny 1in. by 1⅛in. image when projected by a vertical enlarger on to a glazed white card, there is no doubt that it is much easier to focus the image on the fine-ground glass.

Reflex Focussing Device

A reflex focussing device, which reflects the image on to a ground glass screen where it is viewed with a magnifier, is undoubtedly a great help. Even so, a system in which the image is formed in the plane of the plate and without any intervening mirror, is liable to least error due to lack of precision of the components of the reflex focussing device.

It should be quite easy to make up a device of the form shown in Fig. 3, which obviates the need for precision in making and at the same time secures the benefits of viewing an image formed directly on the screen. The only critical item is that the ground upper surface of the screen must be at exactly the same level as that of the lantern plate when substituted for it. This may need the use of a very thin packing under whichever is the thinner.

Once the magnifier is in sharp focus on the ground glass it can be fixed in that position—at least for any one person.

Mounting of Slides

My projector being home-made, I was able to make the slide-retaining springs and slots of such dimensions that they would accommodate slides of greater thickness also than the standard ones. This opened up a further field of economy, namely the use, as cover glasses, of any old unwanted glass plate negatives which vary in thickness depending on the size. Of course this produces slides which are too thick, in some cases, to go in some factory-made projectors, but the economy which can result should not be overlooked. The emulsion of hardened plates is sometimes obstinate to remove even after prolonged soaking in boiling water, but very few are so resistant to a nylon scrubbing brush that they have to be discarded. No doubt the chemically-minded can offer a tip or two for easing the job.

Having cut the cover glasses to about 1/32in. less than 2in. square to allow for paper binding strips all round, I mask the slide to the required size picture area with a 2in. square mask of thin black paper (old packing or film backing), fixed to the emulsion side with two minute spots of " Durofix " applied in such positions that it will not spread as far as the picture area. The slide is then laid, mask upwards, on a 2in. sq. piece of cardboard of the same thickness as itself, and a fine pencil line is drawn round the glass when the mask is in register with the cardboard (this necessitates lifting the mask edges lightly in turn to do so).

With a sharp pointed pen-knife or a pair of curved nail scissors the hole is then cut out of the cardboard to admit the plate. This is probably the most tedious part of the job.

Strips of " Gumstrip," ⅛in. wide and 2in. long, are then cut from a 2in. wide roll and fixed by something less than half their width to all four edges of the cover glass so that, when all components of the slide are dusted and assembled, the other overhanging parts of these strips secure both the cardboard surround and the 1⅝in. sq. plate.

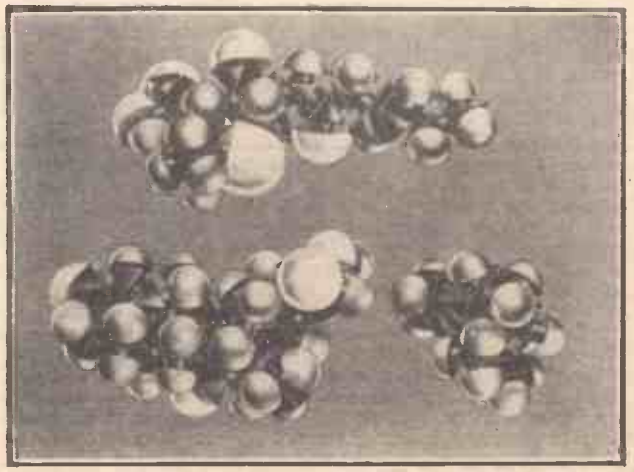
When the slide is dry, the excess gum which will have smeared on the glass can be removed with a damp cloth.

Making slides this way is more laborious than using the standard 2in. sq. plates, but it is far cheaper and, in certain ways, more flexible.

Courtauld Atomic Models

THESE models, which have been developed in the Maidenhead Laboratory of Courtaulds, Ltd., are believed to be a considerable advance on all previous designs. The arrangement of brass link and rubber collar by which the models are joined together provides elastically-distortable valency angles which greatly extend their usefulness. Many molecules can be built, including those with strained rings, which cannot be constructed with a rigid linking mechanism. The length of the link used ensures that the structures are sufficiently " open " to allow easy visual inspection. At the same time there is no sacrifice of free rotation about single bonds and the link is strong enough to allow the largest molecules to be handled without falling apart. Assembly is easy and rapid. The range of models includes 30 atomic species and any partial double bond length which is not obtainable by using these with the standard link may be formed with special adjustable links.

Primarily designed for research laboratories, the models will also be found suitable for educational purposes. Their large size and comparative " transparency " makes the most complicated structures easy to follow. When photographed, they provide excellent illustrations for scientific publications. Enquiries should be addressed to Griffin and Tatlock, Kemble Street, London, W.C.2.



(Top)—Penicillin F ; B. Left)—Cortisone ; (B. Right—a-Pinene.

Building Timing and Delay Mechanisms

The Various Types of Electro-mechanical Arrangement in Use To-day

By F. G. RAYER

UNITS of this type have a wide field of application and can be broadly divided into two kinds. First, there is the type of mechanism which switches on a motor or other circuit for a set period each time it is operated. Initiation of the sequence of events may arise when a button is depressed, or when a coin is inserted. This type of mechanism may be used with all types of model of an "entertainment" nature, the model operating for a set period, then switching itself off. Other applications can be found in lighting circuits, where a model, fish-tank, etc., is illuminated for some prearranged length of time, afterwards switching itself off automatically. Photographic enlargers

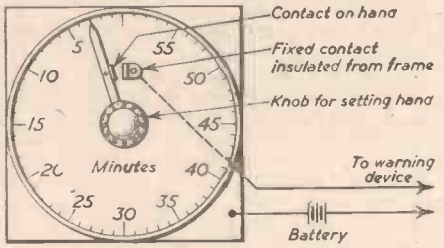


Fig. 1.—Simple clockwork interval timer.

or contact printers may also be operated from such circuits, the enlarger or printing light remaining on for the set period when a button is depressed. Any type of illuminated or working model may be similarly controlled.

The second type of switch is that which completes or breaks a circuit at a prearranged time, re-setting usually being by hand. This type of switch also has numerous applications—it may be used to operate an electric bell or buzzer, or an indicating lamp, or to switch on a radio receiver at a prearranged moment. In commercial practice, factory sirens or other devices may be operated at set times by such means. Other applications will also come to mind.

Such mechanisms may usually be made up without undue difficulty if the principles which may most conveniently be employed are understood. In most cases the exact constructional details are not in any way critical, provided the contacts or other essential items are correctly arranged.

One of the simplest types of interval timer is shown in Fig. 1, and may be constructed from a disused clock, preferably of fairly large type, or from one of the ex-Service clockwork timing movements which are offered by various advertisers. If a clock is used the minute hand should be replaced if it is of fragile type, and a milled knob is added so that the hand can be set from the front of the clock. For the purposes in view, the dial is removed and a new one fitted, intervals being marked in an anti-clockwise direction. To use the timer, the knob is turned so that the hand indicates the interval which is to pass. This might be, say, 8 to 20 minutes in the case of the timer being used to indicate when film development is completed. This movement will be provided for by the usual friction drive in the clock. After the arranged interval the contacts meet, and this may operate a buzzer, bell or signal lamp.

Some commercial timers of this kind have a lever or button which halts the escapement of the clock. The hand may be thus left set to the required position and the clock immediately started when the process to be timed is begun. With some ex-Service mechanisms there is no friction drive, the driving spring itself being mounted on the spindle carrying the hand. Setting the hand thus winds up the spring, which is still in a partially wound condition when the hand has travelled to its limit in a clockwise direction.

Time Switches

These are dissimilar to that dealt with in that they close a circuit at a pre-set time. A simple arrangement for such a mechanism is illustrated in Fig. 2. Here, the hour hand

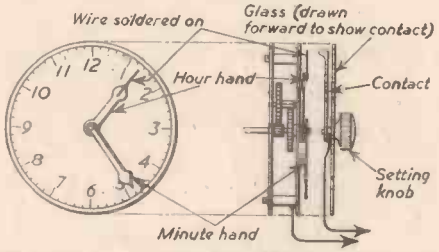


Fig. 2.—Arrangement for switching on at a prearranged time.

has a stout wire soldered to it so that the point projects beyond the minute hand. A contact, with setting knob, is pivoted in line with the spindle holding the hands, and can rotate with light friction. It may be set to any time, and the circuit will be completed when the wire meets the contact, afterwards carrying the latter round with it. With care, the centre of the clock glass itself may be drilled, thus providing a hole through which the rotating contact pivot can pass.

This type of switch may be set up to almost 12 hours ahead, with fair accuracy—e.g., the time of closing will be correct within a few minutes if the clock keeps good time. Extreme accuracy is not possible because of the very slow movement of the hour hand.

Where accurate control over long periods is desired, it is usual to provide two or more rotating contacts or setting discs. For example, one pair of contacts may close at the desired hour, and a second pair at the minute chosen, thereby permitting highly accurate timing. A typical mechanism of this kind, using three discs, is shown in Fig. 3.

The minute wheel revolves once each hour, and has 60 holes punched in it. Any usual form of reduction operates the hour wheel so that it turns once each 24 hours, and 24 holes are provided. Finally, there is the day wheel, revolving once each week. (This would not be required in many cases in the home, but is often found in factory circuits to prevent operation of sirens, etc., upon Sundays.) Contact pins are inserted in any desired holes, and all contacts are in series. It will thus be seen that the whole circuit will only be completed at exactly specified times, and a full weekly time sequence may be set up. Operation at night is avoided by having 24 hourly divisions, instead of 12.

This type of mechanism has many advantages, and is relatively easy to make up. If control at five minute intervals only is required, then the minute wheel need only have 12 holes. Tapered steel pins, a push-fit in the holes, are most convenient, but small bolts would be suitable, especially if the times arranged are not to be changed frequently.

Controlled Circuits

The mechanisms described can control low-voltage circuits of relatively small current capacity direct, but are not suitable for mains-

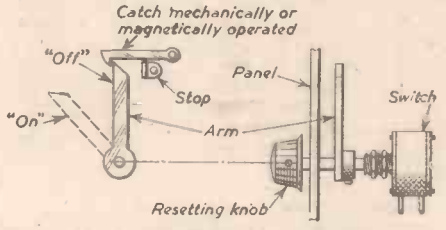


Fig. 4.—Tripped mains switch.

voltage circuits, or high currents. With the latter, a relieving relay or tripped switch can be used.

When a relay is used it will be operated from a low voltage (usually battery, or transformer with rectifier) and be controlled by the actual contacts in the clock or timer. The relay contacts, however, may be of a much more substantial type, able to carry large currents and interrupt high voltages. They in turn, therefore, control the mains-operated equipment.

With a tripped switch an arrangement such as that shown in Fig. 4 is satisfactory, a snap-action radio-type mains switch being used. The catch holds the switch in the "off" position, and is released by an electro-magnet, or by mechanical coupling from the timer, when this is convenient. The switch then snaps into the "on" position, remaining in this position until turned off by hand. If a spring-loaded switch is not used a tension

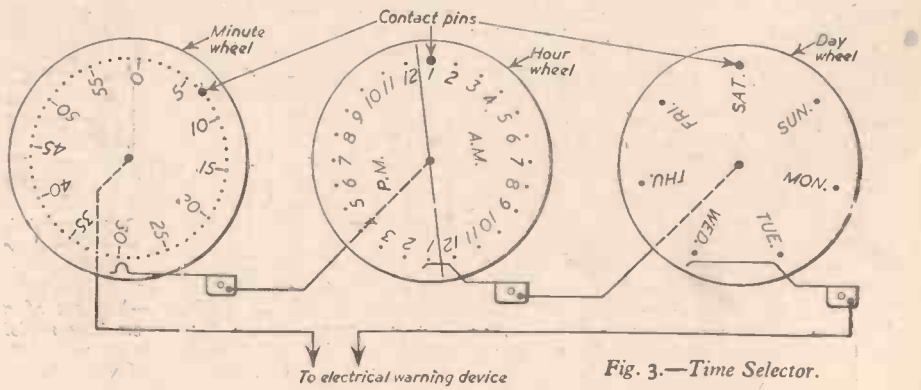


Fig. 3.—Time Selector.

spring may be fitted to pull the arm over to the "on" position.

Such a switch is most convenient for mains radio, lamps, etc. In such a case, the switch is tripped by the timer or clock at the desired hour, and the apparatus then continues to operate until turned off by hand. It is therefore not necessary that contact be maintained in the timer, a momentary completion of the circuit being sufficient.

Coin-operated Mechanisms

These can provide added interest to many models and may be made up in many forms, one of the simplest being shown in Fig. 5. Here, the coin-supporting platform is normally in a raised position, so that the circuit to the motor is not completed. Upon a coin being dropped in the guide, the circuit to the contact screw is completed. The motor thus commences to run, and continues to do so until the rotating arm has passed under the guide and discharged the coin from the cut-out side

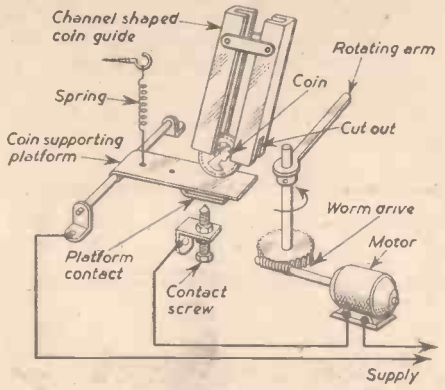


Fig. 5.—Coin operated motor.

provided, when the platform rises and the motor stops. This sequence is repeated each time a coin is dropped into the guide.

Such a mechanism is most effective for controlling moving models, and the length of time for which the model runs may be adjusted by controlling the motor by a variable resistor, or by selecting a suitable reduction ratio between motor and arm spindle. If the motor also drives the model, it will be necessary to arrange for a suitable period of operation by means of the reduction ratio. This ratio will normally require to be high if the motor is not of the type with an integral gearbox or reduction train. For example, 3,000 : 1 would be required if the motor runs at 3,000 r.p.m. and an operating period of one minute is desired. Worm drives are most suitable for such ratios, and 3,000 : 1 would be obtained by using reduction ratios of 30 : 1 and 100 : 1, formed by two worms and two gears.

The motor is best of a low-voltage type, operated from a battery or from the secondary of a suitable mains transformer. With a suitable spring, adequate contact can then be achieved between the screw and metal strip secured to the platform.

Electrical Delay Circuit

An electric motor or clock mechanism need not necessarily be employed in some arrangements of this kind, and a condenser delay circuit is shown in Fig. 6. When the push switch is operated the battery energises the

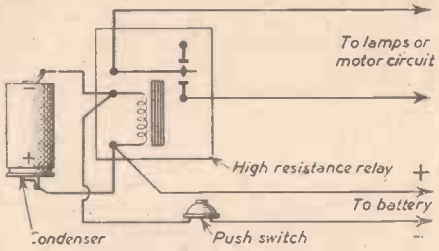


Fig. 6.—An electrical delay circuit.

relay, thereby completing the circuit to the motor or lamps. At the same time the condenser is charged, and its charge continues to hold down the relay armature even when the push switch is released. The charge leaks away through the relay windings, however, until a stage is reached when the armature is released. The lamp or motor circuit is then broken.

The delay provided by such a circuit will depend primarily upon the resistance of the relay windings, and the condenser capacity, and may be from one second to one minute or more. For average delays of 10 to 60 seconds, a 5,000 to 10,000 ohm relay, with 500 to 1,000 mfd. condenser, is suitable. The delay period may be adjusted by altering the armature tension or changing the battery voltage. Alternatively, a variable resistor of about 50,000 ohms may be wired in parallel with the condenser, and adjusted until the condenser discharges in the required period. The larger the condenser capacity, the longer interval must elapse before it is sufficiently discharged to release the armature.

This type of timer may be used with enlargers, printers, and many simple illuminated or moving models. It is particularly convenient when no motor is available, or is undesirable. Low-resistance relays are not suitable for the circuit.

The same result may be obtained mechanically by means of the contact arrangement shown in Fig. 7. When the push is depressed, the circuit to the motor is completed, and the latter commences to run. This causes the lower contact to rise out of the notch in the disc, thereby resulting in the continued operation of the motor even when the push is released. The motor runs until the disc has made a complete revolution, when the contact falls and the circuit is broken. As with the circuit in Fig. 6, matters may be so arranged that a complete sequence of operation is completed. Or the model may be driven from the motor itself so that it ceases to work when the disc stops. This is convenient for models which require to be run for a short time for demonstration or amusement, and where a safeguard against the model being left working is required. A typical working model for timing control is shown in Fig. 8.

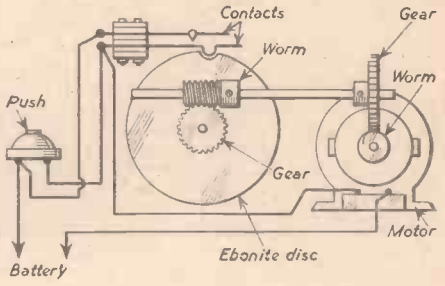


Fig. 7.—Delay mechanism for motor operation.

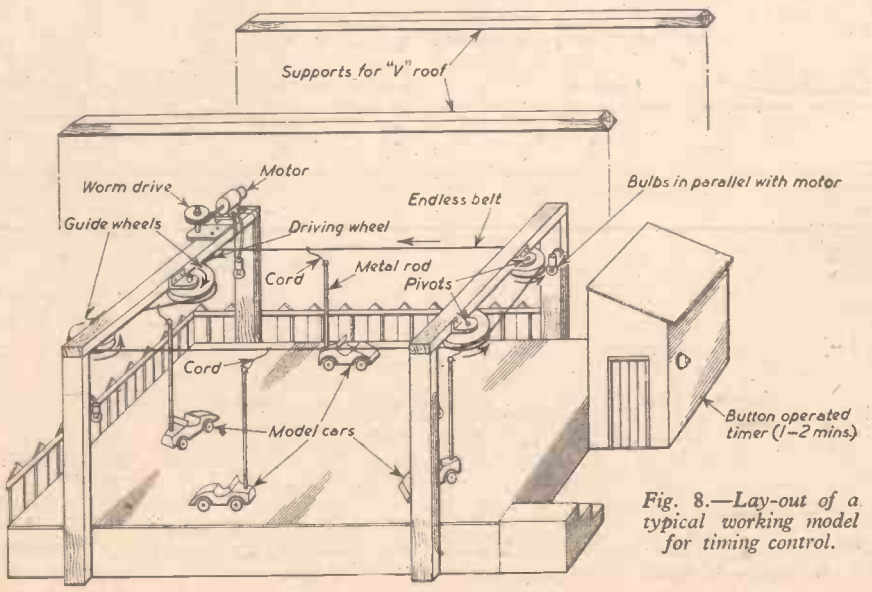


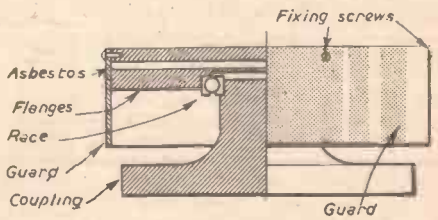
Fig. 8.—Lay-out of a typical working model for timing control.

A Simple Turntable for Welding

By F. J. SIBLEY

A SIMPLE turntable, constructed as shown in the sketch, will be found of great assistance when welding all round an object, for instance, when welding pipe flanges. The unit was made up from scrap.

A large ball race (discarded through pitted balls) was pressed on to a spigot turned on an old heavy coupling, which served as a firm base for the turntable. A cast-iron flange was recessed to receive the outer diameter of

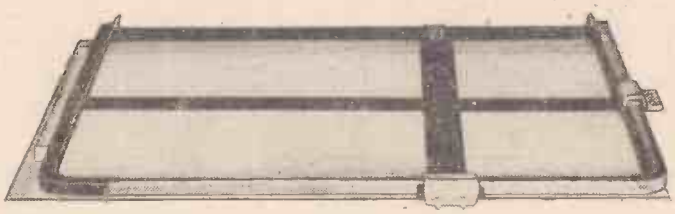


Mr. F. J Sibley's turntable.

the race, as shown, and upon this was placed a sheet of asbestos mill board. The working surface was a cast-iron blank flange of generous thickness placed on the asbestos. To protect the race a sheet metal guard was screwed to the periphery of the upper flange, as shown.

The idea could be improved by the addition of a coiled wire to a foot control with a return spring, but the turntable as sketched has proved satisfactory.

A Simply made Adjustable Masking Frame



An Indispensable Darkroom Accessory for the Photographer

By M. KATERS

THE commercial adjustable masking frame is expensive to buy, but one that is as good in operation and appearance is easily constructed for only a few shillings and is well within the capabilities of the home worker.

All the materials were bought cut to size. That is, the base plate and masking strips were guillotined at the place of purchase at no extra cost. Guillotining is preferable to cutting with a pair of steel snips as one never gets a straight edge with the latter. The metal is apt to buckle even in the most expert hands.

The sizes given are for a 8½in. x 6½in. masking frame but, of course, those can be altered to suit individual requirements.

The Frame

From the materials list take bar A and in the centre mark off 11in. Then cut into the metal about 1/32in. with a hacksaw at these points. This facilitates the bending of the bar. Heat each of these points with a blowlamp; bending them becomes exceptionally easy. The distance between the two legs is the distance between the saw cuts.

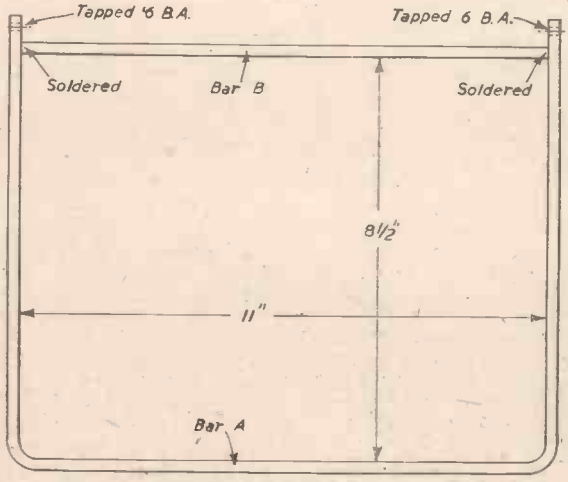


Fig. 1.—Details and dimensions of the frame.

The only point to watch is that the legs lie in the same plane. This is easily checked by laying the frame on the base plate and if necessary altering it while it is still hot.

The fourth side of the bar frame (bar B from list) can now be fitted into position 8½in. from its opposite bar and silver or soft soldered into place (using the blow-lamp). There is no strain, it merely being a masking bar for the photographic paper.

The two projecting pieces are then drilled and tapped 6BA or 4BA and any surplus metal cut off. Details of the frame are shown in Fig. 1.

The Base Plate

The base plate is cut as shown in Fig 2 so that two lugs with 6BA clearance holes stick up. There is a space of about 1/16in. between the lug and the frame bar. It merely gives a tensioning effect and can be dispensed with if so desired.

The two bar pieces (D and E on list) are then riveted into position, the holes in the bottom of the plate being countersunk to give a flush finish. The bars are, of course, at right angles to each other and almost touching the frame bars.

Masking Strips

These can be either ¾in. or 1in. broad with two 6BA clearance holes at one end. The strips are attached to the aluminium clips by two 6BA screws. It is by means of twisting the strip (in the horizontal plane) in the screws that proper alignment can be made. That is, the masking strip can be adjusted to run parallel with its corresponding frame bar.

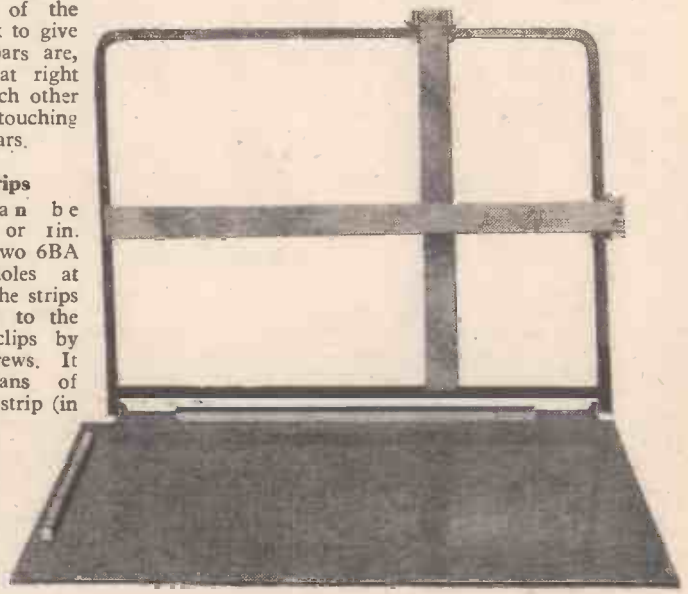
On the short masking strip a small piece of aluminium is soldered to the end which overlaps the frame bar at the hinge (see Fig. 3). If this is not done, the masking strip will buckle against the base when the frame is lowered after having been lifted.

Clips

Two are required, made from aluminium strips 1in. x 1½in. x 1/16in., to the shape shown in Fig. 4. When in position, a piece of clock spring slipped between the clip and the frame bar gives correct tensioning. The pieces of clock spring are cut from a spring with steel snips and are not detempered in any way. They are bent at the ends so that they hook round the clips. If bent too far, of course, they will snap.

Finish

The base plate was painted white, while



A view of the completed masking frame.

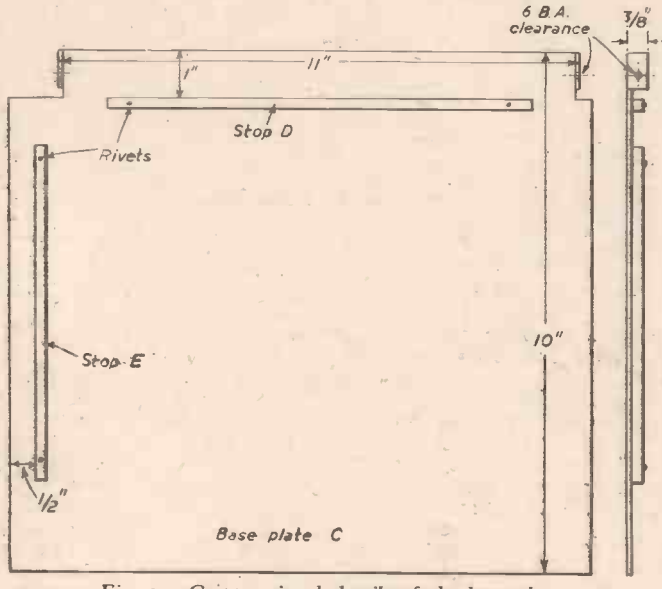


Fig. 2.—Constructional details of the base plate.

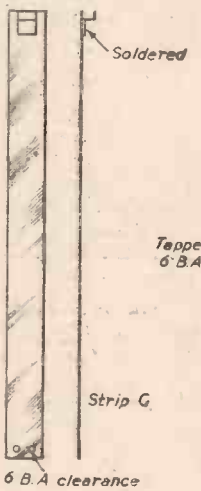


Fig. 3.—Two views of the masking strip.

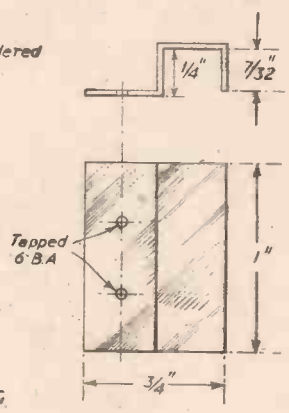


Fig. 4.—Details and dimensions of the clips which enable the strips to slide on the frame.

the frame bars and masking strips were painted with a photographic "dead black" paint. The sides of the frame bars on which the clips slide should not be painted as the clips would then not slide when adjustment is required.

Marking Distances

Some may prefer distances marked on the base plate in order to set the masking strips without using a ruler. If so, then mark out the distances from the stops on a paper scale and fix into position with transparent gummed tape.

Operation

The base is made of metal so that its weight will keep it in position. The masking strips are then adjusted to give the size of photograph required. After focusing on the white surface, the enlarging paper is placed in position between the frame and the base plate, two adjacent edges of the paper butting against the two stop bars D and E.

MATERIALS LIST

A—Frame Bar...	32in.	x ¼in.	x ¼in.
B—Frame Bar...	11in.	x ¼in.	x ¼in.
C—Base Plate ...	12in.	x 10in.	x ⅛in.
D—Stop	8in.	x ¼in.	x ¼in.
E—Stop	6in.	x ¼in.	x ¼in.
The above are all of mild steel			
F—Masking Strip	12in.	x ⅜in.	x 0.012in.
G—Masking Strip	9½in.	x ⅜in.	x 0.012in.
Two strips for clips	1in.	x 1½in.	x ⅛in.
The above are all of aluminium.			

A Simple Method of FRENCH POLISHING

By CECIL JASPER

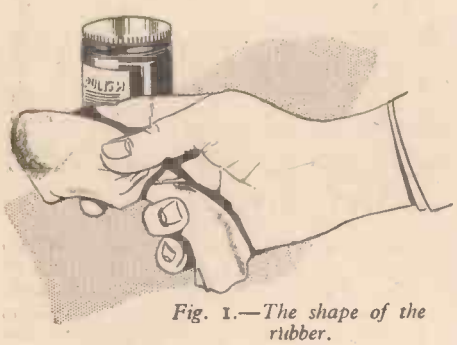


Fig. 1.—The shape of the rubber.

THE object of French Polishing is to produce a smooth, high-gloss permanent finish on a natural wood surface. Hardwoods like oak, ash or walnut, are much better to polish than softwoods like deal or pine, the latter may have great absorption and need much filling up.

"French Polish" is not expensive, it can be purchased or made up by the handyman. To do this obtain ordinary orange or brown shellac and dissolve in methylated spirits in the proportion of about six ounces shellac to one pint of spirits. The polish can be thinner or thicker by altering the proportions. The spirit and the shellac should be placed together in an air-tight container or bottle, then set aside for the shellac to dissolve: occasionally shake the container to help the process.

Filling and Staining

To make a good job of polishing the wood must be filled; make the filler by mixing powdered whiting or chalk with turpentine and a little goldsize to a creamy paste. Afterwards stain with yellow ochre, raw umber or other suitable powder to match the colour of the wood. Rub the stain into the surface crosswise to the grain with a clean rag, then place aside for an hour to dry. Next rub down with glasspaper and wipe clean. The colour of mahogany wood can be greatly improved by rubbing it with raw linseed oil or red oil after filling up. To darken the shade of most woods use an oil scumble stain diluted with turpentine. Black Japan diluted also makes a good stain for oak woods. Always rub the stain well in, this helps it to adhere to the surface.

Bodying In

After filling and staining the work is ready for the first application of polish. Apply the material with a soft brush and apply it quickly and evenly: several applications will be needed. Allow about 10 minutes for each application to dry and lightly glass paper down between each coat to ensure smoothness. When the surface becomes semi-glossy it is time to begin the polishing.

Polisher's Rubber

Take a piece of cotton wool, 6in. square, fold this in two then fold again. Squeeze it into the hand leaving a corner out, this provides a point useful for contacting corners. Now charge the cotton wool with polish and wrap in a clean piece of linen rag. The edges of the rag should be brought to the top when they can be grasped by the hand, thus leaving the rubber perfectly smooth and free from creases. To enable the rubber to be worked into corners the point should lie towards the finger-tips. The shape of the rubber is shown in Fig. 1. Now, when the rubber is grasped tightly,

Fig. 2.—The rubber in use.

the polish exudes through it on to the work, the regulation being effected by pressure of the fingers. The rubber in use is shown in Fig. 2.

Commence polishing by going over the work, lightly rubbing in a circular motion. Avoid applying too much polish to the surface at one time as this has a tendency to work up the filling. Go over the work with light applications, then, when the polish becomes exhausted in the rubber, open the rag and drop a little more polish on to the cotton wool and re-close.

Best results can be obtained by rubbing in light circles overlapping each other. Apply the rubber with a sweep and remove with a sweep, and work with it as dry as possible. A small quantity of raw linseed oil applied to the rubber with the finger-tip will lubricate it and prevent it from dragging. Remember to use only the smallest quantity of oil; too much will spoil the work. When the surface becomes sufficiently hard and glossy give a very light glasspapering down and a final application of polish.

Spiriting Off

Having deposited a thin layer of shellac over the surface the real polishing now commences and this calls for some skill on the part of the operator. The reader should bear in mind that in the first place the shellac was dissolved in the spirit, now it has the same tendency to be dissolved when finally rubbed over with spirit.

Apply a few drops of spirit to the rubber then go over the work lightly, the object now is to gradually reduce the polish in the rubber allowing the spirit to take its place. Keep the rubber moving and never allow it to rest on the work. As the rubbing progresses keep adding a little spirit to the rubber at intervals until the spirit completely replaces the polish. When this has occurred use a new rubber lightly damped with spirit for the final rubbing. As the surface becomes harder the rubbing should become more vigorous, finally finish off with a soft cloth: then place the work aside to harden off.

Failures in French Polishing are mainly due to the application of too much spirit; this works up the surface and dulls it. When this defect occurs dust the work over with powdered chalk then lightly glasspaper down and repolish. It should be remembered that damp or dull weather is detrimental to polishing, so always try and work in a warm place with a temperature of not less than 70 deg. F. Remember warmth is essential to success. *Blooming*—a term used in the trade for loss of gloss is a common failure which is often due to the cold, damp weather. When this defect occurs place the work in a warm place and the gloss will generally return.

When repolishing old work, if time permits, strip off the old polish; this will enable you to do a better job. Some polishers coat the old polish over with methylated spirits, afterwards they put a match to it, the flame softens up the polish when it can be easily scraped off.

To remove scratches place a hot cloth over the affected parts. The heat seals up the grain by making it swell. Afterwards polish in the usual way. The writer has often noticed when some types of polish are rubbed over furniture the polish goes dull in places; this may be due to grease in the mixture. One cannot beat the old remedy of a mixture of linseed oil and vinegar in equal proportions for treating a polished surface. A surface rubbed over with this always looks renewed.

Equipment for the Home Laboratory

By S. M. CHARLETT

FOR those whose interest in chemistry is more than just a passing phase, and who have become sufficiently absorbed in this fascinating subject to construct a home laboratory, certain pieces of equipment are necessary but expensive.

There is not room here to more than touch on the technique of glass working, and the reader is referred to the series of articles on "Glass Blowing for the Beginner" which appeared in the October to December, 1953, issues of PRACTICAL MECHANICS.

Before proceeding to the equipment itself a few tips may be of some value. When cutting glass tubing in the approved manner, that is by nicking it with a file, holding the tube with the thumbs on the opposite side of the tube to this nick, and then pulling the hands apart with a slight twisting motion, always wrap a fold of cloth over the tubing before grasping it.

If the edges of the break are not clean they may be smoothed down by "brushing" with a piece of wire gauze, such as is used in meat safes, see Fig. 1. Remember that all cut edges should be fire polished in order to prevent cuts from the sharp edges. This can be done by rotating the edge in a Bunsen burner flame until the edge suddenly appears a yellow-red colour, a matter of half a minute or so, if the edge is instantly removed from the flame it will be found to be quite smooth, and that the tubing shows no signs of collapsing or narrowing.

Boring Corks

Most apparatus incorporates corks into its design and that being described here depends on corks. There are many ways of boring the required holes in such corks, the *cork borer*, a hot poker, and so on. The writer, however, prefers to use a hand drill, the cork being fitted tightly into a jar which is firmly gripped between the knees. In this way any reasonable size of hole can be drilled quickly and cleanly.

Making a Still

Now to the apparatus itself. The most important commodity in any laboratory is a supply of *distilled water*. The making of a still for this purpose is a comparatively easy operation, and can be performed quite cheaply at home.

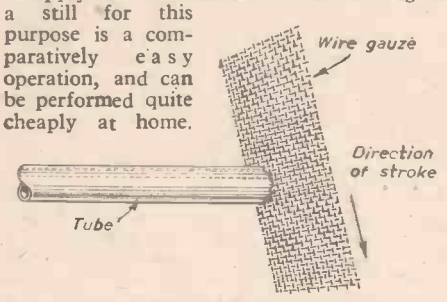


Fig. 1.—"Brushing down" a jagged tube edge.

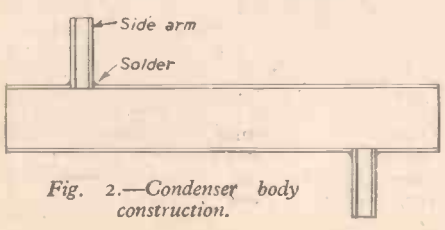


Fig. 2.—Condenser body construction.

For the jacket of a condenser the writer used the barrel of a discarded stirrup pump, the ends of which were cut off and smoothed down. (But any piece of brass or copper tubing, 1½in. in diameter, and 14in. long can be used.) A ⅜in. hole was drilled 2in. from the ends of the tube, and on opposite sides as in Fig. 2, and into each of these was soldered a 3in. piece of ⅜in. o.d. brass tube.

The cooling tube of the condenser was made from a piece of glass tubing about ⅝in. in diameter and 16in. long, to one end of which was sealed a 3in. piece of ¾in. glass tubing. This was done by sealing the end of the wide tubing, blowing a hole of the right size in that end, and then sealing the piece of narrow tubing into the hole. Fuller details of this technique are given in the articles referred to earlier.

Finally, the complete piece of equipment was assembled as in Fig. 3,

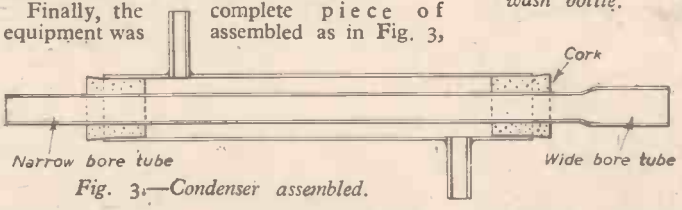


Fig. 3.—Condenser assembled.

using corks of a good tight fit for fixing the glass inner tube into place.

The condenser was then fitted up as in Fig. 4, for the distillation of water. One point to note is that for efficient cooling the cooling water should run in through the bottom inlet tube and out through the top tube.

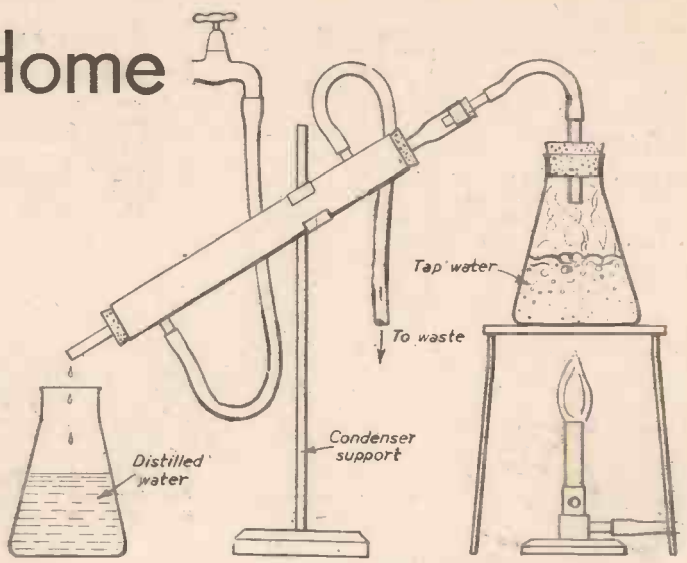


Fig. 4.—Assembly for distilling water.

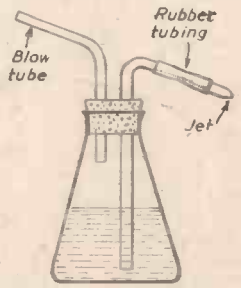
A Wash Bottle

With a supply of distilled water ensured the next piece of most useful apparatus is a wash bottle. This is used for many purposes, such as washing precipitates, washing out residues, and so on. One can be made from a chemical flask as in Fig. 5, but if one is not to hand, any bottle with a neck of 1in. or 1½in. in diameter can be used; the writer's first wash bottle was made from an old salad dressing jar. The tubes should be made from approximately ¼in. glass tubing, bent in a brush flame, or in the flame of a batwing burner. The jet can be drawn out to suit the individual taste, and is connected to the main outlet tube with a piece of rubber tubing, which allows flexibility and enables the water to be directed on to any spot required. Note that the inlet tube does not reach water level, but that the outlet must dip well below the surface.

An Automatic Burette

This apparatus is very useful when performing a number of titrations, or when one wishes to keep a particular burette filled up for use. It would be very expensive to buy, but it can, with a little care, be made at home. The construction is as in Fig. 6, and consists essentially of a basic wash bottle, without the jet, and a burette on to which has been sealed a side arm. This arm must be sealed on *below the lowest graduation mark of the burette* to avoid disturbing the calibration. To the inlet arm of the container is attached the pressure bulb from an atomiser spray, or from a disused scent

Fig. 5.—(right) Construction of a wash bottle.



bottle. To use the burette, connect up the apparatus as in Fig. 6, open the first clip and pump the pressure bulb a few times. The liquid from the container will be forced into the burette, and when it has reached the desired level the clip can be released. Titrations can now be carried out, and the burette refilled when necessary, without the necessity of tipping bottles. As will be seen, several reagent bottles can be used, all that is necessary to exchange them is to disconnect the bottle not required, wash the burette out with distilled water, connect up a fresh bottle of reagent and carry on with the work in hand.

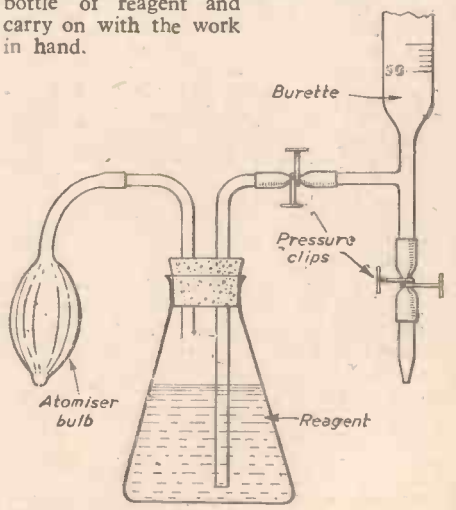


Fig. 6.—Assembly for automatic burette.

The DEVELOPM STEAM

Basic Principles and Details of De of the Steam Car

By G. W. McA

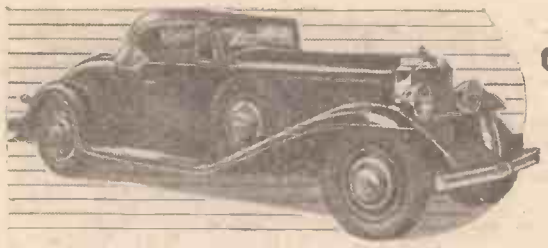


Fig. 12.—Doble E-14 model steam car.

ALTHOUGH most engineers to-day have some experience of electrical transmission for road motor services, and are thus able to compare the merits of this medium with those of the internal combustion motor, relatively few have any experience of steam as applied to private car propulsion. Yet the steam car is admitted by all experts to have the features most desirable in a modern car—silence, flexibility (without any necessity for gear changing), ample power reserve and low cost of operation, and these have been the aim and the envy of every i.c. engine designer for half a century. The makers of Rolls-Royce cars have adopted for all export models an automatic gear-changing system which has found great favour among motorists in the U.S.A., and which has been referred to in the Press as bringing the i.c. engined vehicle nearer to the ideal of the steam car in the simplicity of its control than any component previously fitted has done. Surely an excellent testimonial!

The uncanny silence and power reserve of a steam-propelled car are qualities which can only be appreciated by experience, the engine and its transmission line being devoid of any sound whatever; all one hears as a passenger is the rush of air and the impact of the tyres on the ground—even the latter is absent on some qualities of road surface. The power available, i.e., superheated steam, is precisely similar to that which has revolutionised steam plant in the large power houses of to-day, its extreme liveliness giving a sense of enormous power waiting to be unleashed.

Although steam cars gave an excellent demonstration of their qualities in the early days of motoring, and individual units such as the White and Doble have maintained the reputation at various stages in the interim, the pioneers in this field were greatly handicapped through being ahead of their day in so far as lubrication and metallurgy are concerned, both branches having made great progress during the present century, progress which renders the use of highly-superheated steam to-day no handicap whatever in the maintenance of properly lubricated cylinder bores. The choice of materials has been facilitated by increased knowledge in metallurgy, and only those now engaged in the production of the modern car can best appreciate the difficulties faced by the pioneers. Welding also makes available a bigger variety of lightweight designs, and, coupled with the increased strength of most metals used in this industry, makes possible the ideal combination of strength and low weight.

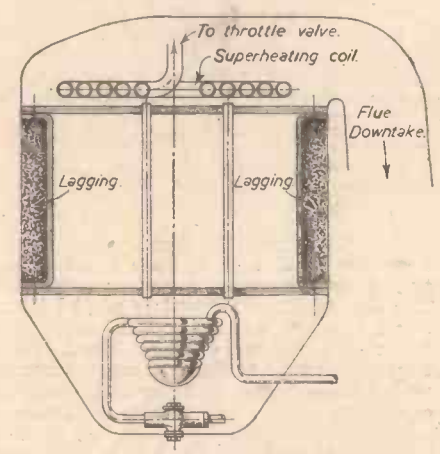


Fig. 1.—Firetube design of generator.

Generator Design

Perhaps the most difficult unit to evolve in steam-car design is the generator, and various designs have been used. Broadly speaking, these may be classified under three heads—watertube, firetube and flash. In the first group come the "Derr" (included in modified form in the Planet steam-car scheme referred to later) and the Bolsover "Express" types, each of which gives very quick generation of steam from cold. The second class is on more normal lines, as seen in Fig. 1, heat from the oil-burner flame being transmitted to the water through the tubes. The flash type of generator usually takes the form shown in Fig. 2, where a continuous tube is coiled in several layers in the manner shown, and water is pumped upwards through the tube while the flame is playing on the coil. The more modern "Doble" type of generator is composed of flat spiral or pancake coils, and, in some cases, helical coil (protected) round the combustion chamber. In some designs the burner is situated beneath the generator, in others above (see Fig. 16). The leading French designer, M. Serpollet, used the coil type of generator seen in Fig. 2, and obtained remarkably good results by studied attention to the spacing of the coils which, in his later machines, were closer, and operated under

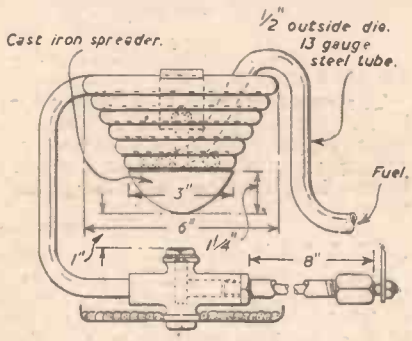


Fig. 3.—Lune Valley burner.

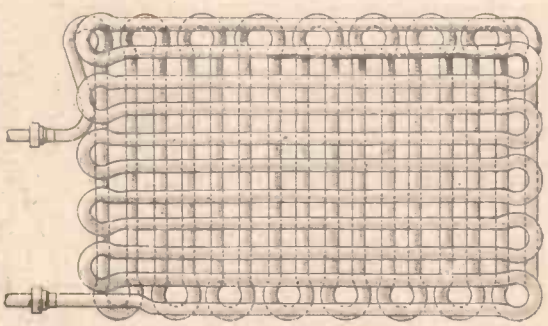


Fig. 2.—An upper grid of Serpollet's flash generator.

induced draught. The firetube generator in the design shown in Fig. 1 had the barrel of welded design with ends flanged to carry the two tubeplates. Approximately 150 tubes each ⅝in. o/d. and 18 swg. thick were expanded into the tubeplates and water was pumped into the boiler via a feed heater coil to ease the evaporative load. A superheater coil was provided at the top above the tube outlets.

The Burner

Various designs of burner have been used, one example known as the Lune Valley type being shown in Fig. 1, and illustrated in detail in Fig. 3. Kerosene is used and fed under approximately 20-30 psi. pressure through the coil to the needle valve, the vapour then emitted producing a white flame of intense heat, assuming a good draught in the flue. In some types of burner trouble was experienced through sooting-up of the jet holes, but this difficulty was largely found, during the initial stages, to be due to lack of experience, and preventable to a considerable degree.

Incidentally burners may be classified under two heads; the vaporising class, seen in Fig. 3, and the atomising burner, used with electric ignition (spark) and having distinct advantages over the vaporising unit.

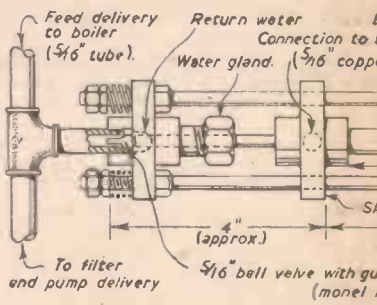


Fig. 4.—St

Water Level Control

A most desirable provision where a fire-tube generator is fitted is some device for automatically controlling the water level, and Fig. 4 shows the detail fitted to the Stanley steam car, any alteration of the level desired being effected by adjustment of the nuts at either end of the frame bars. The operation of this detail is dependent on the expansion and contraction of a brass tube subjected to rising and falling temperatures, and is on straight and reliable thermostatic lines. One end of the tube is connected via a sliding member to the high-temperature steam, and the other to the lower and cooler region at the bottom of the

Fig. 9.—Planet 4-cyl

MENT *of the*
CAR

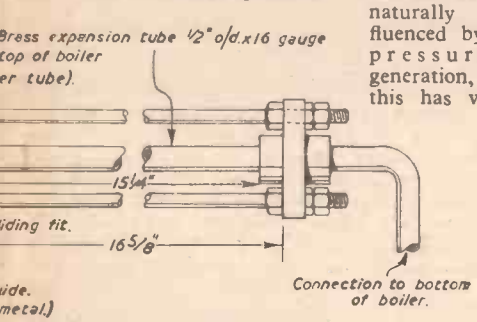
velopment

ARD

Fig. 11.—1904 model Gardner-Serpollet car — photograph taken after 1951 London-Brighton Veteran's run.

boiler. When the pump feed raises the water level above the pre-determined point, the ball valve opens and allows the feed to by-pass back to the tank, a reverse action occurring if the level falls.

The power output of any steam engine is a compound term involving piston area and speed (in feet per minute) and the mean effective steam pressure. The last term is naturally influenced by the pressure of generation, and this has varied according to the opinion held by different designers, ranging from 300 to 1,500 psi. The producer of one of the most recent steam cars built in the U.S.A., Mr. A. Doble, considers the most suitable pressure to be around 750 psi. at a temperature of 750 deg. F., in order to ensure a longer life for engine components, especially piston rings, and the experience of many operators justifies this belief. A further advantage gained by restricting steam pressure is the lower maintenance cost of the generator itself, especially when of the fire-tube type.



anley water level controller.

inder radial engine.

Engines vary greatly in design, and where some builders prefer the simple expansion unit others regard the compound engine as the most suitable for this purpose. Among the former class of engine are those fitted by Serpollet and Stanley, while the compound engine is used by Doble and was fitted exclusively on the very fine White steam cars. Some examples of engines are shown in Figs. 5-10 and briefly described.

Serpollet Engines

In Fig. 5 is seen one of the Serpollet engines, known as the flat-four type, in which 4-cylinders operated a 2-throw crankshaft, this model developing approximately 10 bhp. A 6-cylinder engine of similar design was also made, having three cranks equally spaced at 120 deg. and developing 40 bhp. with cylinders 3in. bore x 4in. stroke. Serpollet's engines in almost every design had a stroke/bore ratio of between 1.33/1 and 1.5/1 and gave very good results. He originally used a uniflow design, but changed to one in which independent poppet valves functioned for steam and exhaust, the steam valves in Fig. 5 being seen in the centre of the group in the bottom right-hand corner, having a live-steam box or chest common to the valves for the two adjacent cylinders.

Another type of engine by the same designer is the 4-cylinder V-4 unit seen in Fig. 6. In view of the fact that the cylinders were at 90 deg. to one another, the cranks could lie in a common plane, and this simplified manufacture appreciably, besides improving the balance. In this engine both bore and stroke are alike (3¼in.) to give a nominal power of 25 bhp. Poppet valves were used in this design also.

The Stanley Engine

A steam car which was deservedly popular and very successful was the 10 hp. Stanley, whose engine is shown in Fig 7. This followed the general practice of double-acting steam design, having link gears

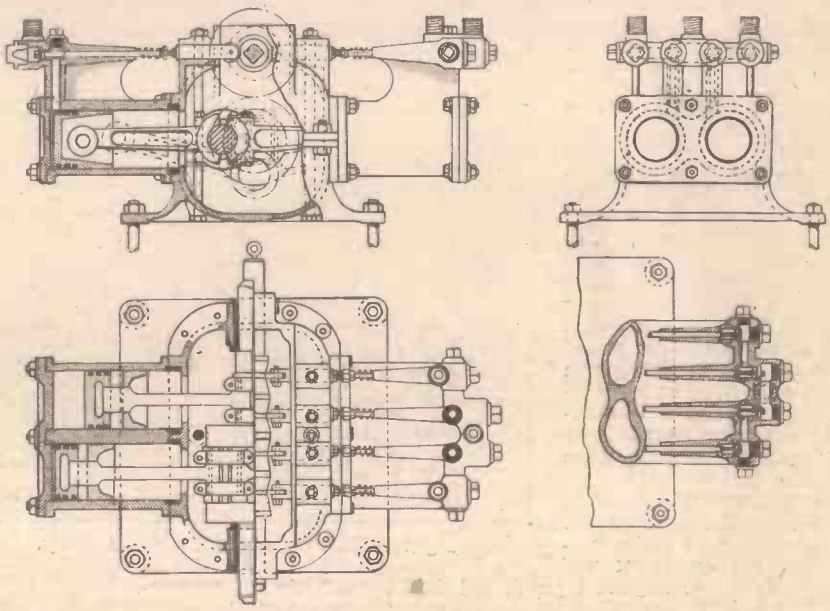


Fig. 5.—Serpollet's flat-four engine.

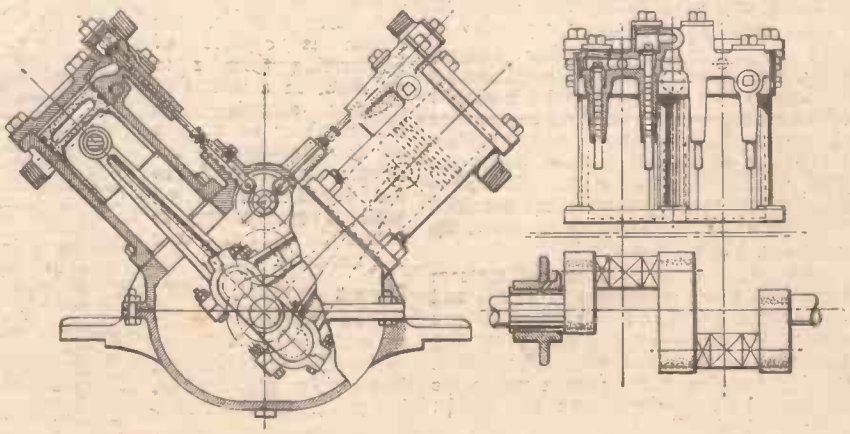


Fig. 6.—Serpollet's V-4 engine.

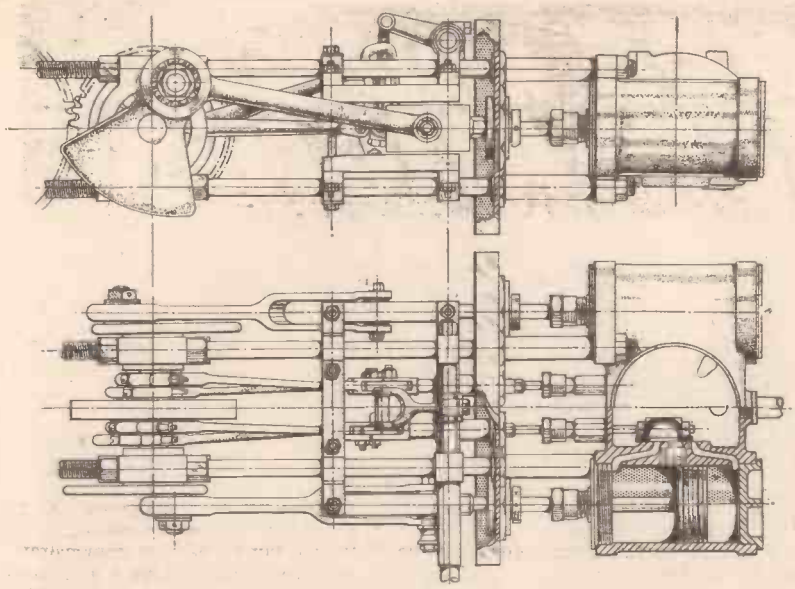


Fig. 7.—Stanley 10 h.p. double-acting engine.

operated by eccentrics and using flat slide-valves. Connecting rod big ends were fitted with ball bearings and, as the illustration shows, the engine is built up on a steel bar framework.

The Doble

The Doble steam engine, combined with rear axle as a unit assembly, is shown in Fig. 8 and forms an excellent example of a double-acting balanced compound with two cylinders each for high and low pressure. The hp. cylinders (2⅜in. dia. x 5in. stroke) operate the outside cranks and the cylinders are cast in pairs, i.e., a high and low pressure cylinder in each block. Cranks for each block are set at 180 deg. to each other, with each set of two cranks placed at 90 deg. apart. Two piston valves only function for controlling the steam distribution and are operated by Stephenson valve gear which provides for reversing, plus three alternative points of cut-off. Roller bearings are fitted to the four main bearings on the crankshaft and to those for connecting rod big ends and the eccentric rod.

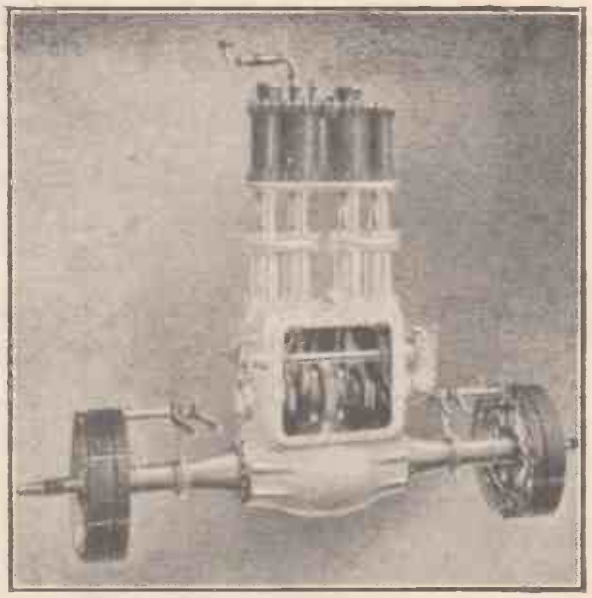


Fig. 8.—Doble engine and rear axle assembly.

The Planet and the Ainslie

Before leaving this section brief reference should be made to two other designs, namely, the Planet 4-cylinder single-acting unit (simple) seen in Fig. 9, and the Ainslie 2-cylinder double-acting (simple) engine seen in Fig. 10. In the former poppet valves are used for steam and exhaust, while the engine seen in Fig. 10 has flat slide-valves where low steam temperatures are provided and piston valves for superheated steam up to 750 deg. F.

Two valuable assets peculiar to the steam car are found in the absence of clutch and change speed gear-box; the latter is not necessary for reversing the car, as sliding reversing cams mounted on the camshaft fulfil this function where poppet valves are fitted and the link motion on the Doble, Stanley and Ainslie engined cars. This fact greatly simplifies the driver's task, as only two pedals are necessary for controlling the car, i.e., engine throttle and brake. When the throttle is opened the car moves forward immediately and acceleration to the speed required is astonishingly rapid and silent—in the Doble car, for example, the engine is capable of accelerating from 1 to 75 mph. in a matter of a few seconds—while hill climbing on such a car is an eye-opener for drivers accustomed to the petrol machine on which a gear change to bottom for hills of 1 in 4 is a necessity.

Layout

The car layout varies appreciably in different designs and, naturally, like its i.c. engine rival, has greatly improved over the years. In external appearance few prospective buyers would be attracted to the Gardner-Serpollet car seen in Fig. 11—though one, at least, of these cars is still giving a very good account of itself—while the more modern Doble car seen in Fig. 12 will compare advantageously with any present-day i.c. model.

In the Serpollet chassis layouts seen in Fig. 13 it will be noticed the drive is taken

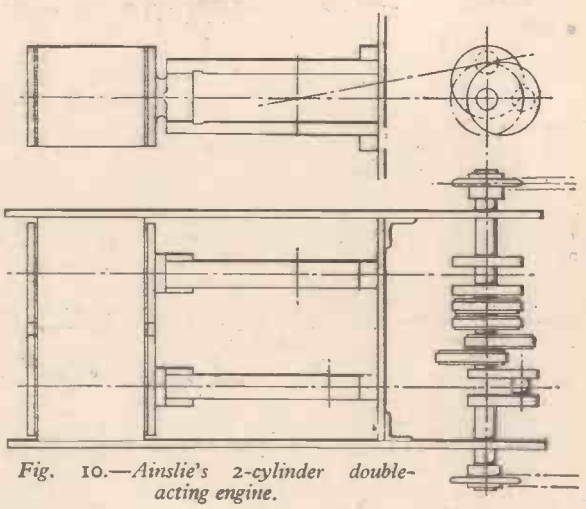


Fig. 10.—Ainslie's 2-cylinder double-acting engine.

by cardan shaft direct from the engine to the bevel gears on the rear axle differential, whereas in the earlier design of this car the drive was through side chains direct from pinions on the engine crankshaft to sprockets on the rear axle. At the front of the chassis will be seen the condenser with engine driven fan to assist the cooling. The generator is located at the rear end and provided with downdraught flue, the combustion gases being discharged downwards to the road under the impetus of induced draught.

Automatic Controls

To relieve the driver of the necessity of watching his water level, force pumps for water and fuel were provided with automatic control, and were driven by a small donkey engine whose exhaust was used to provide the necessary draught for the burner. When steam pressure reached a pre-determined level an automatic regulator cut out the donkey engine, this being re-started when the steam pressure fell below the desired level.

(To be continued)

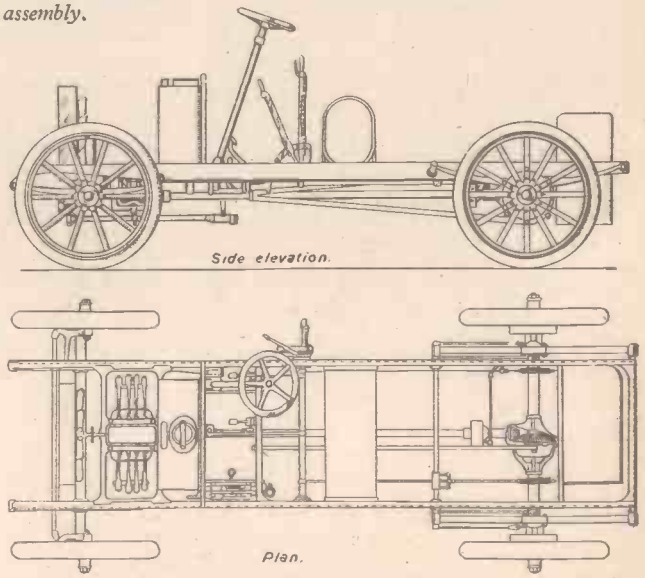


Fig. 13.—Layout drawing of 1904/5 Serpollet car.

SCIENCE AND OBSERVATION

Some Notes and Experiments on Everyday Things

By Prof. A. M. LOW

HERE is an intriguing experiment which requires very little apparatus and no skill. You need a large glass jug of water as tall as possible, and a cup of milk. Leave the jug of water to stand for about 12 minutes; now dip your finger in the milk and from a height of about 18in. allow one drop to fall on to the water in the jug. The milk drop will press itself beneath the surface of the water and set into operation a beautiful vortex ring, which will slowly curl down into the jug until, after a moment or two, local vortices break off. The resulting pattern will excite the admiration of all.

Vortices are very exciting. It is these little "pieces" of air which help or retard an aeroplane and which have often been produced by gunfire to disperse rain clouds.

Lord Brabazon, who held the first pilot's licence in England and who once tied a pig to an aeroplane in order to confute a popular saying, tells me that as a young man he fixed a small box with a hole in one side to a canvas bag under a piano. Anyone coming into the room could be startled by an apparently invisible feather brush slapping them in the face. It was, of course, a vortex ring from the box which pointed towards the door and which had received a surreptitious kick at the right moment.

If you want to be scientific it is said that you can arrange two vortex rings to meet in the middle of a brightly lit beam and if in one box there is hydrogen and in the other nascent chlorine the rings when they meet produce a brilliant flash from, it seems, absolutely nowhere at all. A nascent mixture of the gases from a single box is generally more successful.

Time Please

It is time that makes the difference between hard steel and soft air or water. Water can be very hard at high speeds. Try diving on to water and falling flat! There is a jet of water in a public garden on the continent and you cannot push your walking stick into it because its pressure is high and it is travelling fast.

Next time you dream, think of this case of time. You dreamed last night that you were shooting a lion. You bought your gun, went your journey, were frightened, and as your gun fired you woke up to find that the bang was someone tapping on your door with a cup of tea. In other words, that tap on the door synchronised with the bang of your gun. Two things might be true; first of all you must have dreamed the whole of that long dream in that tiny period between the bang on the door and your waking. What is more wonderful is that for the two bangs to have coincided you must have constructed the whole of that story about the lion backwards in your brain. Time *is* queer!

Watch Your Bath

Have you ever noticed the direction in which the water runs down your bath plug hole as the stream begins to form its vortex? A most learned discussion has taken place on this subject. Some people say that the direction of the whirl was decided by the movement of the earth on its axis. The point is open to debate, but if this theory were true surely all the water in Australia would twirl one way and all the water in England the other? This is not so and careful examination will show that the right- or left-hand turn is decided by the manner in which the water leaves the bath. It is the turn of the pipe, or the grid, or the small piece of solder left behind which gives the initial push to the flow.

There is another question: should rifles be rifled right hand or left hand dependent upon where they are to be used, or should the sights be altered accordingly? The twist of the earth and the twist of the bullet work together to hold the projectile straight. This is an admirable subject for after-dinner discussion.

Do Your Diamonds Squeak?

Here is an interesting little experiment. Take a glazier's diamond and rest it lightly upon any piece of glass. When the cutting angle is right, as if you were about to scratch a line to cut the glass, keep your hand steady and listen. You will hear birds chirruping, very, very gently, but they *do* chirrup. I put this down to the hand tremors and to the vibrations set up on the glass by the diamond beginning to penetrate.

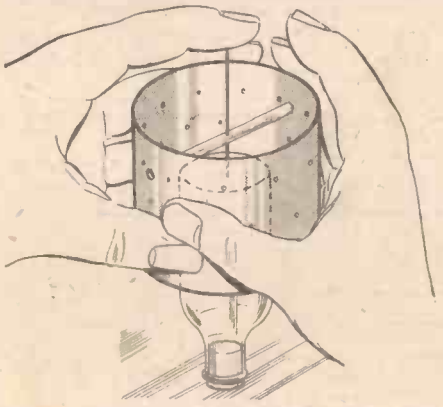


Fig. 1.—Apparatus for demonstrating the "new force."

Chirruping birds are, I think, very attractive, and it is always intriguing to think that in Trafalgar Square there are so many pigeons that there is very little room for them to perch. Those which are not resting on the arms and shoulders of G.I.s being photographed sit all night watching the neon lights. The queer thing is that radiation from these neon lamps either appeals to the birds' sense of humour or they think it is the sun, for they chirrup most merrily to all hours of the morning. A most suitable place, in fact, for their night life!

I do not doubt they can find their way home quite easily, but I am not one of those who attribute the homing pigeon marvel to the mystery of radio. I rather fancy that in their brains they may have a kind of integrator. Just as if you or I were blindfolded and turned round three times in one direction and four times in the other we might be able to finish up facing the way we started. Multiplied hundreds of thousands of times this skill could account for the homing instinct.

A New Force?

Have you heard of the new force which Air Chief Marshal Lord Dowding, of Battle of Britain fame, has been demonstrating? I do not say that I think it is a new force, but it is interesting to try the experiment.

You can make the apparatus in five minutes. Take a piece of ordinary notepaper approximately 7¼in. long and about 2¾in. wide. Cut it in half, leaving two pieces 3⅝in. by 2¾in. Now stick these together to make a paper cylinder 2¾in. long. The reason for the cutting is so that there will be a join down both sides to make it even. With a pin, pierce the cylinder all over from the inside so that the outside is slightly roughened; pin pricks ⅜in. or so apart are quite good enough. At one end of the cylinder approximately ¾in. from the end pierce a hole on each side, the holes being opposite to each other. Across the inside glue an ordinary straw, the ends resting in the pierced holes, see Fig. 1.

Now you are ready. Put a needle down the axis of the cylinder through the straw until it has penetrated the straw by about ¼in. and rest the point upon the bottom of a small medicine bottle about 2 or 3in. high. The cylinder should hang evenly and there is, of course, hardly any friction at all.

Avoiding all draughts, cup your hands round the

This plastic suit, welded together instead of stitched, blown up with compressed air and worn with a "spaceman's" helmet, is worn by atom workers to protect them against deadly radio-active dust.

side of the cylinder not quite touching it and you will find that the cylinder revolves slowly as if there were a wind blowing from the tips of your fingers. Test this with different people, facing north, south, east or west. Try it under all kinds of conditions and you will have astonishing results, which Lord Dowding thought might be a new effect, possibly not in accord with modern physical laws.

My own view is that convection currents and static electrical effects can explain the phenomena. But I hope you will try it for it has been seen by some very eminent men in England and they are rather inclined to disagree as to the cause.

Growing Up

Growth is a wonderful thing. I do not agree with people who think that all children are charming. In my opinion nearly everything that they have comes from their parents. Perhaps one day they will be developed by prenatal treatment.

Once I remarked in a book that the lilies of the field toiled very hard to grow. I am wrong, for it depends on the meaning of the word "toil." But I have seen a convolvulus grow through a 6in. concrete floor seeking for the sun and I have looked at a small parcel of spring onions which were left upon the floor in a dark cellar with one little window. Those simple plants turned their roots completely round so that their tendils all pointed deliberately towards the one light spot. It has been determined by experiment that onion roots will even grow together like people who want to embrace and I am quite certain that our life and that of plants differs only by that great unknown factor of time.

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. Then there is the queer fact that on the surface of liquids there is an added attraction which produces a kind of hard skin or 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 usually float.

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.

A Radio Metal Locator

A Device for Locating Buried Metal

THERE can be few radio experimenters who have not at some time felt the desire to stray down one of the side tracks of radio and to carry out tests with some pieces of apparatus employing wireless principles and materials, although not being concerned with communication.

With this thought in mind, the following apparatus was designed. The circuit was found to give excellent results, and many interesting experiments have been carried out with it. Used on the sites of old Roman camps in Dorset, many coins, rings and other metallic objects were located; some of them of considerable value.

The Case

This is a simple box constructed of thin wood and fitted with a shelf on which the components are mounted. The measurements of the case are not important and will obviously depend upon the size of the components to hand, and also whether one uses midget valves or those of the more normal size. If some of the very small valves can be obtained and are used in conjunction with other miniature components, a really light and compact unit can be made.

The Search Coil Frame

This was made of thin wood 16in. by 14in. by 4in. deep. It is fixed to the bottom of the case by means of small right-angle brackets.

The search coil windings are as follows:
L.1.—7 turns of 30 gauge DCC wire.
L.2.—9 turns of 30 gauge DCC wire.

A space of about half an inch should be left between the windings.

The Circuit

This employs three valves: The first is an oscillator, the second a combined detector oscillator and the third a low-frequency output valve. This last may be a small power valve or a pentode.

The coils for the det.-osc. stage are wound on a former made from a small length of ebonite tube 1½in. in diameter.

L.3.—5 turns of 30 gauge DCC wire.
L.4.—18 turns of 30 gauge DCC wire.

The following is a list of values of the other components required:

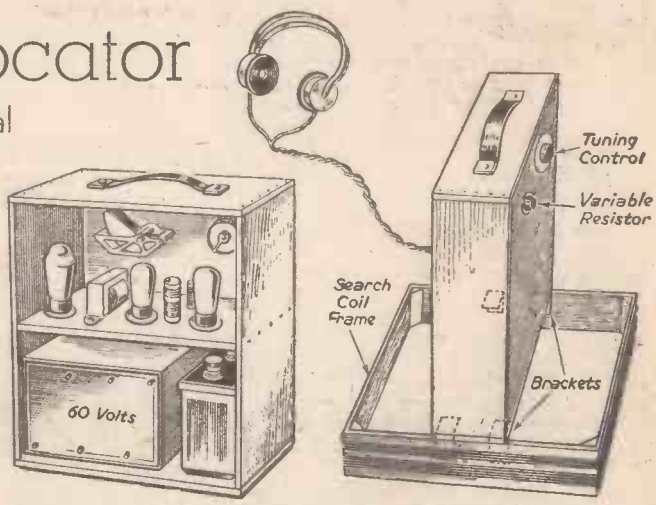


Fig. 2.—Rear view showing components and the locator ready for use.

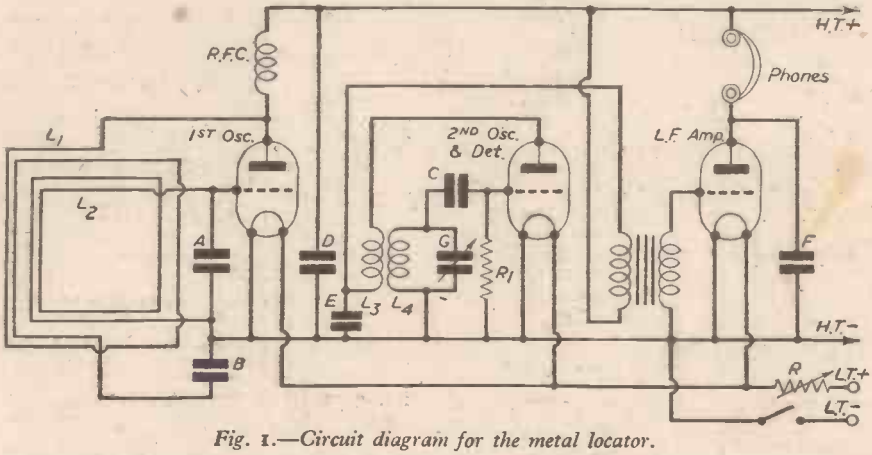


Fig. 1.—Circuit diagram for the metal locator.

Condensers	Resistors
A—.0001 mF.	
B—.0001 mF.	R—30 ohm variable.
C—.0001 mF.	R.1—1 meg.
D—1 mF.	
E—.002 mF.	Transformer. 3-1 ratio.
F—.002 mF.	R.F.C.—25 turns, 30 DCC on ½in. former.
G—.0001 mF. variable.	

Operation

When the set has been completed it is advisable to test out before it is put to serious use. This may be done by burying a small sheet of metal such as copper a few inches under the ground, then with about 60 volts H.T. adjust the tuning condenser and the variable resistor until a whistle is heard in the headphones. With the search coil held just above the ground it will be found that the pitch of the whistle will alter when the apparatus is passed over the buried metal.

Valves

With regard to these, it is best to try out several valves, as it has been found in practice that one valve will not oscillate as well as another, although they may both be of the same type and, according to their markings, identical.

A Continuous Electric Alarm

A Novel Adaptation Which Can be Made to any Alarm Clock

A view of an alarm clock adapted for use as an electric alarm.

AFTER a disturbed night, it may happen that the alarm clock will ring itself out in the morning without rousing the sleeper. To prevent this happening, an adaptation was made to a standard type alarm clock, which completed the circuit of an electric bell and battery, simultaneously with the ringing of the alarm bell of the clock. If the latter rang itself out without being heard, the electric bell would keep on ringing until switched off, which meant a thorough awakening, as the bell switch, together with the bell and battery unit, is extended by a length of flex far enough away to make it necessary to leave the bed to switch off the alarm.

Circuit Details

The diagram of the wiring in Fig. 1 shows the simplicity of the circuit employed, the jack being made up to suit the interior of the clock under adaptation. In some

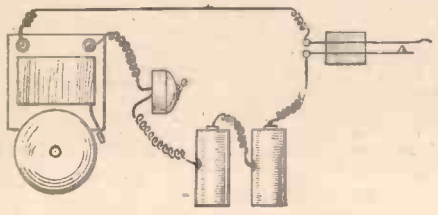


Fig. 1.—Wiring diagram of the electric alarm device.

clocks the release of the alarm mechanism depends upon a wheel, which, by a leaf spring at the arranged time, is displaced axially along the spindle which carries the small alarm time-setting hand. The jack shown in Fig 2, which forms the major part of the adaptation, is placed between the clock dial and the movement in order that the extended contact of the jack just bears against the side of the above-mentioned wheel, so that when this wheel is thrust suddenly along its spindle by the alarm timing movement it closes the jack and completes the electric bell circuit at precisely the same time as the clock alarm rings.

The Jack

Fig. 3 shows the construction of the jack together with suggested measurements, which may have to be altered to meet individual requirements. The contacts should be cut from spring brass, sufficiently thin and flexible to allow the full displacement of the alarm release wheel. As a refinement, silver contacts can be fitted at the points of contact, but this is not a practical necessity, as the contact arms, being parallel and close to each other, make a small sliding and therefore self-cleaning action at the points of contact. The small contact arm may have at its extremity an indent, made with a small centre-punch, to localise the contact with the longer arm. The insulations between the contact arms can be made from ebonite, paxolin, fibre, or even hardwood. The assembly of the insulators and contacts is clamped together with 6 B.A. screws and nuts, the heads of the screws

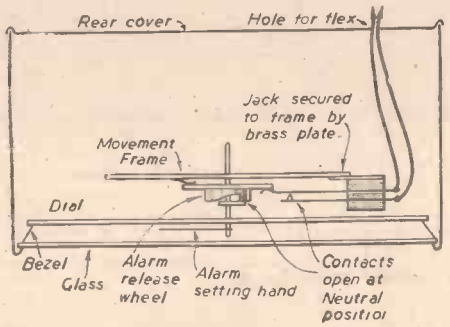


Fig. 2.—Sectional view of an alarm clock showing position of the jack.

holding the jack proper to a baseplate, which serves for the fixing of the jack to the frame of the clock movement. The screwing of the baseplate to the frame of the movement would in some cases necessitate taking down the clock mechanism to work upon the frame, and, to avoid this, the baseplate can be soldered instead of being screwed.

To ascertain the correct position of the jack, it should be held against the frame of the movement so that the long contact is seen to be in the right place against the alarm release wheel, then scribe a line round the jack baseplate on the frame, which will indicate the correct position for fixing, either by soldering or screwing. If it is decided to fix by soldering, the jack is dismantled to prevent overheating of the insulators, especially if they are made from ebonite. The jack baseplate and the selected portion of the movement end frame is tinned in preparation for the soldering.

Connections

A suitable length of flex is passed through a hole drilled in the rear cover of the clock, to be soldered to the tags of the jack contact arms. This length of flex carries at its other extremity the remainder of the adaptation, e.g., the bell battery and the "on" and "off" switch, to the required distance from the sleeper. This latter part of the adaptation can be made up in any way to appeal to the constructor. Fig. 4 shows the unit compactly housed in a small box, with only the switch on the outside. If this idea is adopted, a few small holes which can be arranged in a symmetrical pattern must be bored in the lid to allow the sound of the bell to be heard distinctly. The inside measurements are 7in. x 3¼in. x 1½in. deep. The battery is a large 2-cell cycle unit, with its cells taken apart to allow for accommodation in the box to save space.

In use, the unit may be hung conveniently upon a picture rail by providing a suitable

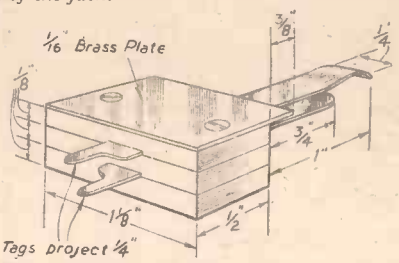
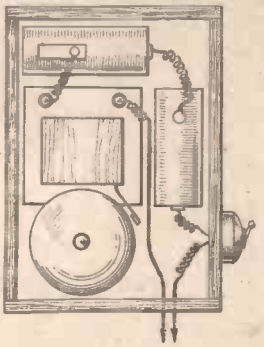


Fig. 3 (Above).—Details of the jack. Fig. 4 (Right).—The electric bell and batteries housed in a small box.



loop on the back of the box. When winding the alarm movement of the clock, do not fail to put the switch in the "on" position if the electric alarm is wanted in the morning.

Trade Notes

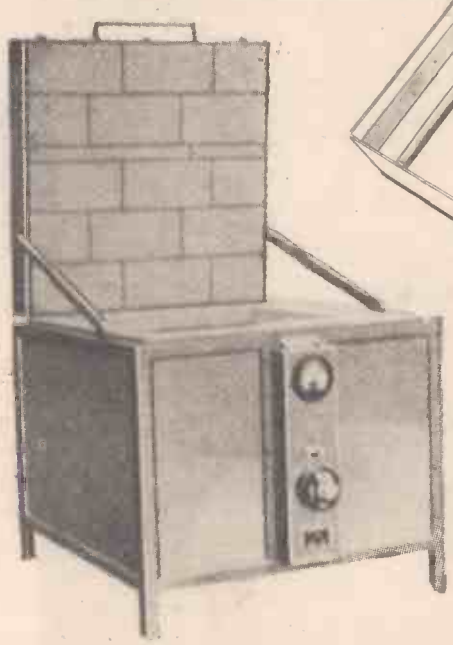
"Makit" Transfer Patterns

FROM the Makit Company, 22-23, Baroness Road, London, E.2, come details of a new scheme for aiding the home furniture maker. It is in effect the use of transfer patterns, which are ironed on to the wood, so eliminating errors. Detailed, fully illustrated instructions are included and it is claimed that with a few hand tools the handyman can produce high-class furniture.

Makit patterns will be available from all hobby equipment dealers at the beginning of this month (April) and new designs will be added at frequent intervals.

Bricesco Electric Kilns

DETAILS of a range of small kilns, suitable for use by the amateur or the professional in industry, studio, school or home has been received from British Ceramic Service Company Limited, 1, Park Avenue, Wolstanton, Stoke-on-Trent. Main details of some of the standard models are given below:—



One of the Bricesco top-loading kilns.

Model No.	Firing Chamber			Cu. ins.	Electrical Supply			Operating Temperature	Price
	Width	Depth	Height		Voltage	Recommended Outlet	Recommended Power Lead	Heats	Degrees Centigrade	
EK/TL5	11"	11"	10½"	1,270	230	15 amp.	3 Core 7/.029	3	1100	£37.10.0
EK/TL5/HT	11"	11"	10½"	1,270	230	15 amp.	3 Core 7/.029	3	1250	£40. 5.0
EK/TL8	18"	18"	15"	4,860	230	30 amp.	3 Core 7/.036	3	1100	£57.10.0
EK/TL8/HT	18"	18"	15"	4,860	230	30 amp.	3 Core 7/.036	3	1250	£65. 0.0
EK/920	20"	22"	22"	9,680	230	60 amp.	19/.064 in Conduit	12	1100	£99. 0.0

These kilns are all, with the exception of the EK/920, top loading kilns; the EK/920 is of the floor type. The kilns can be installed in any room where suitable electrical supply is available and fire hazards have been eliminated. Heating elements are placed under the hearth, on the sides and the door to ensure even distribution of heat. A three-heat control is provided and pilot lights indicate which elements are in use. A range of pyrometers, thermocouples and other auxiliary equipment suitable for use with kilns is also available. Potters' wheels of various types are also supplied and a long range of materials, including clays, stains, glazes and enamel colours and miscellaneous kiln accessories. Further details may be obtained from the above address.

The Easiplate home electro-plating kit.

Home Electroplating Kit

INTEREST in electroplating at home has been growing during the past few years and, realising this, the Liver Plating Co., Newstet Road, Kirkby Trading Estate, Liverpool, has produced and marketed a self-contained kit for the enthusiast. As will be seen from the illustration, everything except the vat is supplied—plating salts, anodes, wire, battery, emery cloth and polish. Full instructions for use are included. The complete kit costs 12s. 6d. or 13s. 6d. by post from the above address and spares are available.

Two New Small Tools

THE I. and G. vibrator type Polisher, which is designed to meet the requirements of the professional woodworker as well as the home handyman, has a sanding pad area of 14 sq. in., a stroke of 3/16in. and a speed of 12,000 strokes per minute.

Its weight of 2¾lb. together with its straight line action ensures the right pressure for giving a smooth scratchless finish. The low design permits operation in restricted places and the absence of moving parts makes oiling unnecessary.

The unit is versatile and can be used for polishing furniture, shoes, leather, waxing cars, removing rust from metal before painting, plaster smoothing, metal burnishing, french polishing and fettling of plastics. It has a conveniently placed on and off switch and it will not cause interference to wireless or television reception. It is supplied complete with electric flex, three grades of sandpaper and one polishing cloth, price 75s.

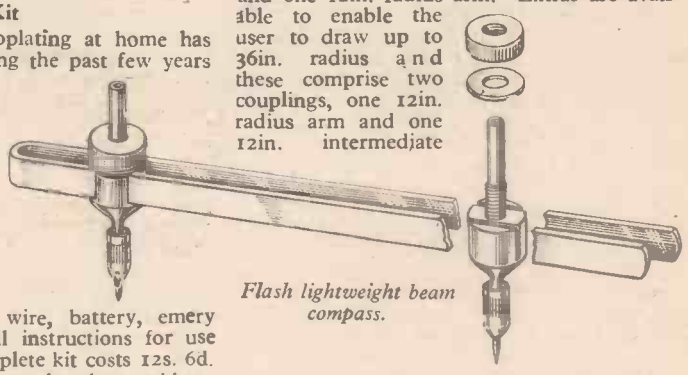
To obviate handsawing, which is slow and tedious, a simple device which will fit into an electric hand drill to give high speed cutting has been introduced, which will be particularly welcome to both amateur and professional workmen.

It will saw timber up to 1¼in. thick, steel, brass, aluminium, copper, etc., and plastics, hardwood and asbestos. Intricate patterns and circles as small as 1in. diam. can also be cut with it. Operation is safe and simple and, supplied with three blades, it costs 49s. 6d.

Both these tools are manufactured by I. and G. Manufacturing Co., Ltd., 31A, Sloane Street, London, S.W.1.

"Flash" Lightweight Beam Compass

THIS precision instrument, shown in the illustration below, is supplied by J. A. Franks, 10, Oak Grove, Poynton, nr. Stockport, Cheshire. The Standard set, which will draw up to 12in. radius circles costs 18/- and consists of two collet assemblies one shouldered point, one 6in. radius arm and one 12in. radius arm. Extras are available to enable the user to draw up to 36in. radius and these comprise two couplings, one 12in. radius arm and one 12in. intermediate section; the price is 11/6. Adjustment is merely by loosening the knurled nut on top of the collet assemblies and sliding along the arm; pencil point and steel point are simple to replace.



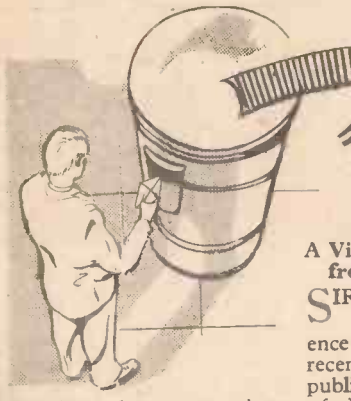
Flash lightweight beam compass.

Precision Counters

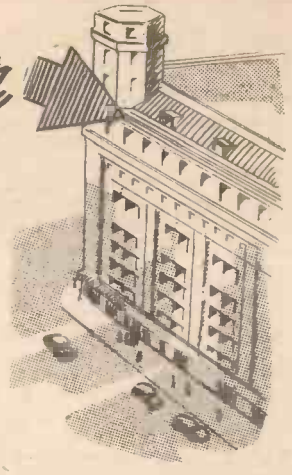
IN many industries the need for the accurate counting of articles during their production, or measuring the extent of a process is a question of vital importance to the general efficiency of any works.

To-day, such counting and measuring, like many other precision operations, can be carried out with a very high degree of accuracy. B. and F. Carter and Co., Ltd., are able to offer various designs of "Albion" Precision Ratchet and Revolution Counters for almost every requirement. For example, when it is desired to stop a machine and give a signal at any figure, an "Albion" Pre-determined Electric Counter is offered. Again it may be desired to record production of a particular machine on an "Albion"

(*Continued on page* 317)



Letters to the Editor



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

A Visitor from Mars

SIR,—With reference to your recent article published in the December, 1954, issue of PRACTICAL MECHANICS on A Visitor From Mars, Mr. Allingham states in his book that, as he approached the saucer, a sliding panel in the lower part moved back and a man leaped lightly and gracefully to the ground.

Now astronomy teaches us that the earth's atmosphere is much denser than that of Mars, therefore the man would have found it very difficult indeed to have leapt lightly and gracefully to the ground.

Another point I noticed is the fact that the man in the photograph is not wearing breathing apparatus of any kind.

Surely a being from Mars, without breathing apparatus, would die from breathing too much oxygen ! He would have collapsed from sheer exhaustion, without considering the fact that Mars is twice the distance from the sun that the earth is and the possible increase in temperature might be too much for the Martian.

With all due respects to Mr. Allingham, I am afraid I find it difficult to believe that his photograph is an exposure of a native of Mars.—L. GEOGHEGAN (Liverpool, 13).

The P.S. "Westward Ho"

SIR,—It gave me great pleasure to read the articles by "Designer," of his model of P.S. *Westward Ho* and I am quite interested in his drawings of her.

I know this boat very well, and have spent many a happy afternoon on her channel cruises, either towards Lynmouth and the Foreland lighthouse or down channel towards Lundy Island or Clovelly. She gave me the impression of being so stately, churning her way to Ilfracombe.

Messrs. Campbell had a very fine fleet of paddle steamers, the majority of which have visited our port. Both wars have claimed a number of these boats, but it was remarkable how they did their job.

In the season here, when these boats make their first appearance, a warning is sent up from the pier, in the form of a "rocket," thus heralding their approach, together with the slogan "The Campbells are Coming."

Perhaps it would be possible to see "Designer's" completed model of the *Westward Ho* displayed in the window of P. and A. Campbell's Office, The Quay, Ilfracombe?—R. B. GARNISH (Ilfracombe).

Steel Wool as a Pipe Filter

SIR,—Steel wool is probably used by most readers of PRACTICAL MECHANICS, but here is a novel use for it. For those who smoke a pipe, it will make an excellent filter. After rolling it into a ball to fit the pipe, blow hard on it to remove any loose particles, which would otherwise be drawn into the throat.

I have economised on tobacco for two years by this means, as well as amusing a friend, who said: "One must be tough to smoke that stuff! "—R. S. PERRY (Montgomeryshire).

The Development of Technical Education

SIR,—How apt and to the point was your article "The Development of Technical Education" in the January issue. You confirm what I have been saying for the past eight years.

I am an instrument maker and have been in the industry for most of my working life (I am 46) and have seen the gradual drying up of skilled craftsmen over most of this period.

There is one point, however, that you did not mention and to which I have never been able to find the answer. Why is the paper and pencil mechanic placed on a more elevated plane than the practical man?

It seems to me that the one is completely dependant on the other, yet this seems to be the case wherever you go. I noticed while working in a large factory that of all the apprentices that came round to work with the men on a rota system for general experience, only about one in fifty was interested in the use of tools.

There is still a vast amount the technician can learn from the craftsman that will not be found in any text books.

Maybe the word "Technician" holds the same glitter that "Magician" had in our younger days!—F. ARMSBY (Enfield).

Radio-active Electricity ?

SIR,—I understand from the National Press that a prototype Atomic Power Station is being developed with a view to eventually providing the majority of the electricity in the National Grid system.

By the time these plants are in full production, it can be assumed that the majority of our homes, factories, and offices will be using this electricity. It can be seen, therefore, that should this electricity be in any way radio-active the danger to the community would be very great.

We have all read of the unfortunate Japanese fishermen who, powdered by atomic dust from an explosion many hundreds of miles away, were gravely ill for some time; not to mention the scientific Jeremiahs who prophesy that the children of those subjected to much radio-activity will be malformed.

Has due consideration been given to these effects ?

Radio engineers all know the difficulties in eradicating the last trace of A.C. ripple from power supplies. Can we be sure that every possible step will be taken to remove the virus of radio-activity from our electricity?—J. HOUGH (Birmingham).

Moulding the Human Face

SIR,—I have a plaster cast that I took from the face of a friend, and I would like to pass on my experience to your readers, including your questioner, J. Turner (Gosport).

We first purchased a quick-drying plaster, a small roll of cotton-wool, a tin of vaseline and a packet of drinking straws. I greased my friend's face with vaseline, paying particular attention to the eyebrows and lashes. Then I cut a drinking straw in half and wrapped some cotton-wool round one end of each piece and inserted them into his nostrils. He then lay on the table, which we had raised the "head" end to keep the blood from his head whilst we operated. I rolled a towel next and wrapped this round his face to form an edge to the cast, then I prepared some very thin plaster ; this picks out more detail than thicker plaster. While I was mixing this my friend was relaxing on the table with eyes and mouth shut, getting used to breathing through the straws. When the plaster was mixed into a creamy consistency I poured it over my friend's face; he still breathed quite naturally through the straws. I then mixed a thicker lot of plaster to give the cast thickness and applied to the first coat of plaster, which we had coloured slightly with burnt umber by the way. We had to wait about 10 to 15 min. for the plaster to set, then my friend took the cast in his hands and sat up. With a few facial contortions the cast came away in his hands.

When dry completely, we greased and filled with plaster, inserting a pencil whilst it was drying. After leaving overnight to dry thoroughly, with a hacksaw blade and screwdriver we chipped the cast away from the "face," this was easy as you have to go more cautiously when you reach the burnt umber and stop on reaching the natural plaster again. We withdrew the pencils, screwed two screws into the walls, leaving them protuding about 1in. and placed the holes made by the pencils over the screws, this being the only fixing needed. All we had to do then was fill in the spaces between the face and the wall with plaster and the job was complete.—D. W. JORDAN (Hitchin).

Cosmogony of the Solar System

SIR,—In his "Astronomy" series Mr. Twining's suggestion was that in the spiral nebulæ we may see the birth of solar systems comparable to our own. He suggests that the nucleus of such a system corresponds to our sun, and that the "arms," in some cases showing "condensations," represent the formation of planets.

So far as I can see, the difficulty arises from a confusion of scale. The appearance of such systems in photographs is certainly suggestive of rotation, and of the throwing off of condensations—indeed, this may be what is actually happening, but it is on a far greater scale than that of the Solar System.

The distances of some of the nearest stars may be directly measured by the parallax method, which involves assuming that only a ray of light travels in a straight line, and that the concept of "angle" works in the same way here and a few light-years away. This method, however, works only for the nearest stars, and even then the angular measurements which have to be taken are extremely small, needing the most refined instruments and techniques to carry them out. Beyond this are a great number of stars of which it can only be said that they definitely show parallaxes, though too small to be measured. Beyond this again, the vast majority of stars and,

of course, all extra-galactic objects show no parallactic movement at all.

The nearest star to the sun is known as Proxima Centauri, and is roughly four light-years away (I quote this figure from memory). Like all the "fixed stars," Proxima shows no disc in the telescope nor, indeed, can ever show one, however powerful the instrument. It can be calculated that a planet revolving about Proxima at the same distance as Jupiter's from the sun could just be separated from the parent body by our most powerful telescopes, so far as angular distance goes. However, the relatively small amount of light which such a planet would reflect would be completely swamped by the very much greater brilliance of the primary. Even assuming the planet to be as large as its sun—rather an unlikely state of affairs—and to have the greatest known "albedo" or reflectivity, it would still be overwhelmed by the light of its parent. Therefore we can have no direct telescopic knowledge of the existence of any planets other than those making up our own system. (Remember that the calculations just quoted refer to Proxima Centauri, the nearest known star.)

The nuclei of spiral nebulæ, however, do in fact show clear discs in the telescope. To do this they would have to be a great deal nearer than Proxima, and if they were in fact so near, it would be reasonable to expect their "planets" to be visible in the telescope. But if they were so near they would show very great parallaxes, or at all events parallaxes greater than that of Proxima. The observed fact is that not one of the spirals does show even a measurable parallax, let alone one greater than Proxima. Therefore it follows that they must be very much more distant than these nearer stars. From this argument it will easily be seen that, to show a disc in the telescope, these objects must be "very much" larger than the average star, and their "planets" must also be bigger than stars. Certainly they must be bigger than the sun, which is rather undersized as stars go, and they are probably no smaller than the entire Solar System.

Of course, it is still open to Mr. Twining to say that the systems under consideration are, in fact, similar to our Solar System but on a scale 10^x times greater. If he does so, however, he is rather abandoning his original statement, that there are other solar systems. —B. L. KERSHAW (Leeds, 16).

SIR,—I must thank Mr. Beeston for correcting the mistake about the distances of the external galaxies in my letter. But is he correct in saying that no detection of planets in stars other than the Sun is possible ? I believe that non-luminous companions to 61 Cygni and 70 Ophiuchi have been deduced from their irregular motions. The masses calculated for these bodies are planetary rather than stellar — i.e., about 20 times Jupiter's mass. This large mass is to be expected since smaller planets could not, as he says, be detected. —J. B. HAMILTON (Romford).

Electro-Osmosis

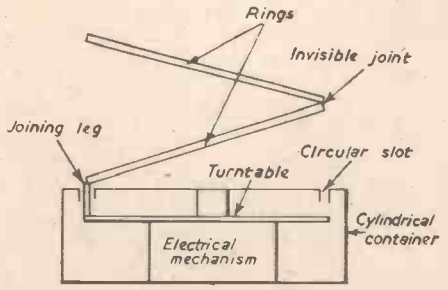
SIR,—*Re* page 90, November issue, where a query appeared on the above subject, this process was successfully used at St. Anne's Cathedral, Leeds, 1, and I understand that it is a Dutch patent, the licensees in this country being Silicaseal Ltd., 281, Westgate Road, Newcastle on Tyne. It is known as the Ernst damp-proofing system.

I understand there is a demonstration installation at the Newcastle address and believe it is fairly expensive—of the order of £1 per foot-run of wall.—J. A. HULL, (Leeds, 1).

Revolving Rings Shop-window Display

SIR,—In the "Information Sought" section of your February issue Mr. R. McDougall, of Greenock, requests information regarding a shop-window display consisting of revolving rings. This device may be purchased from Scientific Sales Service, 39, West Hill, S.W.18.

Before purchase your correspondent may be interested in its make-up, which is explained in the sketch below.—E. M. HUGHES (Limerick).



The shop-window display. Top of container is heavily flocked to conceal slot. Rings are rotated as turntable revolves. Apparent lack of support and rolling of rings are an optical illusion.

SIR,—Re the enquiry in PRACTICAL MECHANICS regarding window display device, this is manufactured by Hervey and Goodman, Ltd., 93-7, Regent Street, London, W.1.—B. GARNISH (Ilfracombe).

Free Pendulum Electric Clock

SIR,—I note with interest Mr. J. A. Roberts's free pendlum clock in February 1955 PRACTICAL MECHANICS.

I have met with the same troubles using the Hipp trip motion and Mr. Roberts's article prompts me to suggest: why not get rid of contacts altogether, or at least no more than one set, by using the impedance effect in an A.C. coil, which can be varied by a moving laminated core or armature. It is not usual to connect A.C. coils in series, but considering the very small amount of power required to drive a clock it may be possible to set up an arrangement as shown in Fig. 1.

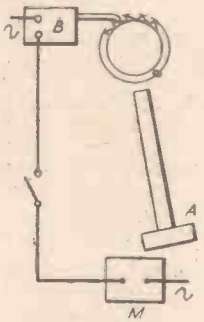


Fig. 1.

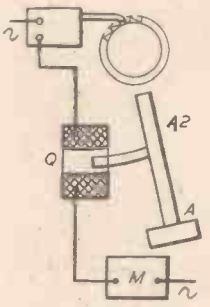


Fig. 2.

Impedance is low with the armature A away from the pot magnet M and, therefore, passes sufficient power to operate B which ratchets a toothed wheel.

The power drops when A is directly over M and B is released.

Using Mr. Roberts's magnetic switch the current is cut off for the free swing to the left. Thus there is only one switch. Now to eliminate that switch.

Assume that we have the same arrangement as Fig. 1, without the switch. Instead, we have a quenching coil Q which neutralises the flow of current as soon as A2 has entered the coil sufficiently more or less to close the iron magnetic circuit. See Fig. 2.

It is well known, of course, that a closed iron circuit can completely stop any current from passing.

Naturally, experiments would have to be extensive with the proper instruments and facilities.—S. N. SHURMAN (Pendlebury).

Using the Mercury Vapour Lamp

SIR,—In your "Information Sought" column of the February issue your correspondent J. P. Griffith, of Stockport, asks for information on the use of a 120-watt mercury vapour lamp. The following should prove of interest.

The radiation given by the inner tube of the high pressure mercury vapour lamp consists of both short-wave and long-wave ultra-violet, in addition to visible light. The short-wave u.v. is normally trapped by the outer glass envelope, which does not transmit it. Most of the powders and paints manufactured for the fluorescent effect are activated only by the long-wave radiation, and therefore for this purpose there is no point in removing the outer envelope. A black filter is, of course, required to mask the visible light. Such a filter, dimensions 11½in. by 3½in., is available from Messrs. Dynalite Electrical, 38, Stevedale Road, Welling, Kent, price 22s. 6d., post paid.

The use of the inner lamp only as a sun lamp has several disadvantages, the main ones being short life due to absence of the outer jacket and oxidation of the lead-in wires due to the formation of ozone.

If a lamp is required merely for "black-light" fluorescent effects a new type of lamp is now available, of identical dimensions and characteristics to standard fluorescent lamps, made in the 2ft. 20 watt, 4ft. 40 watt and 5ft. 80 watt sizes. These have an internal powder coating which converts the short-wave u.v. into long-wave u.v., which passes through the ordinary glass tube. Filter panels as described above are required for most effects, as there is also a fair amount of visible light generated. A complete "Dynalite Kit" is available, comprising 2ft. tube, filter panels and control gear, price £5, from the above address. Many startling effects can be produced using standard "Day-glo" and "Fluo-colours" as used in poster printing, and many textiles glow vividly under "black light."—DYNALITE ELECTRICAL (Welling).

SIR,—In response to the information required by Mr. J. P. Griffith, of Stockport, I suggest the use of an oxide of nickel (glass) filter.

Some years ago I demonstrated fluorescent effects on powders, chemicals, oils and pearls, etc., etc., using an electro medical mercury arc lamp. The front of the fitting was blanked off except for a small window of the o/n glass filter. As near as I can remember the filter measured about 2in. by 4in.

In my opinion this filter gave better definition and cut off more visible light rays than the mercury vapour "black" lamp.

Chance Bros. made this glass and I suggest that electro medical supply shops may have stocks.—K. COOMBS (Cape Town).

Shop Window Condensation

SIR,—Like your correspondent Mr. A. T. Thompson (January issue) I, too, have tried several methods to stop my windows from steaming and streaming with water in the winter. If Mr. Thompson could install somewhere in the shop a simple Tortoise stove with a 4in. flue pipe out through the wall or roof, and burn in it coke, he would find his problem solved.

I did this three years ago, and my shops are the only ones in the street with clear windows on a frosty morning.—H. W. BACON (Herts).

(*Continued on page* 317)

READERS' SALES AND WANTS

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

FOR SALE

COMPRESSORS for sale, 2½ CFM, 180lbs. sq. in., on metal base, with driving wheel and receiver, price £3; ¼ h.p. Heavy Duty Motors, price £3; carriage forward. Wheelhouse, 1, The Grove, Isleworth. (Phone: Hounslow 7558.)

MAKE YOUR OWN MUSICAL BOX. Send s.a.e. for price and tune list of Swiss Movements and cigarette box kits. Mulco, 72, Greyhound Hill, N.W.4. Trade supplied.

NUTS, BOLTS, SCREWS, Rivets, Washers, and hundreds of other items for model engineers and handymen; s.a.e. for list. Whiston (Dept. PMS), New Mills, Stockport.

HOUSE SERVICE METERS, credit and prepayment; available from stock. Universal Electrical, 221, City Road, London, E.C.1.

TYPEWRITERS/DUPLICATORS; Easiest Terms; Free Delivery Anywhere. Verney Clayton, M.C., Market Rasen, Lincolnshire.

TUFNOL: Rod and Sheet, "Perspex" Coloured and Clear Sheet, Clear Rod, Cements and Polishes, Vulcanised Fibre Sheet, Acetate, P.V.C. and Formica; no order too small; send s.a.e. for price list. Lawrence & Jeffreys Ltd., 16, Gloucester Road, Brighton, Sussex, Eng.

GRAINING BY TRANSFER. Perfect reproduction oak, walnut, etc. Samples 1/-; complete range 3/-. P.M., Decano Co., 20, Clarendon Road, Jersey, C.I.

PLATED NUTS, Screws, Washers, Bolts, Soldering Tags, Hankbushes, Self-tapping Screws, Grubscrews, Socket-screws, Wood-screws; large quantities or gross cartons. List sent post free. Sinden Components Ltd., Dept. E., 117, Churchfield Road, Acton, W.3. (ACOrn 8126.)

RUBBER MOULDS for Plaster Ornaments from 2/- each. Moulding compound for mould making 8/6 per lb. Granulated ready for use. Metal toy casting moulds from 3/- each, s.a.e. for list. F. W. Nuthall, 69, St. Mark's Road, Hanwell, London, W.7.

PERSPEX for all purposes, clear or coloured dials, discs, engraving. Denny, 15, Netherwood Road, W.14. (SHE 1426, 5152.)

LATEX FOAM UPHOLSTERY. 2ft. 6in. Damask Mattress, £8/11/-, carr. 2/-; 14½in. x 13in. x 1½in. Seat Unit, 8/6, carr. 1/-; 21in. x 18in. x 4in., 32/6, carr. 2/-; all shapes and sizes; s.a.e. list. B & M (Latex) Sales, 35, Station Road, Addlestone, Surrey. (Telephone: Weybridge 3311.)

HOW TO RE-WIND and service Electric Motors, Generators. Complete Practical Book only 3/-, p.pd. Below:—

10,000 FORMULAS, Processes, Recipes, Trade Secrets. This is the 1,000-page money making and money saving book of the century. Limited number again available. Full approval against payment, 27/6, p.pd. Below:—

BUILD YOUR OWN PHOTO Equipment, 12 designs in two books. Enlargers, printers, dryers, timers, etc., 6/-, p.pd. Below:—

AMERICAN BOAT BUILDERS Annual; 28 boat plans, 8-22ft., and other helpful articles, 7/6, p.pd. Below:—

LATHE HANDBOOK, 3 books in one, 5/-, p.pd.; wood-turning, metal turning, metal spinning, jigs, attachments, special operations; 200 illustrations; outstanding, practical, "how-to-do-it" material throughout. Below:—

TELESCOPES—DESIGN AND CONSTRUCTION, only 3/-, p.pd. Really outstanding American designs at lowest cost to make. Below:—

CAR BODY REPAIRING. Complete A B C course; illustrated; 7/6, p.pd.; lists free. American Publishers Service (P), Sedgeford, Norfolk.

UPHOLSTERERS' supplies, direct from the factors; uncut Moquettes, 12/- yard; Leathercloth, 5/9 yard; Tapestries from 5/11 yard; 72in. Hessian, 1/11 yard; Chair Webbing, 4d. yard; Tacks, Springs, Spring Cushion Units, Tension Springs, etc.; s.a.e. for complete free list. Benfield's, 3, Villiers Rd., N.W.2.

SPEAKERS, 8in., 12/9; P.M. Standard, 3-5 ohms, or with O.P. Transformer, 15/9, used, but guaranteed tested perfect, most makes, post 1/9. baffle board 9d. extra. Extension Speaker Cabinets, 9/9, to fit 8in. Speaker, repolished, baffle board fitted, post 1/9. Duke & Co., 621, Romford Road, London, E.12. (GRA 0677.)

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

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

NEW £X-W.D. fitted Tap and Die Cases to hold 6 13/16in. O/D Dies, 12 Taps, Die Stock, and Tap Wrench, price, including postage, 4/-. Bullers, Printing Office Street, Doncaster.

MAIL ORDER ONLY. Brand New Tools. Bargain price, post free. Lathe Chuck Specialist, Independent, 4in., 60/-; Burnerd, 3½in., 67/6; 4½in., 75/-; 6in., £6/4/6. Burnerd self-centring 3-jaw, 2½in., £6/15/-; 3½in., £7/16/9; 4in., £7/16/9; 5in., £9/17/3; 6in., £11/8/9; 9in., £17/1/3. Micrometer, 1in., 10/-. Angle plate, 3in., 5/3. Vee block, 3in., 5/3; 4in., 6/6. 3 lathe carrier, ½in., ¾in., 1in., 11/6. Burnerd tool post for 3½in. lathe, £7/5/-; 4½in.-5in. lathes, £9/6/-; Machine vice, 18/6. Union hand bench drilling, ¼in. machine, £5/6/6. Steel dieholder, 13/16in., 2/9; 1in., 6/-; 1 5/16in., 10/-. Carb. wheel, 4in. x ½in., 4/-; 3½in. x ¾in., 4/-; 7in. x ¾in., 7/6, all ¾in. hole. Expansive bit, ½in. to 1½in., 19/8; ¾in. to 3in., 26/8. Ratchet brace, 10in. sweep, 16/6. Twist drill grinding jig to ½in., 24/-. Emery wheel, 2in. x 1/16in., 1/2; 3in. x 1/16in., 1/6. Precision drill chucks, ½in., 38/-. Arbors for same, No. 1 M.T., 5/6; 2, 6/-. Drill stands, 1-60, 1/16in.-½in., A-Z, 3/9 each. Dies 13/16in. dia., 40 T.P.I., 5/32in., 3/16in., 7/32in., ¼in., each 2/9. B.A. 0-1-2-3-4-5-6, 2/2; 7-8, 2/9; 9-10, 3/6. Silver steel round 13in. lengths, 12 different sizes, 1/32in. to 9/16in., 10/-. H.S. centre drills, size 1, 2/-; 2, 2/3; 3, 2/9; 4, 3/-. Dividers, 5in., 5/-. Abrafiles, 8d. Links, 2, 4d. Hacksaws, 10in., 3d.; 12in., 3½d. Tailstock dieholder, 13/16in., No. 1 M.T., 13/6. H.S. Twist drills, 1-2, 2/6 each; 3-6, 2/5; 7/11, 2/1; 12-16, 1/11; 17-19, 1/10; 20-24, 1/9; 25-29, 1/8; 30-32, 1/8; 33-42, 1/4; 43-48, 1/3; 49-52, 1/2; 53-70, 1/-; 71-75, 1/6; 76-80, 1/11; 1/16in., 1/2; ¼in., 1/5; 5/32in., 1/10; 3/16in., 2/-; 7/32in., 2/6; ¼in., 3/1; 9/32in., 3/10; 5/16in., 4/6. Adjustable spanners, 9in., 6/3; 11½in., 7/8. H.S. tool bits, square, ¼in., 1/9; 5/16in., 2/7; ¾in., 5/6; ½in., 8/6. Lathe centres, No. 1 MT, 4/3; No. 2, 5/-. Tap, 40 T.P.I., 5/32in., 3/16in., 7/32in., ¼in., 1/9 each, 32 T.P.I., 5/16in., 2/4; ¾in., 2/7; B.A. 0-1-2-3-4-5-6, 1/1; 7-8, 1/3; 9-10, 1/9. 26 T.P.I., 5/16in., 1/7; Whit., 1/16in., 1/8; 3/32in., 1/8; ¼in. 1/2; ¾in., 11d.; 5/16in., 1/3. B.S.F., ¼in., 11d.; 5/16in., 1/3. Your address block letters. S. Grimshaw, 7, Hall Street, Gorton, Manchester, 18.

TOOL BARGAINS. Tap wrenches, ¼in. to 1in., American, 12/6, p. and p. 1/6; High speed drills up to ¾in., 12/6 doz., p. and p. 6d.; Tool maker's cramps 10/- pair, p. and p. 1/-; Surface plates, grade A, 12in. x 8in., 45/- carriage 4/-; Hand drills, ¼in. cap., by Millers Falls, USA, 12/6, p. and p. 1/-; Needle Files, ass., 12/- doz.; Files, ass., up to 14in., 16/6 doz., p. and p. 2/-; Wood Chisels, ¼in. to 1in., set of 6, 15/-, p. and p. 1/-; Files, ass., 4in. to 8in., 10/- doz., p. and p. 1/-; High speed drills up to tapping ¼in., 7/6 doz.; HSS slitting saws, 2¼in. to 3in. dia., various thickness, 3 for 10/-; Grindstones, 8in. x 1in. x 1¼in., 60 grit, 7/6, p. and p. 1/6. 6in. x ½in. x ¼in. to ¾in., 4/6, p. and p. 9d. Bargain list 6d. Mibro Equipments Ltd., 81, Derby Road, Nottingham.

AIR OXYGEN CYLINDERS, 12 x 6½in., 2,000lbs. sq. in., screwed, ¼in. gas, weight 15lbs., 17/6, c.p. Plastic Hose for oil, water, gas, suds, pumps, etc., gut reinforced, unperishable, unkinkable, 14ft. lengths, ¾in. bore, 5/- each, 3 lengths, 12/-, c.p.; Connectors 6d.; a few lengths will make an everlasting garden hose. Wilton, 92, Toynbee Road, Wimbledon, S.W.20.

BRAND NEW Brooks ¾ h.p. Motors, ball-bearing, 230v., A.C., single phase, 50 cycles, 2,800 r.p.m.; ideal for driving woodworking machines, grinders, etc.; latest type in maker's sealed box; £8/15/-; also Capacitor Type, £9/15/-; carriage paid. P. Blood & Co., Wolseley Bridge, near Stafford

"AQUALUNG" CALOR GAS, 1946 Type, F. Regulators, suitable for conversion, 30/-, carriage paid. George Cairns & Sons, 213/215, Westgate Road, Newcastle-upon-Tyne, 4.

TIMBER CUT TO SIZE. General Woodwork Supplies. D.P. P.M., 78, Stoke Newington High Street, N.16.

TROUT REEL CASTINGS, 3½in., narrow drum, 8/9; Check Gear, 8/9; s.a.e. photo. R. Wilson, Brora, Sutherland.

ELECTRICAL

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

AMAZINGLY powerful miniature Electric Motors. MiniMo: 3-6 D.C. volts, .1-.3 amps., speed 4/5,000, weight 1½oz., size 1¼in. x 1½in.; drives boat propellers 1in. dia., aeroplane propellers 5in. dia., price 9/-. MaxiMo: 3-9 D.C. volts, .2-.75 amps., speed 4/5,000, weight 1½oz., size 1¼in. x 1 3/16in., drives boat propellers 1¼in. dia., aeroplane propellers 8in. dia., price 12/6. Maximum power, minimum consumption, for all models. "Friclub" Lubricant for above and all light mechanisms 1/6 per tube; all post paid. Etna Products Ltd., Dept. P.M., "Highland," Alkrington Green, Middleton, Manchester.

HOBBIES

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

TOY & GAME MANUFACTURE. The world's first journal specifically devoted to the manufacture of toys, games, sports equipment and amusement novelties. Annual subscription £1/10/-. Specimen copy 2/6. Techniview Publications Ltd., 125, Oxford Street, London, W.1.

SPARE TIME PROFIT.—Plastic Injection Moulding Machine, suitable for the craftsman, small manufacturer, and those interested in hobbies and education. Apply: Dohm Ltd., 167, Victoria Street, London, S.W.1. (Tel.: Victoria 1414.)

AMATEUR RADIO, World's Greatest Hobby! Write to-day for Catalogue! (Enclose stamp for postage.) Kits from 69/6. Johnsons (Radio), 46, Friar Street, Worcester.

BUILD YOUR OWN CANOE! Kits from £6/10/-; new/secondhand Craft from £11: stamp for lists. Canoe Services. West Coker, Yeovil.

STEAM CAR POWER UNIT. detailed plans suitable for light car; no gears; uses fuel oil; switch on to start; s.a.e. for comprehensive free lists. "Light Steam Power," P.M., Kirk Michael, Isle of Man, U.K.

MAKING YOUR OWN? Telescopes, Enlargers, Binoculars, Microscopes, projectors, or, in fact, anything that needs lenses. Then get our booklets "How to Use ex-Gov. Lenses and Prisms." Nos. 1 and 2, price 2/6 ea. Also our Stereo Book "3D Without Viewers," price 7/6. Comprehensive lists of Lenses, Optical, Radio and Scientific Gear, free for s.a.e. H. W. English, Rayleigh Road, Hutton, Brentwood, Essex.

MAKE YOUR OWN GREENHOUSE. Size 8ft. 6in. x 6ft. wide; complete kit of accurately machined timber. Yours for 42/- deposit; cash Price £13/10/-. Write for details to Garden-Craft (Newark) Sutton-on-Trent, Newark.

PHOTOGRAPHY

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

BOOKS

10,000 FORMULAS and Manufacturing Secrets. Finest book ever published for the man interested in saving money, earning money, or simply "making things." Send s.a.e. for details. Frobisher Co., Dept. P., 10, Lune Street, Preston, Lancs.

WOODWORKING

PLYWOOD, 36 x 12 x 3/16, 13/- doz.; 24 x 12 x 3/16, 9/6 doz.; c.p.; s.a.e. for list. Parmount (Dept. P.M.), Burnley Road, Rawtenstall.

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

ARE YOU LOOKING FOR A RELIABLE FIRM for Timber Plywood, Wallboards, Veneered Plywood; call at our warehouse or send s.a.e. for price lists. N. Gerver, 2/10, Mare Street, London, E.8 (near Cambridge Heath (E.R.) station). (AMHerst 5887.)

WOODWORKING MACHINES, all cast-iron constructed. Complete Saw Benches, 7in., £4/15/-; 8in., £5/10/-; 10in., complete, motorised, £30. Planers, 5in., £12; Bowl Turning Heads, £4; with 8in. Saw Tables, £7/10/-. Lathes, £7/10/-; Combination Lathes, £10/10/-. Motors, Pulleys, Belts, etc. 12 months' written and money refund guarantee. 4d. stamp for illustrated booklet. James Inns (Engineers), Marshall St., Nottingham.

XLL-ALL Combination Saw Bench and Moulder, 10 in 1, will rebate, tongue and groove, mouldings, chamfering; special offer £9, complete saw and cutters. Speedwell Works, Lightwater, Surrey.

HANDICRAFTS

MUSICAL MECHANISMS. Swiss made for fitting in cigarette boxes, etc., 18/- each. Send s.a.e. for complete list of handicraft materials. Metwood Accessories, 65, Church Street, Wolverton, Bucks.

MAKE YOUR OWN MUSICAL BOX, Swiss-made movements, 22/6. S.A.E. list of tunes. Best make only. Albert's Music Shop, 45, Heath Road, Twickenham.

LEATHER for all Leatherwork. Send 2½d. stamp for list and 25 to 30 cuttings. Bowell Agencies, 39, Sandringham Avenue, Leicester.

EDUCATIONAL

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

LEARN IT AS YOU DO IT.—We provide practical equipment combined with instruction in Radio, Television, Electricity, Mechanics, Chemistry, Photography, etc. Write for full details to E.M.I. Institutes, Dept. P.M.47, London, W.4.

MERCHANT NAVY Radio Officer Cadet Training School. World travel and adventure overseas. Brooks' Bar, Manchester.

CELLULOSE

ENTHUSIASTIC POPULARITY!! Cellulose Veneers, washable, flexible; white, black, pearl, glitter; 1,001 uses; all crafts; mixed parcels, 3/6, 6/6, 12/6, p.p. Jackson (Dept. P.M.), "Ouseburn," Woodmansey, E. Yorks.

WATCHMAKERS

IN THE PAST FEW MONTHS we have dealt successfully with many readers' Watch Repairs. Why not send us yours? We succeed where others have failed. Hereford Watch Co., 43, Broad Street, Hereford.

WATCH DIALS reprinted by return post. Write for prices. Gleave & Co., Albemarle Way, E.C.1.

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

WATCH AND CLOCK PARTS, large stocks of all spares, Balance Staffs, Winding Stems, Hair Springs, Complete Balances, etc.; return postal service. Send for latest free lists. H. S. Walsh, 27/28, Anerley Station Road, London, S.E.20.

(Continued on next page)

(Continued from previous page)

MODEL DEALERS

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

HOLIDAY ACCOMMODATION

TOURING HOLIDAYS. "Bed and Breakfast in South & South-West England." Superb Illustrated Guide describing recommended Inns, Farms, Guest Houses, Hotels, etc., 2/9, post free. Herald Handbooks, 3, Teevan Road, Croydon.

INVENTIONS

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

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order 1952.

A.M.I.Mech.E., A.M.Brit.I.R.E., City and Guilds, etc., on "No Pass—No Fee" terms. Over 95% successes. For details of Exams. and courses in all branches of Engineering, Building, etc., write for 144-page Handbook—Free. B.I.E.T., (Dept. 967B), 29, Wright's Lane, London, W.8.

MEN WANTED. — Dignified, well paid career as a Physical Training Instructor. One hour's daily study qualifies in a few months for official diploma. For free details of enrolment, write to: DIRECTOR OF STUDIES, Physical Training Instructor's Course, International Federation of Physical Culture (Dept. P.M.2), Bank Chambers, High Holborn, London, W.C.1.

TECHNICAL INFORMATION SEARCHER. Chartered Patent Agents in Central London have vacancy for a man with an engineering background, preferably to National Certificate level. General education to Matriculation standard. An office job with a 5-day week and short hours. Applicants for interview should state age and give details of education, examinations passed, and experience (if any). Write Box 253, Reynells, 44, Chancery Lane, W.C.2.

MISCELLANEOUS

BUILD YOUR OWN REFRIGERATOR, all components available at reasonable prices. Frigidaire flowing cold units £5; small units, Kelvinator, etc., £4; ¼ h.p. heavy duty Motors, £3; Chrome Cabinet fittings, new, £1; money back guarantee; s.a.e. for list and schematic diagram. Wheelhouse, 1, The Grove, Isleworth, Middx. (Phone: Hounslow 7558.)

"FORTUNES IN FORMULAS," 900-page American book of formulæ. American technical hobby and other books covering every interest. Stamp for lists. Herga Ltd. (Dept. P2), Hastings.

INEXPENSIVE DIAMOND LAPS. Sharpen small carbide and steel tools without heat. Leaflet available. W. J. Millet, C.M.B.H.I., Saint Ives, Huntingdon.

RECTIFIERS, Motors, Transformers, Compressors, etc. S.A.E. list. L. Unwin, Bousley Rise, Ottershaw, Surrey.

PRACTICAL MECHANICS, August, 1942-October, 1949 (May, 1943; August, October, 1947, missing). Offers, part or whole. Box No. 124, c/o PRACTICAL MECHANICS.

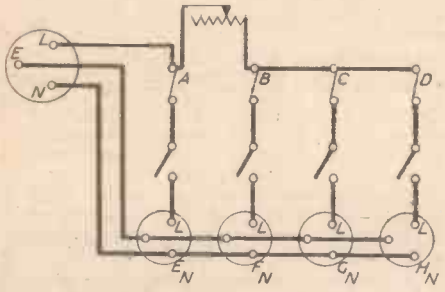
COMPRESSOR EQUIPMENT. Miscellaneous Items; catalogue 1½d. Pryce, 157, Malden Road, Cheam.

SIR,—Re Mr. A. T. Thompson's query about shop window condensation. I would advise him to put an electric fan in the window, two if required, and set so that they blow on the window. This method, in my experience under similar conditions, is ideal.—E. WALKER (Lancs).

Lighting Control Panel

SIR,—In the January, 1955, edition of PRACTICAL MECHANICS you suggest a circuit for a lighting control panel. I notice that the last socket only is controlled by a dimmer, meaning that only one of the three circuits or any additional circuit may be controlled by the dimmer at any one time.

The sketch shows your original circuit with a slight modification, which, I think, will be more suitable for Mr. Fox.



Mr. D. Woolnough's modified circuit.

If the light for the prompter is controlled from the first socket it will be at all times on full voltage, and allowing the foot and headlights to be controlled by the dimmer. On any other occasion if it is desired that more than the prompter's light should not be dimmed, then the dimmer will be placed between B.C. or C.D. as desired and placing the strap from either of these connections as used between A.B.—D. WOOLNOUGH, (Manchester).

SIR,—May I point out an error in the circuit diagram of my switchboard published in the March issue of PRACTICAL MECHANICS ?

The main dimmer and shorting plug should not be in parallel with the input to the distributor but in series. Also, a small detail, the vacant socket of the prompt light should connect to the wire (N) immediately below it.—L. CORDEAUX (W.1).

Velocity of Light—Correction

SIR,—An error appeared in your recent article on the velocity of light. The optical determination to which you give some attention was carried out by Michelson, Pease and Pearson and it has no connection with the famous relativity experiment of Michelson and Morley.—L. ESSEN (Nat. Physical Laboratory).

Making a Lathe Stand

SIR,—With reference to the article, "Making a Lathe Stand," by Mr. W. E. Rickards, in the March issue of PRACTICAL MECHANICS, I would like to draw your readers' attention to the danger in the suggested method of bringing the mains feed to the socket by means of a three-pin plug.

Plugs should, on no account, be used to feed current to a socket as the danger of shock from the live and unprotected prongs of the plug is obvious.

The correct method of wiring would be to connect the mains cable direct to the spot-light switch/socket, and the incoming end of the cable to a three-pin plug for use with a separate socket connected to the mains supply.

If it is really necessary to have a detachable cable to the lathe stand, there are special plugs and sockets available for the purpose.

I would also point out that motors of the induction type used in the vast majority of home workshops do not require radio and television suppressors. Only on direct current motors, universal and commutator type AC motors are suppressors necessary.—AUSTIN WADSWORTH (Glasgow).

Home-made Fishing Tackle

SIR,—In the article on home-made fishing tackle (March, page 251) it is stated that the materials needed are brass, duralumin and steel. It is further stated that if the reel is to be used for sea fishing "Birmabright" should be substituted for duralumin.

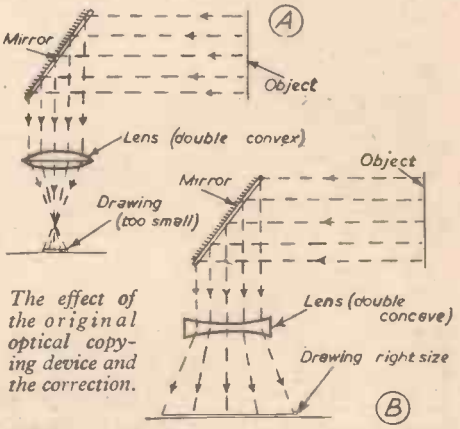
I would like to point out that even if corosion resistant aluminium alloy is used a great deal of corrosion would take place between the alloy and the brass and also to a lesser degree between the brass and steel due to galvanic action.

It is suggested, therefore, that if it is necessary to use aluminium, that B.S.S.1476 NE5 be used and that all other parts be of "active" stainless steel.—A. WATSON (E. Molesey).

Optical Copying Device—Correction

SIR,—In December 1954's issue of PRACTICAL MECHANICS the diagram of the optical copying device on page 136 is more misleading than helpful, simply because the lens shown is incorrect.

The light rays coming from the object and being reflected by the mirror would be refracted inwards, and not outwards on to the drawing; which is contrary to that shown in the diagram. The lens used should be a double concave and not a double convex. The lens shown has the effect of drawing light and heat rays to a focus point (sketch A). I submit a more feasible diagram, i.e., sketch B.—L/CPL. HOLFORD (Gibraltar).



The effect of the original optical copying device and the correction.

Making An Aqualung

SIR,—Re January, 1955, issue, "Making an Aqualung," by E. T. Fearon. Having had considerable experience with the type of demand valve quoted therein, I would state that unless you advise additional modification thereto it can be *dangerous to life.*

The standard screws holding the top to the bottom are too weak, and frequently break in use. They should be drilled out and replaced by larger ones.—G. CALVER (Stoke-in-Teignhead).

[*AUTHOR'S COMMENT : Presumably what Mr. Calver means is that the heads of the screws can be turned off with a screwdriver by over-enthusiastic use during repair or maintenance. Anyone who carries out repairs or maintenance at the bottom of the sea deserves what he gets !*]

Oxygen Regulator Supplies for the "Practical Mechanics" Aqualung

Messrs. Watson Eastern Motors, who were mentioned as suppliers of the above, regret that they have sold their stock of oxygen regulators but are negotiating for further supplies. An announcement will appear in PRACTICAL MECHANICS when these are received.

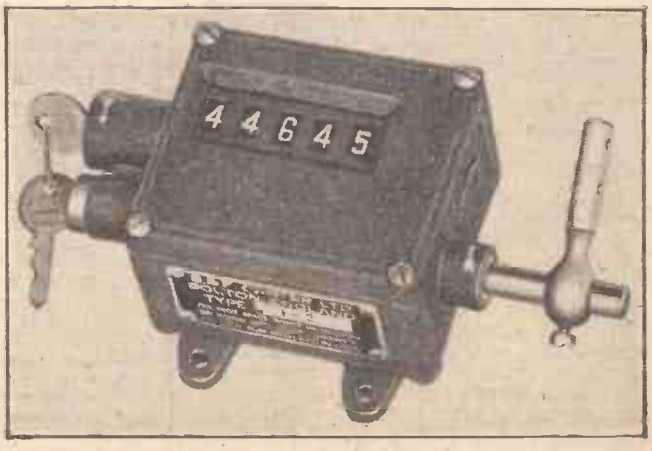
TRADE NOTES

(*Continued from page 310*)

Counter situated in the works office or some other suitable position a considerable distance from the production shop. In this instance the Electro-Magnetic Counter is recommended. The dimensions of this robust instrument are only 5½in. by 3in. by 2¼in.

In addition, B. and F. Carter and Co., Ltd., manufacture a very large range of instruments embracing counters with various numbers of figures, and re-sets can be arranged with either a fixed re-set lever or loose key. For example the Ratchet and Revolution Counter shown in the photograph is supplied with a yale key re-set, ensuring the person in charge only can re-set the instrument. These are ideal for large presses and brick-making machines. The full range of "Albion" Counters incorporates many improvements, the introduction of phosphor-bronze oil-impregnated bushes and the patented cam roller re-set action ensure accurate recording and smooth action over long periods, these are very necessary for accurate counting and measuring when recording output of either the electrical or mechanical type.

B. and F. Carter's technical staff will be pleased to recommend a counter for any particular requirement. Their address is B. and F. Carter and Co., Ltd., Albion Works, Bolton.



One of B. and F. Carter's ratchet and revolution counters.

Your Queries Answered

RULES

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

Bringing Out Wood Graining

PLEASE advise me how to make the grain and "feathering" stand out more prominently in wood. The results I have had so far with linseed oil and spirit stains, finishing off with wax, leave good timber looking very ordinary. Are oil stains more suitable than spirit stains?—Thos. C. Brown (Newcastle-on-Tyne).

THE problem of rendering the grain of wood prominent depends for its solution on how far the wood fibre can be selectively stained. Some stains have more selective actions than others. Oil stains, for instance, are more selective than spirit stains. Hence, for your particular purpose, oil stains would be the more satisfactory of the two, because spirit stains tend to be absorbed more equally. Water stains are often more selective still. They tend to swell the wood and "raise the grain," so that the wood surface has to be sandpapered again. Wax stains, on the other hand, tend merely to lie on the surface of the wood. You can make such stains by melting the wax polish very gently and then by dissolving any oil or wax soluble dye in the molten wax or wax mixture. Oil stains may be made merely by dissolving oil or wax-soluble dyes in linseed oil.

We have usually found that if the wood is lightly stained with a water stain (a mere solution of a dye in water) and afterwards lightly sandpapered, a light oil staining is sufficient to bring up the maximum grain. The wood surface is then finally gone over with a hard wax polish. This gives the dull sheen which, we assume, you desire, and which is certainly of artistic worth and very much to be preferred to the hard, glossy finishes which are commonly given to furniture woods by means of synthetic resin solutions.

Melting Aluminium

WOULD you please inform me as to the best method of melting pure aluminium, with equipment which as far as possible could be home made ?

I am desirous of making small castings in sizes up to 12in. square by ¼in. thick, and any advice on this would be welcome. —R. Latham (Padiham).

IT is a comparatively easy matter to melt scrap aluminium on a small scale. The pure metal melts at about 657 deg. C. On a small scale it is best melted in an iron pot or in a plumbago crucible. The pot should be placed on some type of blacksmith's furnace, i.e., a fire which can readily be blown to near white heat by using a blast of air. Begin by placing small, thin pieces of the scrap metal at the bottom of the pot. Let these melt first; then cover the molten metal over with a ½in. layer of charcoal dust. Add more metal to the pot. Allow this to melt, and so proceed until the whole pot or crucible is fairly full of the molten metal. Remember, of course, that the greater the mass (or quantity) of molten metal which you have in the pot, the greater will be the amount of heat required to keep it molten.

The aluminium can be cast in iron, steel or concrete moulds. The two former types are by far the best. It can also be cast in sand, but for particulars of the many details concerned with sand moulding we must refer you to any textbook on the subject, which you will be able to obtain at your nearest reference library.

Plaster Casting Queries

I HAVE just received an order for a large quantity of plaster figures and plaques and have the following queries.

(1) How can I speed the drying of the articles cast in dental plaster? Some of which were cast weeks ago are soft and wet still, while others are quite hard and dry.

(2) What proportion of plaster and water should I use for the best results?

(3) Will the addition of 10 per cent. of asbestos dust prevent the reproduction of fine detail?

(4) How do commercial firms produce such large quantities? Do they use centrifugal machines to eliminate bubbles and force the plaster into the most detailed parts?

(5) When using plaster moulds, what is the best parting agent and the best means of separating, say, a bas-relief from the mould without damage to either?

(6) Can you recommend a good book on casting practice for really large quantities.—G. Neal (Co. Cork).

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

I FINE white plaster may be better than dental plaster, and can be speeded by adding alum to the water. As plaster varies so much it is best to find the right amount by experimenting with a little first; a medium strength solution will greatly accelerate setting.

2. There is no fixed rule in respect of the best proportion of plaster and water. Plaster should be scattered into the water by hand; gently and quickly until it floats on the surface, the mixture is then stirred briskly. Tests on small amounts will give the correct proportions.

3. The addition of 10 per cent. asbestos dust should not prevent the production of fine detail—again, trial and error with a small amount will help to give the best results.

4. Commercial firms do not, to our knowledge, use centrifugal machines to eliminate air bubbles. Simply tap the mould whilst the plaster is in liquid form; blowing on the surface also removes bubbles.

5. When using plaster moulds it is wise to shellac the inside of the moulds, and, depending on the model, it may be necessary to use thin brass or tin fences. Ordinary grease can be used as a parting agent.

6. I have yet to come across a book dealing with large-scale production of plaster models. Most people like to keep their methods secret. Plaster casting cannot be learnt from one sitting, the best way is to experiment with small quantities, and learn from experience.

Aquarium Queries

I AM interested in the construction of an aquarium for tropical fish and would be very grateful if you will give me an aquarium cement formula, what metals are generally used in the construction of the thermostat, and where I can purchase 14 gauge 1in. L iron—suitable for the frame.—E. V. Fritche (Leicester).

THE following is a good aquarium cement formula:

Silver sand	... 10 parts	Parts by volume
Plaster of Paris	... 10 parts	
Powdered resin	... 2 parts	

The above ingredients are intimately

(*Continued on page* 320)

mixed together. After this, the mixture should be mixed with about half part of umber, i.e., the brown pigment obtained from decorators' shops. Mix the resulting product with boiled linseed oil to make a stiff putty. Add the oil in small amounts at a time, thoroughly mixing it in before adding more. The purpose of the umber is to make the oil dry out quickly.

Another type of cement which you may like to try is the following :

Marine glue ...	12 parts	(By weight)
Slaked lime ...	25 parts	
Turpentine ...	10 parts	
Copal oil varnish	35 parts	
Boiled linseed oil	15 parts	

All the ingredients should be placed in a double-walled pan or in a glass jar standing in a pan of water, and thus slowly heated and stirred until the marine glue has melted and incorporated with the remainder of the materials.

There are many types of thermostats. The type we think you mean is the electrical one, which is operated by the controlled expansion of a bi-metal strip or spring. Brass and steel are commonly used metals in such a strip.

You will, we think, be able to purchase these aquarium thermostats from Messrs. De Von & Co., 127, King's Cross Road, London, W.C.1, or from Messrs. B. T. Child, 113, Pentonville Road, King's Cross, London, W.1. Similarly, thermostats are obtainable from Messrs. L. Cura and Sons, Ltd., Bath Court, London, E.C.1.

Possibly, you will be able to obtain angle iron from one or other of the above firms. If not, apply to Messrs. H. Rollet & Co., Ltd., 6, Chesham Place, London, S.W.1. This material is also supplied by many firms of engineering tools and equipment dealers, of which there are probably several in your town.

Dyeing Lambskins

I HAVE several lambskins which are white. I wish to use these as a rug but would like to dye them darker, either brown or black. Can you give me any information about this as I do not want to spoil the skins ?—D. Royston (Sheffield).

SOAK the sheepskins in cold water until the wool is thoroughly wetted, then transfer them, after draining, to a tannic acid bath in which they should be immersed for about six hours. This bath should contain 5 parts of tannic acid to every 95 parts of water (both by weight). The skin is then withdrawn from the tannic acid bath and passed through light rollers in order to remove superfluous solution. After this it is entered into the cold dye bath which latter, during one hour is slowly raised up to near boiling-point and retained at about that temperature for one hour. The wool will now be fully dyed. It should be removed from the dye bath, drained and then rinsed in cold water. The dye bath composition should be :

Dye	5 parts	by weight
Glauber's salts ...	5 „	„
Water	90 „	„

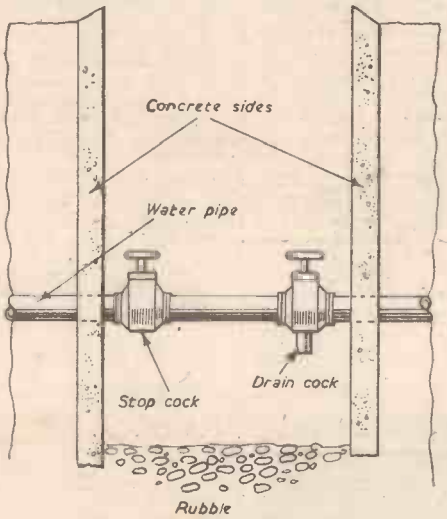
Note that only dyes of the " acid " type are really suitable for this work. The following are some examples of these dyes :

Naphthol Yellow, Quinoline Yellow, Fast Light Yellow G, Flavazin, Brilliant Yellow S, Alphanaphthol Orange, Chrysoin, Orange II, Brilliant Orange R, Fast Acid Scarlet, Fast Red E, Fast Acid Magenta, Wool Red B, Victoria Violet, Acid Violet 6B, Alkali Blue, Soluble Blue, Night Blue, Patent Blue, Acid Blue B, Nigrosine (Black), Acid Green, Fast Green, Naphthol Green B, Fast Brown, Naphthol Black B, Naphthol Blue Black, Naphthylamine Black D, Wool Black.

Drainage Problem

I HAVE a hole with concrete sides and cast-iron cover which gives access to a water stopcock and another tap for draining the pipes. The bottom of the hole is earth for drainage, but I find the water seeps in through the bottom after rainfall and does not drain properly when I open the drain taps to empty the pipes. The soil is clay and I have dug the hole deeper and put in rubble but with no effect. Can you suggest a cheap and effective means of overcoming this ?—E. E. Coles (Luton).

IT is a little difficult to advise without knowing more about the lie of the land and relative level. However, it would seem



Mr. E. E. Coles' stopcock pit.

that your present sump is acting as a well and having clay under your subsoil effectively prevents natural drainage.

We suggest two alternatives, the first being to concrete the bottom of the hole so as to keep out seepage from the soil and empty by bailer or siphon. Alternatively, if you have a point at lower level than the sump hole cut a narrow trench to this point and sloping very slightly from the lowest convenient level in the sump (just below concrete sides) and lay an earthenware 2½in. drainpipe. The lengths need not be joined with cement, but this should drain the water away to a lower level. Fill in the trench after laying the earthenware pipes.

Transferring Newspaper Cuttings

I HAVE some newspaper clippings (photographs) which I wish to transfer on to plain paper. Could you supply me with the formula of a suitable transferring medium ?—R. J. Sinclair (Bangor).

A SOLUTION suitable for transferring newspaper ink impressions is the following :

Liquid soap	6oz.
Potassium carbonate	1oz.
Trigamine (or other wetting agents)	½oz.
Water	3 pints

Moisten the newsprint picture, then place it face downwards on to a sheet of unglazed paper, rub with the back of spoon.

An alternative formula is :

Diglycol stearate	4 oz.
Soda ash	½oz.
Turpentine or Naphtha ...	10oz.
Water	3 pints

Dissolve the diglycol stearate in the water by warming and stirring, then add the other ingredients with rapid stirring until an emulsion is formed. The finished product is used as above.

Information Sought

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

Mr. J. Reeve, of Doncaster, asks for : " Details of a 9ft. portable dinghy with outboard motor and suitable for carrying on a car top."

G. E. Neve (Potters Bar) writes : "I am building my own garage and due to the position of it I find ordinary swing doors are not practical. I wish to make the doors of the ' up and over ' type.

"Would you give me a rough sketch of the general design and also the best material."

From J. Delaney, of Woodford, comes the following : " Kindly let me know how to make a simple plane-table and also how a ' telemeter ' works."

R. M. Mitchell, of Cardiff, asks : " Could you give me details on how to construct a pair of skis together with the associated equipment ? "

The following is a letter from A. E. Atkins, of Southport : " I have a half-size slate-bed billiards table, and am thinking of re-covering it completely. Can you advise me of the best procedure ?

"Also, I am in need of information on rewinding the armature from a Hoover Junior Vacuum which I wish to use."

Mr. R. L. Pye asks : " Could you supply me with any formulae for indoor fireworks. Snakes, ferns, snowstorms and such like ? "

D. Stephens (Rhondda) writes : " I recently purchased an ' Imperia ' knitting machine but find that the firm is now out of business ; therefore I cannot buy new knitting machine needles.

"Can you tell me any firm that would make me these needles ? There is no address of any kind on the machine, only the words ' Imperia Sock Knitting Machine.'

"Can you trace for me if they were taken over by another firm ? "

J. M., of Peebles, writes : " I have read of electrically-heated flying suits provided for airmen, and wonder if it is possible to construct electrically-heated mittens, the power to be provided either from a car battery or from a portable pocket battery."

W. G. McFarlane (Glasgow) writes : " I would appreciate your advice on the conversion of a bell-type toilet cistern to one of the type which has a valve arrangement and an inverted ' U ' pipe in the cistern. I have a lathe and the necessary tools."

Mr. R. L. Wright, of Wolverhampton, asks : " Could you give me details for constructing a ventriloquist's dummy ? "

A letter from A. Grossmann (N.W.7) asks : " I wish to construct a small electric muffle furnace with inside dimensions approx. 6in. x 4in. x 3in. suitable for vitreous enamelling on metal. I would be grateful for any information regarding materials."

J. M. James (Birmingham) writes : " Could you supply me with details for constructing Venetian blinds, using wood or aluminium for the slats ? I wish to make them for a kitchen window, 6ft. x 4ft. 6in."

THE Cyclist
Editor: F. J. CAMM

VOL. XXIII APRIL, 1955 No. 395

All letters should be addressed to the Editor, "THE CYCLIST," George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2

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

COMMENTS OF THE MONTH By F. J. C.

The Bicycle Publicity Committee

WE are glad to note that the British Cycle and Motor Cycle Manufacturers' Union has formed a Bicycle Publicity Committee with the object of securing increased publicity for cycling. The chairman is Mr. D. D. McLachlan, of the Hercules Cycle Co., and the members of the Committee are Mr. H. M. Palin (Director of the Manufacturers' Union), Mr. S. C. Woods (Raleigh Industries), Mr. V. G. Taylor (B.S.A. Cycles), Mr. A. J. Northwood (Phillips Cycles), and Mr. Hilary Watts (P.R.O. of the Union). Attempts have been made in the past to gain publicity for cycling, by the C.T.C. and others, but nothing has succeeded to the same extent as the efforts of the British League of Racing Cyclists, who have made cycling front page news and newspaper editors cycling conscious. Publicity for cycling cannot be gained only on its merits as a healthy pastime. It must be linked with sport, and no doubt the new committee has this in mind. To popularise cycling it is necessary in preaching to the unconverted to remove from their minds the impression, which is undoubtedly there, that cycling is hard work. An investigation would show that those holding this view were equipped at some time in their lives with bicycles which were not tailored to their physique. It is important that dealers should be instructed in the art of selling the right type of bicycle to a particular customer, both as to gear, frame style, saddle position, type of saddle, and handlebar. So many dealers sell any particular cycle they may have in stock in order to secure the sale. As we have said, publicity for cycling, if it is to be of value to the trade, must find new customers, and the new customers are the as yet unconverted.

Presumably, publicity will draw attention to the marvels of the modern bicycle, its health-giving properties, the joys of cycle touring, its utility value as a vehicle of transport, its handiness for shopping and short journeys, and so on. Directly that interest is gained, the prospective customer will go to a cycle dealer, and that is where the publicity will either succeed or fail. We suggest therefore that in the early stages of their campaign the Bicycle Publicity Committee conducts a campaign amongst cycle dealers, and this it may easily do through the members of the union. Lyrical words about the bicycle being "poetry in steel," "the modern giant's boots," and similar fancy phrases will not convince a man who rides off on too high a gear fitted to a Dreadnought machine with an unsuitable saddle and handlebars wrongly adjusted.

A few bicycle manufacturers in the past have inserted booklets in the saddle bag, explaining the virtues of cycling. One, indeed, was written by our contributor, Frank Urry. We suggest, however, that as the manufacturers are now making a concerted attack on cycling publicity they should make a similar attack on dealer methods. In the motor trade, dealers have to undergo a course in servicing before they are allowed to take up a main agency. We suggest that a similar method should be adopted in the bicycle trade.

1955 Cycle Show—Royal Patronage

HER MAJESTY THE QUEEN has approved the grant of Her Royal Patronage to the 1955 Cycle and Motor Cycle Show to be held in London from the 12th to 19th November, 1955, presumably at Earls Court.

Bicycle Production

AN indication of the expansion of the bicycle industry is given by the export figures recently announced by the manufacturers: 181,453 bicycles valued with parts at £2,460,820 were exported during January, 1955, compared with 137,244 machines (value with parts £1,932,841) exported in the corresponding month in 1954. This represents an increase in value of nearly £528,000.

Regarding bicycle production, the latest figures from the Ministry of Supply show that 322,000 bicycles were produced during November, 1954. This is a great improvement (46,000) over the quantity produced in November, 1953, when 276,000 machines left the factories. This figure of 322,000 equals the previous highest monthly total in 1954 (September) and both represent the highest monthly average figures achieved since the peak year of 1951.

The Real Cause?

IN an article entitled: "The Real Cause of Road Accidents," the motoring correspondent of the *Star* wrote the following: "It has become customary to blame inadequate roads and congested conditions, but let's face up to it, the major cause of accidents is the behaviour of motorists themselves. If we could analyse the cause of accidents . . . a majority of them, and particularly fatal ones, are caused by excessive speed, which is not necessarily high speed. Every driver should realise that while it is moving, his car is like a loaded gun in his hand." The motoring correspondent, who in this case is Mr. L. H. Cade, has evidently changed his views for he has not always written in this strain! In any case, he should at least take some pains to verify his statements. For it is not true that the majority of accidents are caused by excessive speed, whatever that speed may be. If Mr. Cade, who presumably receives copies of Ministry of Transport statistics and the statistics issued by Scotland Yard, studies them he will know that speed is not the major cause. Some accidents, indeed, have been caused by pedestrians walking into stationary cars, others due to dazzle and most to carelessness.

If, as Mr. Cade thinks, a car is like a loaded gun in the driver's hands, he should issue his warning to pedestrians, for while a man is driving a car it will always be "like a loaded gun." Carelessness is not the sin of remissness of any particular section of road users, and for Mr. Cade to direct his remarks to motorists only is to run counter to established facts supported not only by the M.O.T. and Scotland Yard, but by the R.A.C. and the A.A.

Understandably, Mr. Cade's words have brought comfort to many and particularly in the cycling movement. One writer suggests that makers should build safety into motor-cars, thereby suggesting that vehicles to-day are unsafe. He also thinks that motoring organisations should refuse to defend an obviously guilty member, thereby suggesting that they should constitute themselves as judge and jury before the case has been heard by magistrates. The writer suggests that it is the policy of the cycling organisations not to defend "obviously guilty members." Judging from the number of cases defended and lost by the C.T.C., this cannot be true, but to our certain knowledge the motoring organisations give a great amount of consideration to each case submitted to them for defence. To suggest that a man "obviously guilty" should be tried beforehand by his own organisation, found guilty, and denied the rights of defence in mitigation, a right which is extended to an obviously guilty murderer, is to suggest a malicious, punitive and unrealistic outlook on British justice.

London Speed Limit Enquiry

THE special sub-committee set up by the London and Home Counties Traffic Advisory Committee, at the request of Mr. John Boyd-Carpenter, Minister of Transport and Civil Aviation, to review the 30 m.p.h. speed limit on roads of traffic importance in the London Traffic Area, have invited views on this subject from associations and other bodies representing local authorities, trade and industry, road users, and others specially interested.

Other associations or bodies which would like to submit views are invited to send them to the Secretary, Mr. P. E. Lazarus, 21-37, Hereford Road, London, W.2.

The Roadfarers' Club has already submitted its views. It states without equivocation that there is no need for a speed limit in London and similar places and that it should be abolished altogether. Official statistics show that the average speed through London is 8 m.p.h., and whilst the authorities are trying to find a solution to our congested road problem and to find a method of relieving traffic jams, they should remove one cause of it—namely the speed limit. It is monstrous that a person can be prosecuted for exceeding the speed limit within an hour's travel during which he has travelled 8 miles. The police will support

(*Continued at foot of page* 41)

At What Rate Do You Ride?

How to Measure Your Speed

By FREDERICK JACE

ALL travellers whether they ride bicycles, motor-cycles, or motor-cars are, like fishermen, not averse to stretching the truth. When dealing with the rate at which they have covered a particular journey, none of them err on the side of modesty, and 15 miles an hour, by the simple process of forgetting a few minutes at the beginning of the journey and at the end of it, becomes 18 miles an hour. In no case does a cyclist ever say that he has travelled at a lower speed.

The Acid Test

The crudest methods are sometimes employed to measure the rate of travel, and in the absence of an accurate speedometer cyclists will endeavour, whilst riding, to read the running seconds hand of a small, cheap, and therefore inaccurate, wrist watch. The acid test is to have two accurate watches operated by two observers stationed a measured distance apart, the first pressing the stop mechanism of the watch the moment the front wheel has passed over the "line," and the second stopping his watch the moment the front wheel passes the finishing "line."

Unless you adopt this method or use a very accurate speedometer you are merely practising self-deception. For such as these, and, indeed, all those who either cannot or do not care to take the trouble to calculate for themselves, the table on this page will be of use.

First, I will give a short account of how the calculations are made, so that anyone may prove for himself that these are not fancy figures, but indisputable facts.

How the Figures Were Obtained

Everyone on buying a bicycle knows the number of inches to which it is geared. For example, we will suppose our bicycle is geared to 63in., this means simply that one revolution of the pedals will, by means of the large driving chain-wheel, send the bicycle the same distance as if the wheel was 63in. high, and turned round once.

Now the circumference (i.e., the length round the rim) of a circle is known to be approximately 3 1/7 times the diameter or height, so that one turn of the pedals will send our bicycle along a distance of 63in. by 3 1/7in., 198in., or 5½ yds. As there are 1,760 yds. in a mile, we have for each mile we travel to turn our pedals $\frac{1,760}{5\frac{1}{2}}$ times, which comes to 320 revolutions a mile.

Again, if we are travelling at 15 miles an hour, we go a mile in exactly four minutes—that is, we make 320 revolutions in four minutes, which is the same as 80 revolutions each minute (see table). All the other calculations in the table are made in a similar manner.

Results

Secondly, I will discuss briefly the table itself and the results from it.

Gear of machine (in.)	53	58	63	68	73	98
Number of revolutions made each mile	380	348	320	296	276	206
Number of revolutions made each minute when riding:						
24 miles per hour ...	152	140	128	118	110	82
20 " " " ...	127	116	107	99	92	69
15 " " " ...	95	87	80	74	69	51
12 " " " ...	76	70	64	59	55	41
10 " " " ...	62	58	54	49	46	33
8 " " " ...	51	47	44	39	37	27
Pace in miles per hour when making:						
Revolutions—						
2 in each second ...	19	20¾	22½	24½	26	35
1½ " " " ...	14¼	15½	16⅞	18¼	19½	26¼
1 " " " ...	9½	10⅜	11¼	12⅙	13	17½
¾ " " " ...	7	7⅝	8½	9	9¾	13
½ " " " ...	4¾	5	5½	6	6½	8¾

By revolution is meant throughout this article one complete turn of the pedals, i.e., when one pedal has described a complete circle.

At the head of the columns are given six different gears, the first five of which probably embrace all road machines, while the sixth (the gear of a track man) is simply placed for comparison.

Any rider has only to look for the gear of his machine in the top horizontal column and the numbers vertically below it will apply to him throughout. If, however, his machine is geared between any two of the given gears, the results throughout will be proportionately between the numbers given in the two vertical columns.

Pedalling Speeds

To make use of the results of this table we must know something as to the number of revolutions it is possible to make in a given time. It will be found that 120 revolutions a minute, or two a second, is exceptionally fast work, only attainable for very short distances; in fact, the limit of speed may safely be placed at 130 revolutions a minute, or a fraction more than two a second. Going down the scale, 90 a minute or 1½ a second is still distinctly fast work; 60 per minute, or one per second, medium; 45 per minute, or ¾ per second, and 30 per minute, or ½ per second, slow and very slow, respectively.

Taking the average road gear for a man as 63 and for a woman 58, we find that travelling 20 miles an hour even for very short distances is a fast pace, while from 10 to 15 miles an hour downhill, and from five to 10 uphill is a fair medium, which will probably, if the hills are equally proportioned, give an average of 10 to 12 miles an hour.

Buying a Bicycle?

Finally, I must give a word of caution to those who intend buying bicycles, and who might be influenced by this article into getting high-geared machines. It must be remembered that the higher the gear the less easy it is to climb hills, so that for ordinary road use the best gear for women is probably 55 to 60, and for men from 60 to 65.

As I have pointed out many times before in this journal, it is better to be under-geared than over-geared. If you feel that you want a change of gear, or if you cycle in a district where many hills are encountered, several alternatives are open to you. You can employ, for example, a rear wheel with double sprockets, merely reversing the wheel to obtain the alternative ratio. You may select a bicycle equipped with a three-speed or two-speed hub, or you may fit to your bicycle one of the many derailleur gears now available.

It is significant that practically every maker now supplies one or more models equipped with one of these two forms of gear, and there can be no doubt that bicycles of the future will nearly all be equipped with gears.

A good speedometer and a good watch are essential if you want to know the speed at which you really travel. A good watch is a good friend.

If you are in training for speed work it is very necessary that you check your form by measuring your speed, taking a careful note of the results obtained from a given system of training. It is not sufficient merely to "think" that such-and-such a method is giving improved results over another. Careful time tests recorded in a notebook remove all doubt.

The new 1955 model LESDIX Crystal Set

in black or brown bakelite case, fitted litz wound tapped aerial coil for long or short aerial, var. solid dielectric condenser, germanium detector needing no adjustment, sockets for aerial and earth connections and double headphones, fitted headband cord and plug. 30/-, post 2/6.

THE JUNEERO METAL CONSTRUCTIONAL KIT with Xakto slide gauge. Model 2A consists of the Multi-purpose tool, vice with slide gauge and protractor, scroll tool, metal cutting shears, screw cutting die, spanners, steel strip and rods, angle iron, nuts and bolts, springs and discs, plain and corrugated metal, instructions and design sheet. List price 49/6. **Brand new and boxed, OUR PRICE 35/-**, post 1/6.

SEWING MACHINE MOTORS. New 230 volt a.c. with fixing bracket for any domestic sewing machine. Foot switch and needle light, £6.10.0, fully guaranteed.

TRANSFORMERS. Double wound, 230 volts 50 cycles input, 12 volts 4 amps., and 24 volts 2 amps. output, 35/-, post 2/-. 53 volts 15 amps. output, £6.10.0, carr. 7/6. Many other sizes in stock. Write for list.

WATT HOUR METERS. Chamberlain & Hookham 20 amps., 230 volts a.c., 50 cycles. 25/-, post 2/6.

FLEXIBLE DRIVES. For small motors, 7ft. long with ¼in. square both ends. 5/6, post 1/-.

NIFE BATTERIES. New and uncharged surplus. 1.2 volt 45 a.h. cells, 30/-, plus 2/- post. Bank of 10 cells in wood crate for 12 volts 45 a.h. £12.10.0, carr. 10/-.

LIGHTING PLANTS. D.C. 12/18 volts, 360 watts, Alco Lyon with switchboard and tank, £20. 36 volts 36 amps., 1260 watts, £35. *Write for list.*

ELECTRADIX RADIOS
Dept. H,
214, Queenstown Road, London, S.W.8
Telephone : MACaulay 2159

A.C./D.C. MOTORS 24v. 2a., 6in. x 2½in. dia., spindle 1in. x ¼in. New 18/6.

New Frequency Crystals 9,100 kc/s. 10/6. Type FT243, 5675-8650 kc/s. in 25 kc/s intervals, from 8/6 to 10/6.

Powerful small Blower Motors, 12/24 v. A.C./D.C., 14/6. As used for the Hedge Trimmer. Or can be used Car Heater.

Meter Kit, 2½in. M/c calibrated meter. Volts 0-3-30-150-300-600 D.C. 0-60 m/a. and 0-5,000 ohms with ebonite case 4in. x 6in. x 1½in., 27/6.

Transformers, Input 200/240 v. Sec. tapped 3-4-5-6-8-9-10-12-15-18-20-24-30 volts at 2 amps., 21/6. 17-11-5 volts, at 5 amps., 22/6. 17-11-5 volts at 1½ amps., 16/6. 6.3 volts, 2½ amps., 8/6. 12 months' guarantee.

Selenium Rectifiers F.W. 12-6 volt, 1 A., 8/6. 3 A., 14/6, 4 A., 23/6. 6 A., 30/-. 16 A., 50/-. 24 v. 2 A., 30/-. 250 v. 100 mA. H.W., 9/-. 250 mA., 17/6. 60 mA., 6/6.

D.P.D.T. Relays. Operates at 200/300 volts D.C., 8/6. D.P. Make and Break, 8/6. Any combination or voltage can be supplied at varying prices.

0-5 amp. 2½" Square M/c Ammeters, 11/9.

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

M/c Microphones with matched transformer, 15/6.

Small Motors. 12 v. A.C./D.C., 2in. x 1¾in., 10/-.

Pocket Voltmeters. M/c. 2in., 0-20-200 v., 11/9.

12 v. D.C. Relays. S.P. Double Contact 25 amp. 8/6.

Rheostats, 12 v. 1 A., 2/6. 12 v. 5 A., 10/6.

Latest Car Lights Relay Assembly "Flasher" Units, 6 or 12 v., 17/6; or with 2 lamps and switch, 50/-. STATE BATTERY CONNECTION TO CHASSIS.

4ft. Each Section Fishing Rod Aerials, Set 3, 7/6. Base, 3/6.

TR/196. Transmitter Section. NEW and complete—less valves—15/-.

All Carriage Paid in U.K.

THE RADIO & ELECTRICAL MART
253, Portobello Rd., London, W.11
Park 6026

ELECTRIC PAINT STRIPPER

30/- complete

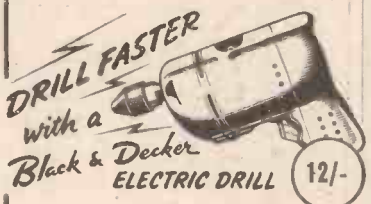
Old paint peels off like magic with the Horvell electric paint stripper. Easy, even strokes remove paint, varnish, etc., leaving a smooth surface. Four-sided blade manages difficult angles and corners. A.C./D.C. mains (state voltage). **Price 30/-, or 4/- down and 3 monthly payments of 10/-.** *P. & P. 1/-. Leaflet free.*
Extra flex 1/- a yard.

ELECTRIC PAINT SPRAYER

For 5/- deposit

Cash 75/-. Or 5/- deposit and 6 monthly payments of 13/6.

Paint easily, evenly, twice as fast with the Burgess Electric Sprayer. Sprays paint, varnish, etc. Complete with sturdy glass container, flex, nozzle for ceiling spraying and extra nozzle discs for different liquids. A.C. mains only—state voltage. Guaranteed. *Leaflet free.*
Supplied with 96-page book.



The Black & Decker U-1 ¼in. **DEPOSIT** Portable Electric Drill saves hours on home and workshop jobs. Drills wood, steel, brick, etc. Also drives sanding discs, polisher pads, etc. Fully suppressed. £5.19.6 or 12/- deposit and 6 monthly payments of £1. Also ¼in. Drill, U-20. £12.7.6 or 28/- deposit and 8 monthly payments of £1.11.0. A.C./D.C. motor. Voltages 110 to 250. State voltage required. Also 5in. Saw attachment, only £3.5.0 or 5/- down and 6 monthly payments of 11/-.
Send for complete tool list.

YOURS for 14 days FREE

PHILISHAVE

World's Largest Sale

Try the wonderful Philishave Electric Dry Shaver FREE for 14 days. Send only 5/- deposit (returnable if not satisfied). Two shaving heads with two 6-bladed cutters have unique rotary action which genuinely **shaves—doesn't** just snip at the hairs. **Result—better, quicker** shave. Operates 110/250 volts A.C./D.C. £7.9.3 cash less your deposit. Or 5/- deposit can be first payment, followed by 8 monthly payments of £1. 12 months' guarantee.

Illustrated brochure of this and other Shavers Free on request.

BARGAIN DISTRIBUTORS
(DEPT. 16), 5 SILVER STREET, LUTON

The Model Railway Club

MODEL RAILWAY EXHIBITION

WORKING MODEL RAILWAYS & TRAMS
LOCOMOTIVES • COACHES
WAGONS • SIGNALS
STATIONS • RAILWAY MODELS OF ALL KINDS

Model Steam Passenger-Hauling Engines

ADMISSION 2/6
Children under 14, 1/3

Special terms for parties of 12 or more : Apply to The Model Railway Club, 60, Howard Road, South Norwood, S.E.25.

Easter Week
TUESDAY, APRIL 12—SATURDAY, APRIL 16
Tuesday 12 noon to 9 p.m.
Other days 10.30 a.m. to 9 p.m.

Central Hall Westminster, S.W.1

Real Value

3/7 PER OZ.

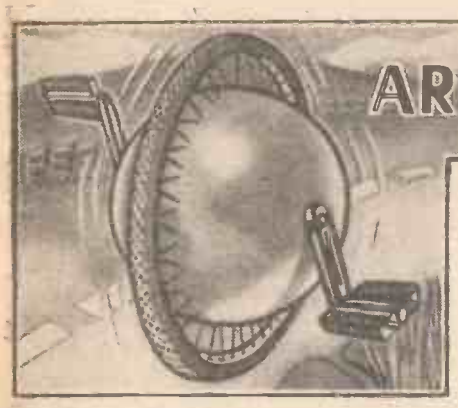
put that in your pipe and prove it!

IT'S A GALLAHER TOBACCO

MODEL IT FIRST . . .
with
'Plasticine' Regd.

IF YOU WANT to see the mechanical snags in anything you are making, try modelling it in "Plasticine" first. You'll save time and trouble by unforeseen factors. "Plasticine" was used in an experiment on making the three coupling links for railway carriages from one block of steel. Besides experimental models it can be very useful for holding screws in position, picking up nuts dropped in inaccessible places, or securing wires during testing. There are dozens of ways in which "Plasticine" can be useful to you—get some to-day and see how it can help you. It is available in sixteen colours.

HARBUTT'S PLASTICINE LTD.
Bathampton, Bath, Somerset



AROUND THE WHEELWORLD

By ICARUS

The R.R.A. Report

THE year 1954 proved to be one of the busiest in the history of the Road Records Association—145 notices were received, three more than in 1953 and a number which has been exceeded only in three previous years. Sixty-five of the notices were received within a period of five weeks. Thirteen of the attempts were successful, and one record was ultimately withdrawn owing to the course being slightly short. The number of records which have been certified by the Association since its inception is 711. The 13 successful attempts relate to the 50-miles, 100-miles, 12-hours, 24-hours, Land's End to John o' Groats and 1,000-miles, Liverpool to London, Liverpool to Edinburgh, and Land's End to London. There were two successful attempts on the 50-miles, two on the 100-miles, and two on the Liverpool to Edinburgh record.

The secretary reports that at January, 1955, membership of the association consisted of 109 clubs, 37 life members, and 106 private members.

This old Association, which reaches back into the latter end of the last century, when it was formed as a result of the attitude of the N.C.U. towards racing on the roads, exists to homologate records made on the road by cyclists and tricyclists, both solo and tandem.

The Oats

THE proposed stage towns for the Oats, the 1,000-mile, 1955, Amateur Circuit of Britain for the Quaker Oats Trophy suggests that this year it is going to be a tough event, probably the toughest amateur cycle stage race in Europe, and one of the most important cycling events in Britain.

Organised by the British League of Racing Cyclists, the Oats will begin at Manchester on Friday, July 15th, and end at London on Saturday, July 23rd.

The nine proposed stages are: July 15th, Manchester to Scarborough; July 16th, Scarborough to Whitley Bay; July 17th, Whitley Bay to Musselburgh/Edinburgh; July 18th, Edinburgh to Glasgow; July 19th, Glasgow to Carlisle; July 20th, Carlisle to Morecambe; July 21st, Morecambe to Wolverhampton; July 23rd, Wolverhampton to London.

For the first time in a stage race a team time-trial will be organised along the 50-mile route from Scarborough to Middlesbrough. On July 20th, a 38-mile time-trial from Carlisle to Keswick will be run.

The 80 competitors in 16 teams will compete for prizes to the value of more than £500, including the Quaker Oats Challenge Trophy, now held by Vivian Bailes, 28-year-old Middlesbrough joiner.

N.C.U. News

J. A. DENNIS announces that the N.C.U. National 1,000 Metres Tandem Championship has been allocated to the Marlbro' A.C. and will take place at Paddington Track on July 2nd.

The N.C.U. National 4,000 Metres Team Pursuit Championship has been allocated to the N.C.U. Birmingham Centre and will be held at Salford Road Park Track on August 19th and 20th. The competition will reach the conclusion of semi-finals on this date and finals will be at a Herne Hill Meeting of Champions on September 10th.

The National Women's 500 Metres title will be promoted by Birmingham Centre N.C.U. at Salford Park on August 20th.

The N.C.U. Professional Racing Committee announce that a regular series of professional races will be held (every Monday evening) at Herne Hill Track in conjunction with the Monday Competition series. The races will be held subject to a minimum number of 10 riders (scratch races) and 20 riders (team races) entering and being prepared to start.

The Professional Racing Committee also announces that it intends to institute Professional Championships of Great Britain at 1,000 metres sprint, and 5,000 metres individual pursuit. Tenders to promote these titles are invited and should be sent to N.C.U. headquarters by April 18th.

A motor-paced professional title will be considered by the committee if demand is forthcoming.

The W.R.R.A. and Overtaking

THE Women's Road Record Association have altered their rules relating to overtaking. Now, any official or observer following a woman's road record attempt may overtake the rider at any time to feed, marshal or photograph, or even to offer her a few words of encouragement. Will the R.R.A. follow suit? I can see no objection to this new rule, provided that it is not used in order either to pace or to give shelter. No official or observer would wish to invalidate a successful record attempt, and it seems to me that the modified rule will not be abused by them. It might, however, by unofficial observers, or Pressmen whom the rule also protects.

The Late John Brereton Summers

I REGRET to record the death of John Brereton Summers, the president and secretary of the Fellowship of Old Time Cyclists at the age of 86. He was a member of the Catford C.C. and secretary of the Old Kittens. He had led a somewhat adventurous life. He was in Bulawayo in 1895, fought in the Matabele land rebellion, and the second Boer War, returning to England in 1901. He rode a bone-shaker in 1884, and claimed to have ridden every style of bicycle, from single-seater to seven-seater.

His very first cycling club was the now defunct Redhill Wanderers of which he became secretary. He joined the Catford C.C. in 1892.

He had been secretary of the Bulawayo C.C., in Rhodesia, where he organised sport meetings, and a cycle parade in connection with the relief of Mafeking celebrations. He became a member of F.O.T.C. in 1918 and became honorary secretary in 1942, finally being elected to the presidency last year. He had an unbroken record as secretary of one club or another for over 60 years. Thus, another old timer passes.

Pub Signs

HAVE you noticed, as more and more of our old inns are absorbed by mass-producing brewers, that the inn sign is passing, and is being replaced by signs bearing the names of the brewers? Somewhere in tiny lettering you may discover the name of the inn. I think this is a great mistake. There was pleasure in the old inn sign, with its beckoning welcome to the traveller. I do not like to feel that our inns are now just advertisements for brewers. Down the Bath Road, for example, there are innumerable old inns owned by Simonds. Each inn shows a hop leaf sign which is Simonds' trade mark.

Presumably, the traveller is expected to hop from one hop leaf tavern to another, in the presumption that the traveller picks his inn according to the brewer, which he does not. The old Ostrich Inn at Colnbrook is now a hop leaf inn. The old sign of the Ostrich has vanished. The history of England was written in its inns. Do you remember the words of William Shenstone (1714-1763)?:

Whoe'er has travelled life's dull round,
Where'er his stages may have been,
May sigh to think he still has found
The warmest welcome at an inn.
Whoe'er would turn their wandering feet,
Assured the kindest smiles to meet,
Whoe'er would go, and not depart,
But with kind wishes from the heart,
O let them quit the world's loud din,
And seek the comforts of an inn.
Along the varying roads of life,
In calm content, in toil or strife;
At morn or noon, by night or day,
As time conducts him on his way,
How oft does man by care oppressed,
Find at an inn a place of rest?

COMMENTS OF THE MONTH

(*Continued from page* 37)

the statement that the majority of accidents in London are not due to speed. It is absurd to suggest that a motorist is safe at 30 m.p.h. and unsafe at 31. The club also suggests that speed limits in the parks should be abolished.

Wayside Thoughts

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

One of England's loveliest 16th Cent. half-timber buildings—A National Trust property.

The Real Traveller

IT is a pleasant thing every morning to think that in another few weeks my daily journey will run out, not to work, but to some place I want to see again and savour before it is too late. For I suppose that day may come when I shall have to wander by other means, or not at all, so I am anxious not to miss any present opportunity.

I have always held the opinion that a traveller, in the real sense of the term, must do something with his body to crown the urge to roam, otherwise he is merely a passenger, and though that condition may suit most people I do think it leaves an emptiness in the sense of adventure. It is why I consider cycling is so good for all of us, even the elderly who love their land and see it, not only through their eyes but with all the senses.

The old fellows may go slowly, and perhaps are not the right company for the young and virile, but they journey without reference to the leagues or thought of the morrow; it is just a holiday with a map as guide. Personally I enjoy this form of touring—a lonely wight along the road—for three or four days, and then I want a companion. That is the trouble of the elder rider, to find the friend who fits into moods and times and area, and forgets to be impatient; and as the years go on the circle narrows. But in that matter I am lucky and can usually arrange my trips to suit the other fellow.

The Lost Leagues

ONE thing I have not done—a thing I have wanted to do ever since as a youth I first toured Scotland—and that is to ride over the Western Seaboard when the mountains are snow carpeted, but the roads clear. That I understand frequently happens in Scotland's winter for the Gulf Stream keeps the roads clear, while three to five hundred feet higher is the snow. I confess though I should not have been a very happy traveller during this January!

Now it is too late to risk the long rides from place to place, for winter accommodation in Scotland has long stretches between and short daylight hours in which to make them. I was reminded of my desire the other day by a friend who was with me a decade back on the road from Corpach to Mallaig, and meeting me in the snowy street asked if adventure still called and if the Stage House Inn by Glenfinnan would have a roaring fire and enough food! Well, if not in winter and its slapping gales, I hope to make that journey and many another over and among the heathered hills in spring, summer and autumn, though, alas, it may not be on two wheels, for an affectionate family likes now to keep me under control and wrap me round with ease.

Away Back

CYCLING to the young and nimble should always be an adventure, the call to do something to remember when those valiant days have gone. We went cycle camping long before the first world war, when tents and equipment were clumsy things in comparison, and, indeed, after several journeys came to the conclusion the burden was too great for comfort. So we had a porter in the form of a Humber car which we unmercifully over-loaded—and, believe it or not, there was always a bother who should be made to drive!

We toured the Yorkshire Dales in that manner, and I remember once lighting a primus after breakfast, putting lamb, green garden peas and pearl barley to stew for our evening meal while we went over The Buttertubs. It was a perfect summer's day, smooth and quiet, and when we came down the valley there was the curl of smoke to welcome us, and nearer at hand a scent of ravishing content.

On that same holiday we bought home-made butter at 8d. a lb. in Alston and new-laid eggs twenty for a shilling. What a long way off it seems, and, of course, it is, for that summer Joseph Chamberlain died, and we—Birmingham folk—did not know anything about it until six days later! How good it was to completely lose touch with the world except that beautiful bit of it adjacent; something you cannot do in this land now, with wireless and TV everywhere. We finished that tour in the Lake District persuading our hard-worked wagon to face the hills, and, when it would not, backing it up so the old thing could not see the gradient.

Early Cycle Camping

FOR three days we sat ourselves down in Borrowdale, just between the Jaws thereof by the banks of Derwent, which, incidentally, provided us with fish. How quiet it was then, almost lonely, where now the traffic goes roaring through.

One day we climbed Great Gable and cut our light shoes to ribbons. We had in our party a well-known Midland track racing-man who was having the time of his life, and when the Great Gable idea was mooted said it was just what he wanted, a good walk. We rode to Raingauge Cottage, left our bicycles and took to the goat path for Sty Head, climbed Green, and then Great Gable, ate our "hard tack" on the summit warmed by the glorious sun, and were back in camp in time for high tea. But the track boy lay in his tent and could not be persuaded to move a finger to prepare a meal. "Call that walking?" said he. "I should give it a very rude name except for the company." Remarkable how we look at things and how they react on our tempers.

Next day he had completely recovered and laughed at himself as a poor specimen, when the girls could do it and still smile and wash-up. Alas! that lad must have known far more strenuous days, for he went to Central Africa in the first world war and was killed.

As we grew up to the cycle-cum-camping way of holidays our technique improved, and it was the only method we called holidaying until the first world war cancelled any such ways. Indeed, we were returning from just such a break in 1914, when war was declared, and had quite a number of adventures on the way, being stopped repeatedly because our attendant wagon displayed numerous tent poles which official folk fancied might be wireless installation.

The Joyous Holiday

WE old folk are apt to think things will never be the same again. Of course they won't, time changes fashions and fancies, but the happy joys of yesteryear can and will be as good, if the approach to them is as simple as was mine in the days of my youth. Do not envy the folk who go touring gorgeously at unlimited expense, for the spirit they miss is worth far more than the material comforts they gain. There is no adventure in the expensively organised tour, it is merely sightseeing and display, and while the one may be satisfying in a gentle way, the other is vanity which rarely pays a dividend in pleasure. An individual need not be rich to richly jewel his holidays with memory, to make anticipation dim compared with realisation and its retrospect a joy for ever. I have known all kinds of holidays, wet, fine, gay, expensive, adventurous, but the ones that stick in joyous memory are of the simple kind where we "made do" with what we had, created fun from our shortcomings, and sought adventure over lonely trails because the young spirit must go exploring.

Many of our pleasures to-day are artificial and of push-button type, even motoring; but cycling, that is freedom, that is travel in the real meaning of the term.

Published about the 30th of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, Strand, London, W.C.2, and Printed in England by W. Speaight & Sons, Exmoor Street, London, W.10. Sole Agents for Australia and New Zealand—Gordon & Gotch (A/sia), Ltd. Sole Agents for South Africa—Central News Agency, Ltd. Subscription Rate (including postage): For one year, Inland and Abroad 14s.

"Practical Mechanics" Advice Bureau. COUPON
This coupon is available until April 30th, 1955, and must be attached to all letters containing queries, together with 6d. Postal Order. *A stamped, addressed envelope must also be enclosed.*
Practical Mechanics. April, 1955.

Free Guide — SUCCESS IN ENGINEERING

132-PAGE BOOK FREE!

SEND FOR YOUR COPY

One of the following Courses taken quietly at home in your spare time can be the means of securing substantial well-paid promotion in your present calling, or entry into a more congenial career with better prospects.

ENGINEERING, RADIO, AERO, ETC.

Aero. Draughtsmanship
Jig & Tool Design
Press Tool & Die Design
Sheet Metalwork
Automobile Repairs
Garage Management
Works M'gmnt. & Admin.
Practical Foremanship
Ratefixing & Estimating
Time & Motion Study
Engineering Inspection
Metallurgy
Refrigeration
Welding (all branches)
Maintenance Engineering
Steam Engine Technology
I.C. Engine Technology
Diesel Engine Technology
Elec. Draughtsmanship
Machine „
Automobile „
Structural „
R/F Concrete „
Structural Engineering
Mathematics (all stages)
Radio Technology
Telecommunications
Wiring & Installation
Television
Radio Servicing
Gen. Elec. Engineering
Generators & Motors
Generation & Supply
Aircraft Mainten. Licences
Aerodynamics
Electrical Design
Ordnance Survey Dr'ship.

BUILDING AND STRUCTURAL

L.I.O.B. A.I.A.S. A.R.San.I. M.R.San.I.
A.M.I.San.E. A.A.L.P.A. L.A.B.S.S. A.R.I.C.S.
Building Construction
Costs & Accounts
Surveying & Levelling
Clerk of Works
Quantity Surveying
Builders' Quantities
Carpentry & Joinery
Building Inspector
Building Draughtsmanship
Heating and Ventilating

GENERAL, LOCAL GOVERNMENT, ETC

Gen. Cert. of Education
Book-keeping (all stages)
College of Preceptors
Woodwork Teacher
Metalwork Teacher
Housing Manager (A.I.Hsg.)
Common. Prelim. Exam
A.C.I.S., A.C.C.S.
A.C.W.A. (Costing)
School Attendance Officer
Sanitary Inspector
Civil Service Exams.

BECOME A DRAUGHTSMAN—LEARN AT HOME AND EARN BIG MONEY

Men and Youths urgently wanted for well paid positions as Draughtsmen, Inspectors, etc., in **Aero, Jig and Tool, Press Tool, Electrical, Mechanical** and other Branches of **Engineering.** Practical experience is unnecessary for those who are willing to learn—**our Guaranteed "Home Study" courses will get you in.** Those already engaged in the General Drawing Office should study some specialised Branch such as Jig and Tool or Press Tool Work and so considerably increase their scope and earning capacity.

★ OVER SIXTY YEARS OF CONTINUOUS SUCCESS ★

NATIONAL INSTITUTE OF ENGINEERING

(Dept. 29)

148, HOLBORN, LONDON, E.C.1

SOUTH AFRICA : E.C.S.A., P.O. BOX NO. 8417, JOHANNESBURG

FOUNDED 1885 - FOREMOST TODAY

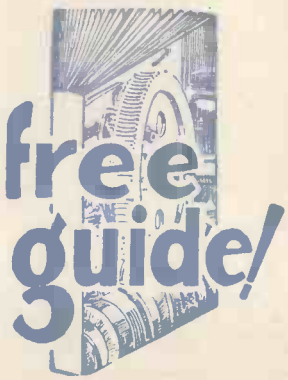
This remarkable FREE GUIDE explains :

- ★ Openings, prospects, salaries, etc., in Draughtsmanship and in all other branches of Engineering and Building.
- ★ How to obtain money-making technical qualifications through special RAPID FULLY-GUARANTEED COURSES.

MANY INTERESTING COURSES TO SELECT FROM!

A.M.I.Mech.E., A.M.I.M.I., A.M.Brit.I.R.E., A.M.I.P.E., A.M.I.C.E., A.M.I.Struct.E., A.M.I.Mun.E., M.R.San.I., A.M.I.E.D., A.F.R.Ae.S., London B.Sc., Degrees.

Fully guaranteed postal courses for all the above and many other examinations and careers. Fully described in the New Free Guide



THE ACID TEST OF TUTORIAL EFFICIENCY

SUCCESS—OR NO FEE

We definitely guarantee that if you fail to pass the examination for which you are preparing under our guidance, or if you are not satisfied in every way with our tutorial service—**then your Tuition Fee will be returned** in full and without question. This is surely the acid test of tutorial efficiency.

If you have ambition you must investigate the Tutorial and Employment services we offer. Founded in 1885, our success record is unapproachable.

ALL TEXTBOOKS ARE SUPPLIED FREE
PROMPT TUTORIAL SERVICE GUARANTEED
NO AGENTS OR TRAVELLERS EMPLOYED

Free Coupon

SEND OFF THIS COUPON NOW AND BE ALL SET FOR SUCCESS

To : NATIONAL INSTITUTE OF ENGINEERING (Dept. 29). 148-150, Holborn, London. E.C.1.

Please Forward your Free Guide to
NAME .....
ADDRESS .....
.....

My general interest is in : (1) ENGINEERING (2) AERO (3) RADIO (4) BUILDING (5) MUNICIPAL WORK *(Place a cross against the branches in which you are interested.)*

The subject of examination in which I am especially interested is .....

To be filled in where you already have a special preference.
(1½d. stamp only required if unsealed envelope used.)