

Radio Controlled Model of the Royal Yacht

NEWNES

50p
13

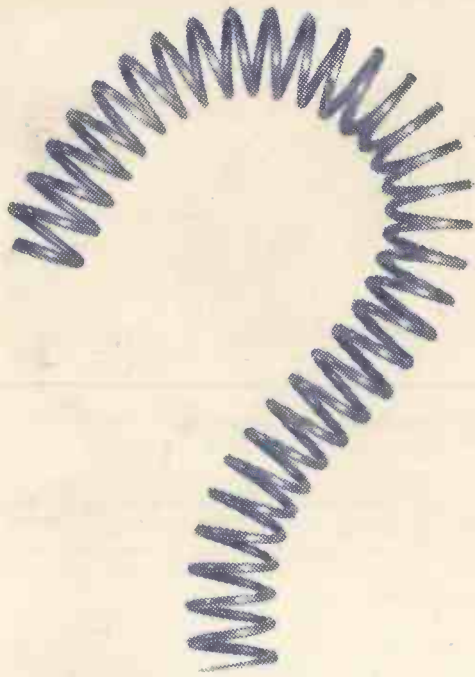
PRACTICAL MECHANICS

EDITOR : F. J. CAMM
SEPTEMBER: 1957



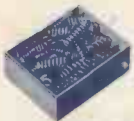
CONTENTS

POWER IN THE WORKSHOP
DETERMINING ENLARGING EXPOSURE
POPULAR VARIETIES OF TROPICAL FISH
A MINIATURE BILLIARD TABLE
A FOUR-WAY TABLE
A VARIABLE-POSITION BED SWITCH
SPECIAL SECTION FOR JUNIORS



Stuck for a Spring?

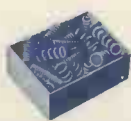
If so, Terry's BOXES OF ASSORTED SPRINGS are the answer. Here you have a marvellous assortment of Compression and Expansion springs . . . in all varieties, weights, lengths, gauges and diameters. The 6 boxes we show here are only a few from our very wide and varied range. Let us send you a fully illustrated list—post free.



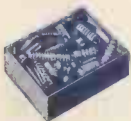
No. 757. Extra Light Compression, 1 gross Assorted, $\frac{1}{8}$ " to $\frac{1}{4}$ ", $\frac{1}{2}$ " to 2" long, 27 to 20 S.W.G. 15/- each.



No. 388. $\frac{1}{2}$ gross Assorted Small Expansion Springs, $\frac{1}{8}$ " to $1\frac{1}{2}$ ", 18G to 21G. 9/6 each.



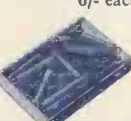
No. 1013. 1 gross Small Coil Compression Springs, $\frac{1}{8}$ " to $1\frac{1}{2}$ " long, $\frac{3}{16}$ " to $\frac{3}{8}$ " diam., 24G to 19G. 6/- each.



No. 758. Fine Expansion Springs. 1 gross Assorted $\frac{1}{8}$ " to $\frac{1}{4}$ ", $\frac{1}{2}$ " to 2" long, 27 to 20 S.W.G. 15/- each.



No. 466. $\frac{1}{2}$ gross Assorted Small Expansion Springs, $\frac{1}{8}$ " to $1\frac{1}{2}$ " long, $\frac{3}{16}$ " to $\frac{3}{8}$ " diam., 21G to 24G. 9/6 each.



No. 753. 3 doz. Assorted Light Expansion, $\frac{1}{2}$ " to $\frac{1}{4}$ " diam., 2" to 6" long, 22 to 18 S.W.G. 10/6 each.

Cut production costs with **TERRY Wire Circlips**

(Square Section)

We can supply from stock in sizes from $\frac{1}{8}$ " to $\frac{1}{4}$ "



* Really interested in springs? The 1957 edition of "Spring Design and Calculating"—full of spring data—post free 12/6.

TERRY'S ASSORTED SPRINGS

HERBERT TERRY & SONS LIMITED · REDDITCH · WORCS

(Makers of quality Springs, Wireforms and Presswork for over a century)

HT 22A

MAKE SOUND JOINTS SIMPLY BY USING **Multicore**

ERSIN MULTICORE

Contains 5 cores of extra-active, non-corrosive Ersin Flux. Prevents oxidation and cleans surface oxides.

SIZE 1 CARTON
4 specifications for radio enthusiasts.

5/-

HANDYMAN'S CARTON

Suitable for 200 average joints. 6d.



Wherever precision soldering is essential, manufacturers, engineers and handymen rely on MULTICORE. There's a MULTICORE SOLDER just made for the job you have in hand. Here are some of them.

ARAX MULTICORE

FOR METAL FABRICATION
(Not wire-to-tag joints)

Contains 2 cores of Arax flux—so fast that even blued steel spring can be soldered without pre-cleaning. Flux residue is easily removed with water.

SIZE 8 CARTON
5/-

Handymans Carton 6d.



HOME CONSTRUCTOR'S 2/6 PACK

In addition to the well-known Home Constructors Pack (containing 19ft. of 18 s.w.g. 60/40 alloy) a similar pack is now available containing 40ft. of 22 s.w.g. 60/40 alloy especially suitable for printed circuits.



BIB WIRE STRIPPER AND CUTTER

The 3 in 1 tool. For stripping insulation without nicking wire, cutting without leaving rough edges, and splitting extruded flex. 3/6 each



MULTICORE SOLDERS LTD.,

MULTICORE WORKS, HEMEL HEMPSTEAD, HERTS. (BOXMOOR 3636)



Mk V. "EVEREST"

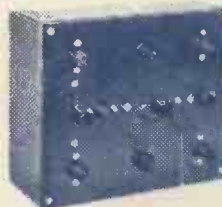
MULTIPLE RADIO CONTROL UNIT
Tuned Reed. 6 Channels

The crowning achievement for the remote control of all Models. The PROTOTYPE of this set "swept the board" at the Radio Control Competitions during the Season 1955.

TRADE MARK

RECEIVER

Fitted with Standard Hard Valves with an average life of 3,000 hours, and 6 Standard Relays. The Receiver output will operate either Electric Motors or Escapements.



CONTROL BOX

Control Box size, 6in. x 5 1/2in. x 2 1/2in., giving up to 6 Controls with ample lead to Transmitter easily held by hand

TRANSMITTER

Self-contained for housing all batteries, and with 8ft. sectiona Aerial. Fitted with 2 Standard Hard Valves (1 Mullard DL92, 1 Mullard DCC90). Price, complete (including Purchase Tax), £29.3.11.

RECEIVER ONLY

(including Purchase Tax), £17.15.3

CONTROL BOX ONLY (including Purchase Tax), £4. 12.5

TRANSMITTER ONLY (including Purchase Tax), £6. 16.4

Write for our NEW Illustrated Folder giving full details of all E.D. ENGINES, RADIO CONTROLS, SPARE PARTS, ACCESSORIES, etc.

Order from your model shop.



ELECTRONIC DEVELOPMENTS (SURREY) LTD
DEVELOPMENT ENGINEERS
ISLAND FARM RD, WEST MOLESEY, (SURREY) ENGLAND.



RECTANGULAR T.V. TUBES 12 MONTHS GUARANTEE
 AS SUPPLIED TO THE TRADE FOR THE LAST 7 YEARS.
 14in. £5.10. 17in. £7.10.

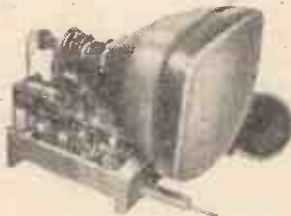
6 months full replacement. 6 months progressive. Made possible by the high quality of our tubes. Ins., carr. 15/6.

CONVERT your 9in.—10in.—12in. to 14in.—15in.—16in. SPECIAL OFFER £5.
 12in. T.V. TUBES—£6. Guaranteed. Ins., carr. 15/6.

ELECTROSTATIC T.V. TUBES. All at 10/- each. 8 1/2in. E4205/B/7, 2 1/2in. DG7/5, 2 1/2in. O9D, 4 1/2in. E4103/B/4, 1 1/2in. VCR131, 1 1/2in. Not guaranteed free from defects. P. & P. 5/-.

17in. T.V. CHASSIS. £19.19.6.

17in. Rectangular tube on adapted chassis. All channels. Valve line up (5 valves) 6SN7, 6V6, EY51, 2-6D2s. Others 6L18, EL38, 7-6F1s. 12 months guarantee on tube, 3 months on chassis and valves. Complete and working on any channel. 1-5. Less valves. With 5 valves £21.19.6. With all valves £25.19.6. Ins., carr. 25/- (Incl. tube). **TURRET TUNER 50/-** extra. State B.B.C. channel (and I.T.A. channel if TURRET TUNER required).



14in. T.V. CHASSIS, TUBE & SPEAKER, £13.19.6.

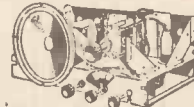
As above with 14in. round tube. Less valves. 3 months guarantee. With 5 valves £15.19.6. With all valves £19.19.6. **TURRET TUNER 50/-** extra. Ins., carr. 25/- (Incl. tube).

RADIOGRAM CHASSIS. 29/9.

5 valve s/het. 3 w/band and gram. Including 8in. speaker. A.C. mains. Complete, less valves. Front drive. Size 12in. x 10in. x 8in. Printed dial. Ins., carr. 5/6.

POPULAR RADIO OR RADIOGRAM CHASSIS. 39/9.

3 w/band and gram. S/het. 5 valve (intrl. octal). Ideal for table gram, but still giving high quality output. 4 knob control. 8in. P.M. speaker 7/9 extra. Set of knobs 2/- . Size 12in. x 6in. x 7in. Less valves. Ins., carr. 5/6.



A.C./D.C. MIDGET RADIO. 99/6. (Incl. valves).

CCH35, EF39, EBC33, CL33, 35Z4 or metal rec. 3 control knobs. Switched for gram. In attractive brown plastic cabinet 15in. x 7 1/2in. x 9in. Ins., carr. 5/6.

T.V. CONSTRUCTOR CHASSIS

SOUND AND VISION STRIPS, 19/6. S/het. Complete s/vision strip. Less valves. Free drawing. P. & P. 3/6.

TIME BASE, 7/9. Containing scanning coil, focus unit, line trans., etc. Less valves. FREE drawing. P. & P. 3/6.

POWER PACK AND AMPLIFIER, 19/6. Output stage 6V6. With O.P. trans., 3 ohms matching. Choke smoothed H.T. 350 v., 250 m.a. 6.3v. at 5 a., 22 v. at 3 a., 6.3 v. at 4 a., 4 v. centre tapped. Less valves. FREE drawing. Ins., carr. 5/6.

CO-AX CABLE, 6d. yard. Cut to any length. Good quality. P. & P. on 20 yds., 1/6. 45/- per 100 yds. P. & P. 3/6.

DUKE & CO. (DEPT. 5), 621-623, ROMFORD ROAD, (MANOR PARK, E.12. NOTE.—New Phone Nos. LF. 6001-3. FREE CATALOGUE.

EXTENSION SPEAKERS, 29/9.

In beautiful polished cabinet, of attractive design. Complete fitted with 8in. P.M. speaker. "W.B." or "Goodman's" of the highest quality. Standard matching to any receiver, 2-5 ohms. Flex and switch included. Size 11in. x 13 1/2in. x 6 1/2in. Unrepeatable at this price. Money refunded if not completely satisfied. Ins., carr. 3/6.



8in. P.M. SPEAKERS, 8/9. Treat the lady at home. Let her listen to that T.V. or radio programme. With O.P. trans., 10/- . P. & P. 2/9.

SPEAKERS, 12/9. Goodman's or Elac. High quality 8in. P.M. Money back, satisfaction guaranteed. P. & P. 2/9. Export orders invited.

TELEPHONE SETS, 7/9.

Ex-W.D. Wireless remote control unit. E. Mk. 11. New condition, Morse taper, switched, jack plugs, etc. Less phone. Ins., carr. 3/6.



AERIALS, 25/6. For all I.T.A. and F.M. channels For outdoor or loft. 3 element. P. & P. 2/6.

V.H.F. 1466 RECEIVER, 27/6. Ex-W.D. New condition. Incl. 6 valves. Receives T.V., sound and amateurs. 30.5-40 mc/s. I.F.s. 7 mc/s. Dial drive tuning. FREE drawing. Ins., carr. 4/6.

V.H.F. 1125 RECEIVER, 7/9. Incl. valves. Chassis 12in. x 8in. x 4in. Needs some modification to put into service P./P. 2/3.

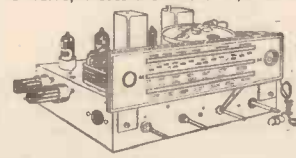
SELF-FEED SOLDERING, 29/6.

6-12 volt, 100-125 volt, 6-12 volt, 200-240 volt, 45/- . Made for the American market. Car battery or mains. Export quality. Complete in light carrying case. Reel of solder and spare parts. P. & P. 2/9. Export enquiries invited.



ARGOSY PUSH PULL R/GRAM CHASSIS, 139/6

8 valve, latest models. 3 w/band and gram. switched. Over 10 watts output. Full tone range. 4 knob controls. Less valves. (2-EBF80, 2-EL42, ECH81, EBC41, EZ80, EM34). Ins., carr. 5/6.



"ZYTO" DO IT YOURSELF TOOLKIT

A SET OF HIGH-GRADE TOOLS, FULL SIZE AND FULLY GUARANTEED, COMPLETE IN STEEL TOOLBOX WITH LOCKING HANDLES AND SLIDING TRAY



Delivered on first payment of **£5'0'0**
 Balance in Eight Monthly Payments of 32/6
 Cash Price **£16'10'0**

CONTENTS

- 1 20" HANDSAW
- 1 10" BRASS-BACK TENON SAW
- 1 STANLEY ADJUSTABLE IRON PLANE, 9" x 2"
- 1 SET OF 3 HANDED CHISELS, 1/2", 3/4", 1"
- 1 CLAW HAMMER
- 1 6" CABINET HANDED SCREWDRIVER
- 1 6" RATCHET ELECTRICIAN'S SCREWDRIVER
- 1 CROSSPENE PIN HAMMER
- 2 HANDED BRAD-AWLS
- 1 PAIR PINNERS, 6"
- 1 7" FOOTPRINT PIPE WRENCH
- 1 3" PAINT-STRIPPING KNIFE
- 1 PUTTY KNIFE
- 1 STANLEY RATCHET BRACE
- 1 SET FIVE FAST-CUTTING CENTRE BITS, 1/2", 3/4", 1", 1 1/2"
- 1 POINTING TROWEL
- 1 PADSAW WITH BLADE
- 1 PAIR COMBINATION PLIERS
- 1 SET CRAMPHEADS
- 1 WIRE BRUSH
- 1 BLOWLAMP
- 1 STANLEY HAND DRILL
- 1 SET TWIST DRILLS
- 1 SOLDERING IRON
- 1 STICK SOLDER
- 1 TIN FLUX
- 1 MITRE BLOCK
- 1 PAIR RADIO PLIERS
- 1 JUNIOR HACKSAW
- 1 SPARE HACKSAW BLADES
- 1 NAIL PUNCH
- 1 2' BOXWOOD FOLDING RULE
- 1 INSTRUCTION BOOK

ILLUSTRATED LEAFLET FREE ON REQUEST
S. TYZACK & SON LTD Telephone: SHOREDITCH 8301
 341-345 OLD ST., E.C.1.



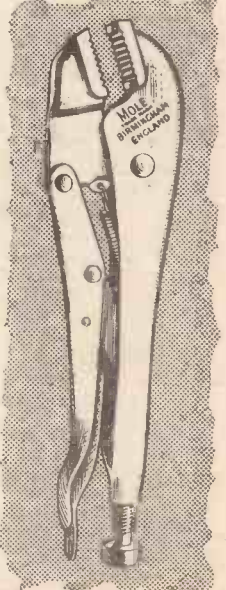
"all hands" ... but a **THIRD HAND** would have done

The heavens help the sailor in a plight like this!

Nowadays don't be "all at sea" when you are doing a job where a third hand is wanted—use a Mole Wrench, the versatile tool that holds on with hands off—ideal for the countless jobs in home, garage or workshop. Used by Handymen and Engineers the world over, its toggle action gripping power of 2,000 lbs. locks the wrench to the work, released only when the centre lever is touched. Use it as superpliers, wrench, hand vice, clamp—whatever the job demands. You'll always find a use for



7in., 12/6; 10in., 15/-
 FROM IRONMONGERS, MOTOR & MOTOR CYCLE ACCESSORY DEALERS.
 If in any difficulty write to: M. MOLE & SON, LTD., BIRMINGHAM, 3.



Make model buildings —



as simply
as this!

A new method—described in a new book on Pyruma Modelling. This shows how to turn empty match boxes into model buildings, by Pyruma 'Plasticraft.' It is one of the many methods of modelling in plastic Pyruma, shown in black and white and full colour pages, which enable you to build and finish in natural colours :—

MODEL FARMS, RAILWAY STATIONS, SIGNAL CABINS, AIRPORT BUILDINGS, DOCKS, SHIPS, FIGURES, ANIMALS, ASHTRAYS, BOOKENDS, DOLL'S FURNITURE, PLAQUES, RELIEF MAPS, ETC.



is a ready-to-use material, cheap to buy locally, and easy to work by following the Instruction Book offered below. Pyruma dries or can be baked to stone-hard permanence, then painted in natural colours. Sold by local Ironmongers and Hardwaremen, Hobbies shops and Art material Dealers, in airtight tins from 1/6 upwards.

Send Coupon and 6d. P.O. (not stamps) for this NEW Book of instructions to :—

J.H. SANKEY & SON, L^{TD}
1857-1957
DEPT. P.M., ILFORD, ESSEX.

Enclose 6d. P.O. (not stamps) for **PYRUMA MODELLING INSTRUCTION BOOK** addressed to :—

NAME (block letters)

ADDRESS

BOX KITES, the one and only well-known R.A.F. dinghy antenna type, brand new in metal containers, complete with flying cord, 20/-, post 1/6.

MOTOR GENERATORS, U.S. mfr., totally enclosed, 4 1/2 in. long, 2 1/2 in. dia., input 27 v. 1.5 amps., output 285 v. at 60 mA., output from 12 v. supply is approx. 150 v., new, unused, 12/6, post 2/-.

TRANSMITTER RECEIVERS NO. 17, Mk. II, these are complete with valves, high res. headphones, hand microphone, instruction booklet, frequency range 44 to 61 Mc/s, range with simple aerial 5 to 8 miles, requires ordinary 2 v. and 120 v. batteries, these are brand new in sealed cartons, our price 50/-, carriage (inland only) 6/-.

HUGHES 12-VOLT SHUNT MOTORS, taking 1.25 amps. light, and up to 2 amps. on load, 5,000 r.p.m., external terminations for reversing, oil impregnated bearings, 4 in. shaft, size 3 1/2 in. long, 1 1/2 in. dia., weight 20 oz., a superior and powerful motor, original cost over £7, our price new unused, 10/-, post 1/3 ; 2 for 20/-, post paid ; ditto, fitted reduction gears, giving a final drive of either 160 or 320 r.p.m., state which required. 12/6 post 1/6 ; 2 for 25/-, post paid.

CHARTBOARD LAMPS, fully adjustable pattern, having 5 swivel points, providing light exactly where required, base can be screwed to bench, table or wall, fitted s.b.c. lampholder and shade, finish black and silver, total length 20 in., brand new in sealed cartons, 15/-, post 1/6.

MERCURY SWITCHES, 250 v. 10 amp., glass tilt type fitted brackets, specially made to give 3-second delay make after dit, new boxed 5/-, post 7d.



"BAMBI" GARDEN SPRAYERS, also suitable for disinfectants, penetrating oil, lime wash, etc., made by Fisons Pest Control Ltd., consists of the special glass container holding 4 pints, marked in 1/2 pints, filler cap, is a 1- or 1-oz. measure, adjustable webbing for shoulder or back, so that both hands are free. 40 in. flexible tubing to the polished brass syringe, with nozzle that gives a finely atomized spray. Scrap those messy old-fashioned sprayers that require buckets, hoses, etc., invest in a "Bambi," value to-day 45/-, our price new boxed 20/-, post 3/-, 2 for 40/-, post paid.

MAINS BLOWERS, 200/250 v. A.C./D.C., 1 amp., 5,000 r.p.m., consists of the motor with attached enclosed fan, end funnel intake 1 1/2 in. dia., side outlet 1 1/2 in. x 1/2 in. plinth base 4 1/2 in. x 5 1/2 in., finish black crackle and aluminum die-cast, size overall 9 in. long, 5 in. high, 4 1/2 in. wide, weight 7 1/2 lb., a very superior blower, fraction of Original cost, 25/-, post 3/-.

SHADED POLE MOTORS, 12-v. 50-cycles A.C., size 3 in. x 2 in. x 1 1/2 in., complete with 3 in. fan, made for lamphouse cooling, silent running, unused and perfect, 10/-, post 1/4.

TELEPHONE SETS, consists of 2 combined microphones and receivers which when wired up with ordinary twin flex, provide perfect 2-way communication, excellent results up to 1 mile have been reported, self-energised, no battery required, price the 2 instruments new unused, 7/6, post 1/3, twin P.V.C. 14/36 flex up to 300ft, lengths at 1d. per ft.

MAGNETIC RELAYS 5C/649, 9-14 v., takes 1 amp. at 12 v., closes 40 amp. D.C. contacts, bakelite case enclosed with cover, new, unused, worth 30/-, our price 2/6, post 10d. ; 24/- doz., post 2/6.

Send s.a.e. for current bargains lists. Tel. : HAR 1306
MIDLAND INSTRUMENT CO., Moorpool Circle, B'ham, 17

BUBBLE SEXTANTS MK. IX, BM and AM with averaging mechanism. A very recent and improved pattern weighing only 4 1/2 lbs. and fitted with double eyepiece. Original cost over £100. In good working order. Offered at **67/6** Post 2/6

A few in imperfect condition available at 37/6.

40x Pancratic Featherweight Telescope
This precision British made instrument is the most powerful lightweight Telescope yet produced. Power can be varied from 25x to 40x. Fitted with precision achromatic Object Glass of 1.3/8 in. dia. Length closed 12 in. With three draws extended 28 in. Weight only 12 ozs.
£7.7.0 Post Free. Ex-Government Table Tripod available if desired, 15/- extra.

Every purchase covered by our guarantee of "Satisfaction or full refund," or we will gladly submit on approval. Catalogue on request.

CHARLES FRANK
67-73 SALTMARKET, GLASGOW, C.1
Telephone : Bell 2106/7 (Established 1907) Telegrams : "Binccam," Glasgow

Learn ESPERANTO - and be at home with the world

ESPERANTO, the practical international language, is helping to bring about the understanding essential to our troubled world.

Easy Travel
ESPERANTO will enable you to travel freely, correspond with people in all countries, and enlarge your social horizons to a far greater extent than you have ever dreamed.

Rapid Progress
ESPERANTO is learnt far more quickly than any other language. There are evening classes and study groups in many towns, or for only £1 you can have a complete correspondence course, including textbook, dictionary, and correction of exercises. Send the coupon to-day to

BRITISH ESPERANTO ASSOCIATION
140 Holland Park Avenue, London, W.11

Please send free information about Esperanto.
 I enclose £1. Please send popular correspondence Course and free information. Tick where applicable.

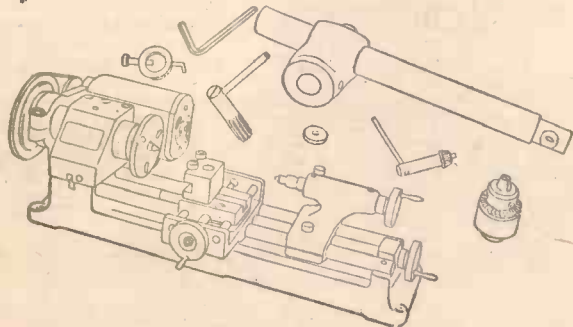
NAME

ADDRESS

576

The EMCO-UNIMAT

A portable, precision, machine tool



Only 16in. long, the Emco-Unimat is capable of several standard workshop practices to highly critical limits. *The basic tool will buff, turn, polish, drill, grind and mill, and a full range of extra equipment vastly increases the scope of the tool.*

SPECIFICATION

Centre Height, 1 1/2 in. Takes between centres 6 1/2 in. Hollow spindle admits 1/4 in. Drill chuck cap, 1/4 in. Chuck to drill table (max.), 4 1/2 in

ADDITIONAL EQUIPMENT
 Jig Saw. SC Lathe Chuck. Circular Saw. Drilling Vice. Milling Table and Clamps. Flexible Shaft. Thread Chasing and Dividing.

CASH PRICE £27-17-6

EXTENDED CREDIT AVAILABLE
GENEROUS TERMS AVAILABLE TO MERCHANT STOCKISTS

J. & H. SMITH LTD.
 16 HARRISON ST LEEDS 1. Tel. 21561

See the versatile Emco-Unimat at your local tool dealer, or write for fully descriptive literature to:



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



METALS AND ACCESSORIES

ALUMINIUM, BRASS, COPPER, STEEL, ETC.

Angle, Sheet, Tube, Foil, Strip, Channel, Rod, Bar, Wire, Moulding, Etc. Tin Plates, Silver Steel, Expanded Metal, Blanks, Rivets, Springs, Etc. Tools Drills, Taps, Dies, Screws, Etc.

Formica, Perspex, Pegboard, Paxolin, Ebonite, Curtain Rail and Rod, Adhesives, Etc. and many other items for use in Home, Workshop, Etc.

LARGE or SMALL Quantities COMPARE our PRICES
MAIL ORDER SERVICE (2d. stamp for list) IMMEDIATE DESPATCH

CLAY BROS. & CO. (P.M. 8)
6a SPRINGBRIDGE ROAD, EALING, W.5

Phone: EALing 2215

2 MINS. EALING BROADWAY STATION, OPPOSITE BENTALLS

Training with I.C.S.

THE WAY TO SUCCESS

The great and growing demand of today is for **TRAINED** men. Tens of thousands more are needed, but there is no worth-while place for the untrained.

Let I.C.S. Postal Tuition give you the specialised knowledge that marks you out for promotion to the best jobs—for **SUCCESS!** I.C.S. teaches you at home in your own time—expertly, quickly and easily. It is the world's largest and most successful correspondence school, offering courses for almost every branch of trade, industry and the professions.

ADVERTISING

Practical and Mail Order
 Retail and Dept. Store
EXAMS: Advertising
 Ass. I.P.A.

COMMERCIAL ART

BOOK-KEEPING & BUSINESS TRAINING

Accountancy
 Costing
 Secretarial
EXAMS: Chार्ट. Inst. Secs, Ass. of Cert. & Corp. Accts. Inst. of Cost & Wks. Accts. Inst. of Bookkeepers

ARCHITECTURE & BUILDING

Drawing & Designing
 Quantity Surveying
 Builders & Surveyors' Clerks
 Construction
 Air Conditioning
 Heating & Ventilating
 Woodworking
EXAMS: Roy. Inst. of Br. Archts. Inst. of Quant. Survysrs. Roy. Inst. of Chtd. Survysrs. Inst. of Bldrs. Inst. of Struc. Engrs.

CIVIL ENGINEERING

Surveying & Mapping
 Structural & Concrete Engg.
EXAMS: Inst. of Civil Engrs. Inst. of Mun. Engrs. Inst. of Struc. Engrs.

MANAGEMENT

Foremanship
 Indust. Management
EXAMS: Br. Inst. of Management, Inter Final & Cert. in Foremanship

ELECTRONIC ENGINEERING

Industrial Electronics
 Electronic Computers

FARMING & HORTICULTURE

Arable Farming
 Pig Keeping
 Poultry Keeping
 Farm Machinery (Maintenance)
 Flower, Vegetable & Fruit Gardening
EXAMS: R.H.S. General

FIRE ENGINEERING

EXAMS: Inst. of Fire Engrs. Fire Service Promotion

GENERAL CERTIFICATE OF EDUCATION

Principal Subjects at Ord. or Advanced Level
 Engg. Joint Board. Prelim.

MECHANICAL ENGINEERING

Subjects include:—
 Welding, Fitting, Turning
 Erecting, Jig & Tool Design
 Production, Draughtsmanship
 Maintenance, Diesel Engrs.
 Diesel Electric Locomotives
 Refrigeration
 Sheet Metal Work, &c.
EXAMS: Inst. of Mech. Engrs. Inst. of Prod. Engrs. Soc. of Engrs. Inst. of Engg. Designers
 Cert. in Foremanship

ELECTRICAL ENGINEERING

Illumination & Heating
 Power House Attendants' Electricians'
EXAMS: Soc. of Engrs. C. & G. Cert. in Elec. Engg.

MOTOR ENGINEERING

Diesel Transport Engrs.
 Owner Drivers'

PHOTOGRAPHY

A new Course incl. Colour Work

RADIO & TELEVISION ENGINEERING

Service Engineers'
 Television Servicing & Engg.
 Practical Radio with Equipment
EXAMS: Br. Inst. of Radio Engrs. C. & G. Radio Cert. - P.M.G.'s Cert. in Wireless. C. & G. Telecoms. Engg.

SALES PROMOTION

Sales Management
 Window Dressing
EXAMS: Inc. Sales Mangrs. Ass. United Comm. Travellers Ass. Dip.

WRITING FOR PROF.

Free Lance Journalism
 Short Story Writing

NEW 'LEARN-AS-YOU-EARN' PRACTICAL RADIO COURSE. Build your own radio receiver and testing equipment.

Moderate fees include all books

INTERNATIONAL CORRESPONDENCE SCHOOLS

Dept. 169D, International Buildings, Kingsway, London, W.C.2

Please send me free booklet on.....Age.....

Name..... Occupation.....
 (USE BLOCK LETTERS)

Address

957

Addresses for Overseas Readers

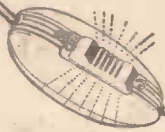
Australia: 140, Elizabeth Street, Sydney. Eire: 3, North Earl Street, Dublin.
 India: Lakshmi Bldg., Sir Pheroza Mehta Rd., Fort Bombay. New Zealand: 182, Wakefield Street, Wellington. N. Ireland: 26, Howard Street, Belfast.
 South Africa: Dept. L., 45, Shortmarket Street, Cape Town

INTERNATIONAL CORRESPONDENCE SCHOOLS



NEON INDICATOR SWITCH!

10/6 Post free.



FIT THIS TO YOUR ELECTRIC BLANKET AND BRING IT UP TO DATE.

Double Pole Break, A.C.-D.C. Silver Contacts, Improved Cord Grip, Simple Wiring, Modern Streamline Styling in Cream Bakelite.

SUITABLE ALSO FOR ANY OTHER APPLIANCE WHICH REQUIRES A VISUAL INDICATION THAT IT IS ON (SOLDERING IRONS, ETC.)

★ SEND 4d. IN STAMPS NOW FOR OUR ELECTRICAL CATALOGUE ★

DESCRIBES FULLY OUR RANGE OF ELECTRICAL SUNDRIES—WITH IDEAS FOR THE HOME HANDYMAN — OVER 300 ITEMS —

THE 'MAGSTAT'



This is a precision bi-metal thermostat for the control of alternating currents of up to ½ amp. at 240 volts. The temperature range lies between minus 50 deg. F. and plus 250 deg. F. An ingenious magnetic snap action is incorporated which gives freedom from radio interference. The operating temperature is altered by rotation of the adjustment screw, clockwise for increase and anti-clockwise for decrease. Dimensions 2in. x ½in. x ¾in.

PRICE : 5/6 each. Post 3d.

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.

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.

THERMOSTATS. PF. Room Thermostat, 15 amps., 250 volts A.C. 5in. x 1½in. x 2in. A beautiful instrument. Temp. ranges 30/90, 40/100, 40/80, 60/100 deg. F. as required. £2/0/0, post 6d.

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 capacity is 10 amp., 250 volts A.C. Differential 4-6 deg. F. Size 4½in. x 2in. x 1½in.

PRICE : 35/- Post 6d.

REPLACEMENT ELEMENTS

FOR DOMESTIC ELECTRICAL APPLIANCES

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

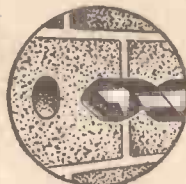
THERMOSTAT. BW/1. 3 amps., 250 volts A.C. For control of hot-plates, vulcanisers, etc. 50-550 deg. F. 15/6, post 4d. We are only too glad to send illustrated leaflets on any of these Thermostats if you will send a S.A.E. stating which model interests you

IMMERSION HEATERS

We can offer a wide range from 2 to 4kW. and in stem lengths 11in. to 42in. Please send for our catalogue.

Model PJ. Miniature Thermostat for control of domestic Electric Irons and special-purpose machines where space is limited. Capacity: 5 amps., 250 volts A.C. 4in. x 4in. x 11/16in. Single screw fixing. Price 9/3. Post 3d

THE TECHNICAL SERVICES CO. SHRUBLAND WORKS · BANSTEAD · SURREY



TUNGSTEN CARBIDE TIPPED TOOLS

PLUGGING DRILLS

For clean round holes in brick, concrete, tiles, marble, etc., for all fixing jobs with Maso Plugs.

GLAZEMASTER

For drilling windows, mirrors, glasses, bottles, plate glass shelves, etc.

Write for Booklet P.M. Obtainable from your Tool Stockist and Ironmonger.



MASON MASTER

The Tradesman's Choice

Manufactured by

JOHN M. PERKINS & SMITH, LTD., BRAUNSTON, NR. RUGBY
Tel.: BRAUNSTON 351-2

THE ULTRA LENS AIDS PRODUCTION

This unequalled electric magnifier is of the most modern design and has proved its extreme usefulness to countless industrial firms engaged on minute examination of surfaces of every conceivable object.

Whether you are manufacturing, buying or selling, there are occasions when you have to submit some objects to a very close scrutiny. At these times the **ULTRA LENS** becomes indispensable.



Triple lenses ensure distortion-free magnification and eliminate the necessity for adjustment of focus. The focus is always perfect.

The **ULTRA LENS** achieves a six-fold magnification in a brilliantly lit field which is shadowless.

Please ask your local Tool Shop, Jeweller, Optician, Scientific Instruments, Stamp-Dealer. or

Write for full particulars to

THE ULTRA LENS COMPANY

17c, Oxendon Street, London, S.W.1

Tel.: TRAfalgar 2055

TAKE UP PELMANISM

For Courage and Clear-Thinking

The Grasshopper Mind

YOU know the people with "Grasshopper Minds" as well as you know yourself. Their minds nibble at everything and master nothing.

At home in the evening they tunc in the radio or television—tire of it—then glance through a magazine—can't get interested. Finally, unable to concentrate on anything, they either go to the pictures or fall asleep in the chair. At their work they always take up the easiest job first, put it down when it gets hard and start something else. Jump from one thing to another all the time.

There are thousands of these people with 'Grasshopper Minds' in the world. In fact, they are the very people who do the world's most tiresome tasks—and get but a pittance for their work. They do the world's clerical work, and the routine drudgery. Day after day, year after year—endlessly—they hang on to the jobs that are smallest salaried, longest hoored, least interesting, and poorest futured!

What is Holding You Back ?

If you have a 'Grasshopper Mind' you know that this is true. And you know why it is true. Even the blazing sun can't burn a hole in a piece of tissue paper unless its rays are focused and concentrated on one spot. A mind that balks at sticking to one thing for more than a few minutes surely cannot be depended upon to get you anywhere in your years of life!

What Can You Do About It ?

Take up Pelmanism now! A course of Pelmanism brings out the mind's latent powers and develops them to the highest point of efficiency. It banishes such weaknesses and defects as Mind Wandering, Inferiority and Indecision, which interfere with the effective working powers of the mind, and in their place develops strong, positive, vital qualities, such as Optimism, Concentration and Reliability, all qualities of the utmost value in any walk of life.

Send for Free Book

The Pelman Course is simple and interesting, and takes up very little time; you can enrol on the most convenient terms. The Course is fully described in "The Science of Success," which will be sent you gratis and post free, on application to:

PELMAN INSTITUTE,
130, Norfolk Mansions,
Wigmore Street, London, W.1.

WELbeck 1411

POST THIS FREE COUPON TO-DAY

Pelman Institute,
130, Norfolk Mansions, Wigmore Street, London, W.1.

"The Science of Success," please.

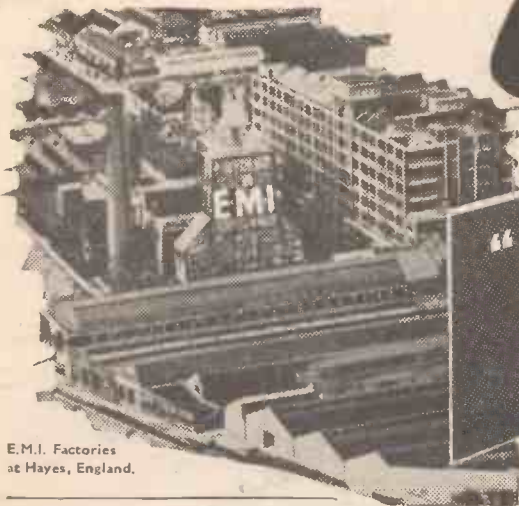
Name

Address

PELMAN (OVERSEAS) INSTITUTES, DELHI: 10, Alipore Road. **MELBOURNE:** 386, Flinders Lane. **DURBAN:** Natal Bank Chambers (P.O. Box 1489). **PARIS:** 176, Boulevard Haussmann **AMSTERDAM:** Prinsengracht 1021.

Remember—Everything you do is preceded by your attitude of mind.

ENROL with E.M.I



E.M.I. Factories at Hayes, England.

"HIS MASTER'S VOICE"
MARCONIPHONE · COLUMBIA

to train for your
CAREER-HOBBY
OR NEW INTEREST

PERSONAL & INDIVIDUAL HOME TRAINING IN:—

Accountancy
 Advertising
 Aeronautical Eng.
 A.R.B. Licences
 Art (Fashion, Illustrating, Humorous)
 Automobile Eng.
 Banking
 Book-keeping
 Building
 Business Management
 Carpentry
 Chemistry
 City & Guilds Exams.
 Civil Service

Commercial Subjects
 Commercial Art
 Computers
 Customs Officer
 Draughtsmanship
 Economics
 Electrical Eng.
 Electrical Installations
 Electronics
 Electronic
 Draughtsmanship
 Eng. Drawing
 Export
 General Certificate of Education

Heating & Ventilation Eng.
 High Speed Oil Engines
 Industrial Admin.
 Jig & Tool Design
 Journalism
 Languages
 Management
 Maintenance Eng.
 Mathematics
 M.C.A. Licences
 Mechanical Eng.
 Metallurgy
 Motor Eng.
 Painting & Decorating

Photography
 P.M.G. Cert.
 Police
 Production Eng.
 Production Planning
 Radar
 Radio
 Radio Amateurs (C & G) Licence
 Radio & Television Servicing
 Refrigeration
 Sales Management
 Sanitary Eng.
 Salesmanship

Secretaryship
 Servo Mechanisms
 Shorthand & Typing
 Short Story Writing
 Short Wave Radio
 Sound Recording
 Telecommunications
 Television
 Time & Motion Study
 Tracing
 Transistors
 Welding
 Workshop Practice
 Works Management and many others

Also courses for GENERAL CERTIFICATE OF EDUCATION, A.M.I.H. & V.E., A.M.S.E., A.M.Brit.I.R.E., A.M.I.Mech.E., A.M.I.E.D., A.M.I.M.I., A.F.R.Ae.S., A.M.I.P.E., A.M.I.I.A., A.C.C.A., A.C.I.S., A.C.C.S., A.C.W.A., City & Guilds Examinations, R.T.E.B. Serv. Certs. R.S.A. Certificates, etc.

NEW!

Courses with PRACTICAL EQUIPMENT
 in RADIO · TELEVISION · MECHANICS

CHEMISTRY · ELECTRICITY · DRAUGHTSMANSHIP
PHOTOGRAPHY etc. etc.

COURSES FROM
15/-
PER MONTH



EMI

INSTITUTES

POST THIS COUPON TODAY

To:— E.M.I. INSTITUTES, Dept. 144K, London, W.4.

NAME _____ Age _____ (If under 21)

ADDRESS _____

I am interested in the following subject(s) with/without equipment

(Sept./57) (We shall not worry you with personal visits)

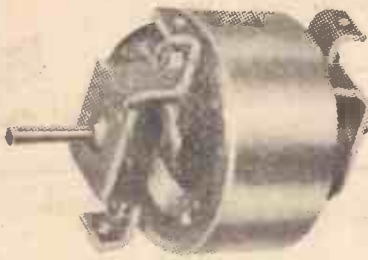
FREE

BLOCK
 CAPS
 PLEASE

IC 106

The only Home Study College run by a World-wide industrial organisation

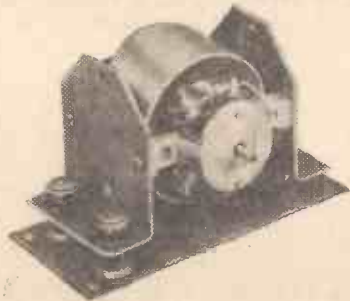
The Bestfriend "ZEPHYR" Motor and Accessories



A silent, shaded pole motor, A.C. only, 200/250 volts, 2,600 R.P.M., 25 watts. 3½" x 2½", with double-ended spindle. Precision built and specially suitable where absolute silence is essential. Continuously rated and designed for use in construction of table and extractor fans, projector cooling units, fan heaters, cupboard airing devices, etc. An extremely high-class product,

designed by engineers with a quarter of a century of experience in motor construction. **37/6** Post Free

An anti-vibration stand for above motor. Horizontal or vertical mounting. Supplied in breakdown form for home constructors. 4½" x 2½" x 2". Three point suspension. Steel, Cadmium plated. **7/6** Post Free



FANS

3 Bladed Metal 3" to 5" 5/-
BAKELITE 3 Blades 8" 7/6
Post Free

The Bestfriend Electrical Co. Ltd.,
BANSTEAD SURREY

SPOT THE BARGAIN

- Item -No.
- 8009 B.A. HEX Bolts Steel, Nuts and Washers. 1 Gross each 432 Parts in all. Mixed 2, 4 and 6 B.A. 7/- per Packet. Post 1/6d. SEE LIST FOR SWITCHES.
 - 8009A B.A. ROUND HEAD Screws, Steel Nuts and Washers. 1 Gross each (432 Parts) mixed 2, 4 and 6 B.A. 7/- per Packet. Post 1/6d. SEE LIST FOR "V" BELTS
 - 8009B B.A. CHEESE HEAD Screws, Steel Nuts and Washers. 1 Gross each (432 Parts) mixed 2, 4 and 6 B.A. 7/- per Packet. Post 1/6d. SEE LIST FOR "V" PULLEYS
 - 8009C B.A. COUNTERSUNK HEAD Screws, Steel Nuts and Washers. 1 Gross each (432 Parts) mixed 2, 4 and 6 B.A. 7/- per Packet. Post 1/6d. SEE LIST FOR MOTORS
 - 8010 SPECIAL MOTORIST'S MIXTURE. This very special mixture contains 1 gross of Bolts and Screws Steel 1/4"-5/16" and 3/8" chiefly Cad. Plated with one nut and 2 washers, 576 parts in all: 22/6d. per Parcel Post Paid. No half parcels available. SEE LIST FOR CONTACT POINTS
 - 8000B 4 B.A. HEXAGON BOLTS various lengths with nuts and washers to fit. 1 Gross each (432 Parts) over 90% Cadmium Plated. 7/- Packet. Post 1/6d. SEE LIST FOR SILVER SOLDER
 - 8000C 2 B.A. HEXAGON BOLTS various lengths with nuts and washers to fit. 1 Gross each (432 Parts) over 90% Cadmium Plated. 8/6d. Packet. Post 1/6d. SEE LIST FOR SCREWED ROD
 - 8000E 1/4" B.S.F. HEXAGON BOLTS, various lengths with nuts and washers to fit. 1/2 Gross each (216 Parts) over 90% Cadmium Plated. 8/6d. Packet. Post 1/6d. SEE LIST FOR COPPER TUBE
 - 8000G 5/16" B.S.F. HEXAGON BOLTS various lengths with nuts and washers to fit. 1/2 Gross each (216 Parts) over 90% Cadmium Plated. 11/- Packet. Post 2/6d. SEE LIST FOR BALLRACES
 - 9000J 3/8" B.S.F. HEXAGON BOLTS, various lengths with nuts and washers to fit. 1/2 Gross each (216 Parts) over 80% Cadmium Plated. 12/6d. Packet. Post 2/6d. SEE LIST FOR ALLEN SCREWS
 - 8000L 7/16" B.S.F. HEXAGON BOLTS various lengths with nuts and washers to fit. 1/4 Gross each (108 Parts) over 80% Cadmium Plated. 9/- Packet. Post 2/6d. SEE LIST FOR SILVER STEEL
 - 8000N 1/2" B.S.F. HEXAGON BOLTS various lengths with nuts and washers to fit. 1/4 Gross each (108 Parts) over 80% Cadmium Plated. 11/- Packet. Post 2/6d. SEE LIST FOR SHIM-STOCK
 - 8001 POT LUCK. Almost anything, but chiefly Screws, Bolts, Washers, Rivets. 1/4" to 6 B.A. 4 lbs. 5/- Post 2/- SEE LIST FOR SELF-TAPPING SCREWS

Cash with order. All goods on 28 days' approval against cash. Orders over £1 (Inland) post free. Collective post on orders under £1 send 2/6d. (Inland).
EXTRA DISCOUNT GIFT WITH ORDERS OVER £2
K. R. WHISTON (DEPT. P.M.9), NEW MILLS, STOCKPORT
PHONE: NEW MILLS 2028

SEE EARTH SATELLITE



AMAZING NEW OFFER
ASTRONOMICAL TELESCOPES 99/6 !!

See the Moon at Close Quarters, Examine the Immense Craters, Mountain Ranges, etc. Observe Saturn's Rings, Nebulae, etc., etc.

Specification. 2 in. dia. Length 39 in. Mag 53 x Linear (equivalent 2809 x Area). Weight Approx. 2 lb. 2 oz.

Standard Model 99/6. De-Luxe Model 147/6. Both packed in strong Stowing Cylinder with Caps. Registered Postage and Packing 10/6.

Altazimuth Portable Clamp Stands. Extra 37/6. P./P. 2/6.

Astro Kits. Self Adaptable Parts. "Do it Yourself." 63/-. P./P. 3/6

High Power Eyepieces, 80 X, 28/- P./P. 2/-, 106 X, 37/6. P./P. 2/-.

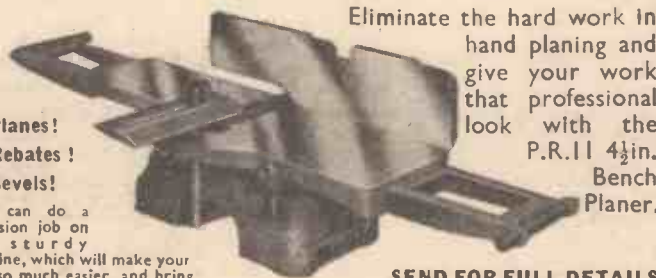
Stamp for Full Particulars. Photographs 1/- set (returnable). Lists and Terms. Made to order.

HOLMES, WILSON & CO.
SCIENTIFIC INSTRUMENT MAKERS
(Dept. PM26), Martins Bank Chambers, 33 Bedford Street, North Shields, Northumberland.

BETTER CABINET MAKING

It Planes!
It Rebates!
It Bevels!

You can do a precision job on this sturdy machine, which will make your task so much easier, and bring greater pleasure to your Furniture making.

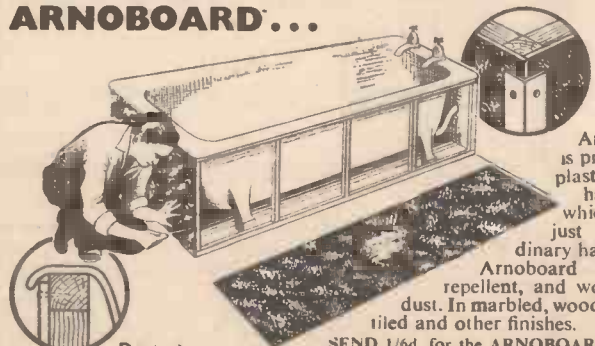


Eliminate the hard work in hand planing and give your work that professional look with the P.R.11 4½ in. Bench Planer.

SEND FOR FULL DETAILS TO (DEPT. BP/43)

MYFORD BEESTON NOTTINGHAM

MODERNISE YOUR BATH with ARNOBOARD...



Arnoboard is prefinished plastic-faced hardboard which works just like ordinary hardboard. Arnoboard is water repellent, and won't hold dust. In marbled, wood grained, tiled and other finishes.

Dept. J.
ARNOLITE LIMITED
WEST PARADE - HULL
Telephone: 35687

SEND 1/6d. for the ARNOBOARD BOOK, leaflet and free sample NOW—IT WILL SHOW YOU HOW TO MODERNISE YOUR HOME THE NEW, EASY WAY—IT WILL SAVE YOU POUNDS.

ALUMINIUM

BRASS - COPPER

- SHEETS
- RODS
- TUBES
- MOULDINGS & SECTIONS

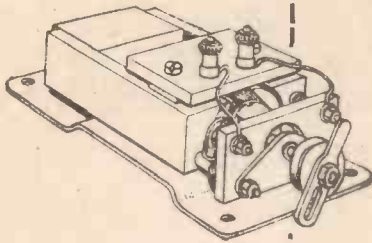
DETAILED PRICE LIST UPON APPLICATION NO S.A.E. REQUIRED

ALCOB METALS LTD.

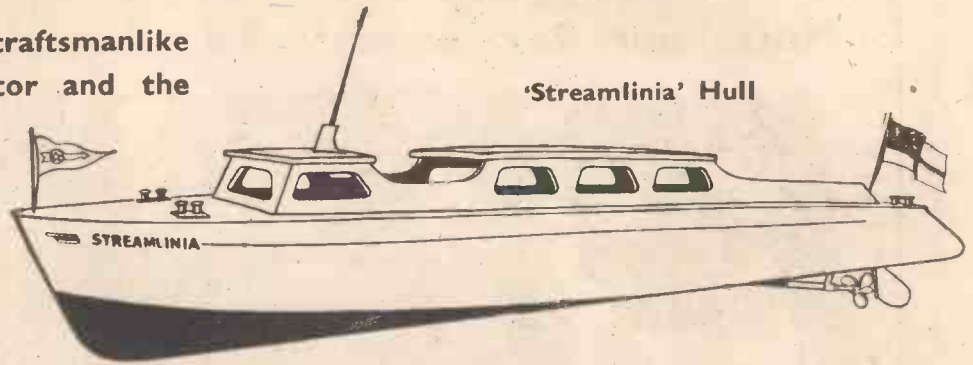
367 EDGWARE ROAD, Paddington, London, W.2.
Tel. PADdington 2232 (3 lines)

Build a boat and be proud of it!

You can do a splendid craftsmanlike job with the Marine Motor and the Streamlinia Hull



Write to-day to Bassett-Lowke for "Model Shipping and Engineering Catalogue," a manual of great help to the model engineer. Price 2/6.



The "Streamlinia" Motor Boat Hull is carved from seasoned timber and finished painted ready for final finishing coat. It will carry plant up to 6½ lbs., is designed for speed and is suitable for steam, electric or i.c. drive. Excellent for radio control. Length 3 ft. 3 in., beam 8 in., price £9 14s. 0d.

Also Propeller Shaft £1 8s. 9d. Rudder £1 4s. 0d. Flagstaff and socket (fore) 7/9 each (aft) 6/- each. Bollards 3/- each. Set of 2 sheets of drawings of the hull lines in 3 scales 10/-.

The Marine Boat Motor is an ideal power unit for this model. Operates on 2-3 cell dry batteries in series or on 6 volt accumulators. Well suited for radio control work, as it can be polarity reversed. Price £2 17s. 6d.

BASSETT-LOWKE LTD

21, Kingswell Street, NORTHAMPTON

LONDON 112 High Holborn W.C.2

MANCHESTER 22 Corporation Street

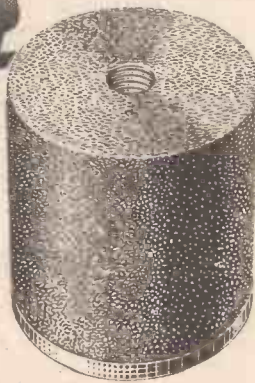
* Permanent Magnets in action *



Ever dropped a nut in a gearbox?

In case you do, have an 'Eclipse' Pot Magnet available to help you recover the nut. This is one of many ways in which magnets can help you.

Ask your tool dealer for descriptive literature.

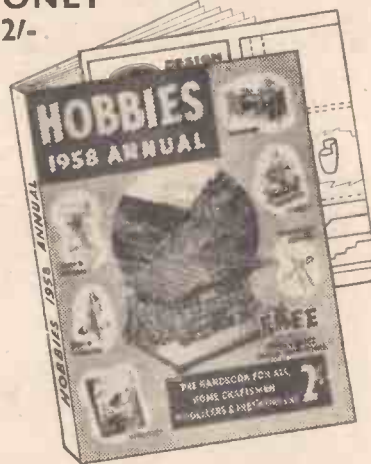


**PERMANENT
MAGNETS**

Made by James Neill & Company (Sheffield) Limited and obtainable from all tool distributors

PM 42

ONLY 2/-



Full instructions for making

- ★ Spanish Guitar
- ★ TV Table
- ★ Contemporary Lamp
- ★ Marquetry Picture
- ★ Transparency Viewer
- ★ Articles in Hardboard
- ★ Gatepost Signs
- ★ Fretwork

and a host of other projects in

HOBBIES 1958 ANNUAL

FREE! Design for making a charming musical Swiss Chalet Cigarette Box with each copy. 168 pages packed with interest for modellers and handymen. On sale now (price 2/-) from branches, newsagents, etc., or direct (2/3 post free).

**SOON SOLD
OUT—GET
YOURS NOW!**

To Hobbies Ltd. Dept. 7, Dereham, Norfolk.
Please send copy of Hobbies 1958 Annual (P.O. 2/3)

Name.....
Address.....

VALUABLE NEW HANDBOOK FREE TO AMBITIOUS ENGINEERS

Have you had your copy of "Engineering Opportunities"?

The new edition of "ENGINEERING OPPORTUNITIES" is now available—without charge—to all who are anxious for a worthwhile post in Engineering. Frank, informative and completely up to date, the new "ENGINEERING OPPORTUNITIES" should be in the hands of every person engaged in any branch of the Engineering industry, irrespective of age, experience or training.

**We definitely Guarantee
"NO PASS—NO FEE"**

This remarkable book gives details of examinations and courses in every branch of Engineering, Building, etc., outlines the openings available and the essential requirements to quick promotion and describes the advantages of our Special Appointments Department.

WHICH OF THESE IS YOUR PET SUBJECT?

MECHANICAL ENGINEERING
Gen. Mech. Eng.—Maintenance — Draughtsmanship—Heavy Diesel—Die & Press Tool Work—Welding—Production Eng.—Jig & Tool Design—Sheet Metal Work—Works Management — Mining — Refrigeration—Metallurgy.

ELECTRICAL ENGINEERING
Gen. Elec. Eng.—Elementary & Advanced Elec. Technology — Installations Draughtsmanship—Supply — Maintenance — Design — Electrical Traction — Mining Electrical Eng.—Power Station Equipment, etc.

RADIO ENGINEERING
Gen. Radio Eng.—Radio Servicing, Maintenance & Repairs—Sound Film Projection — Telegraphy — Telephony — Television — C. & G. Telecommunications.

AUTOMOBILE ENGINEERING
Gen. Automobile Eng.—Motor Maintenance & Repairs — High Speed Diesel—Garage Mngment.

CIVIL ENGINEERING
Gen. Civil Eng.—Sanitary Eng.—Structural Eng.—Road Eng.—Reinforced Concrete—Geology.

BUILDING
Gen. Building—Heating & Ventilation—Architectural Draughtsmanship — Surveying — Clerk of Works — Carpentry and Joinery — Quantities — Valuations

WE HAVE A WIDE RANGE OF AERONAUTICAL COURSES AND COURSES IN FORESTRY, TIMBER TECHNOLOGY, PLASTICS, G.P.O. ENG., TEXTILE TECHNOLOGY, ETC., ETC.

One of these qualifications would increase your earning power
WHICH ONE?

A.M.I.Mech.E., A.M.I.C.E., A.M.I.P.E., B.Sc., A.M.Brit.I.R.E., A.F.R.Ae.S., A.M.I.M.I., L.I.O.B., A.R.I.B.A., A.M.I.H. & V.E., M.R.San.I., F.R.I.C.S., A.M.I.E.D., CITY & GUILDS, COMMON PRELIM., GEN. CERT. OF EDUCATION, ETC.

**THE BRITISH INSTITUTE OF
ENGINEERING TECHNOLOGY**



410A, COLLEGE HOUSE,
29-31, WRIGHT'S LANE,
KENSINGTON, W.8.

Phone: WESTern 9861

WHAT THIS BOOK TELLS YOU

- ★ HOW to get a better paid, more interesting job.
- ★ HOW to qualify for rapid promotion.
- ★ HOW to put some valuable letters after your name and become a "key-man" . . . quickly and easily.
- ★ HOW to benefit from our free Advisory and Appointments Depts.
- ★ WHERE today's real opportunities are . . . and HOW you can take advantage of the chances you are now missing.
- ★ HOW, irrespective of your age, education or experience, YOU can succeed in any branch of Engineering that appeals to you.

**144 PAGES OF EXPERT
CAREER-GUIDANCE**



You are bound to benefit from reading "ENGINEERING OPPORTUNITIES," and if you are earning less than £15 a week you should send for your copy of this enlightening book now—FREE and without obligation.

POST NOW!

to: B.I.E.T. 410A, COLLEGE HOUSE, 29-31, WRIGHT'S LANE, KENSINGTON, W.8.

Please send me FREE and without obligation, a copy of "ENGINEERING OPPORTUNITIES." I am interested in (state subject, exam., or career).....

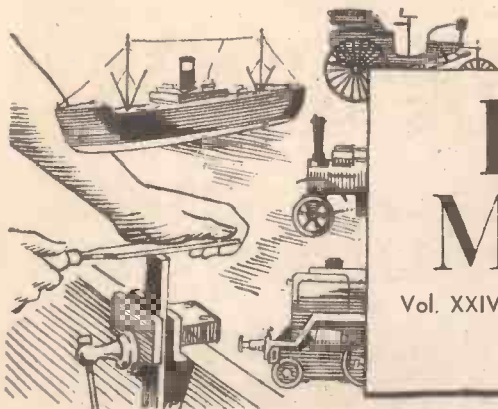
NAME

ADDRESS.....

WRITE IF YOU PREFER NOT TO CUT THIS PAGE

Only 2d. stamp is needed if posted in an unsealed envelope.

THE B.I.E.T. IS THE LEADING INSTITUTE OF ITS KIND IN THE WORLD



Practical Mechanics

Vol. XXIV. No. 283

SEPTEMBER, 1957

"The Cyclist" and "Home Movies"
are temporarily incorporated



Editorial and Advertisement Offices
"PRACTICAL MECHANICS"
George Newnes, Ltd., Tower House,
Southampton Street, Strand, W.C.2.
Phone: Temple Bar 4363.
Telegrams: Newnes, Rand, London.

SUBSCRIPTION RATES

Including postage for one year

| | |
|--------|---------------------|
| Inland | 18s. 6d. per annum. |
| Abroad | 17s. per annum. |
| Canada | 17s. per annum. |

Copyright in all drawings, photographs and articles published in "Practical Mechanics" is specially reserved throughout the countries signatory to the Berne Convention and the U.S.A. Reproduction or imitations of any of these are therefore expressly forbidden.

CONTENTS:

| | Page |
|---|------|
| Fair Comment | 565 |
| Power in the Workshop | 566 |
| Slot Machine Shaving | 567 |
| A Chess Table | 568 |
| Determining Enlarging Exposure | 569 |
| A Four-way Table | 571 |
| Roof Lights in Small Sheds | 572 |
| Making Full Use of Your Circular Saw | 573 |
| Make this Simple Chandelier | 574 |
| Modelling in Horn | 575 |
| Making a Wool Winder | 576 |
| Popular Varieties of Tropical Fish | 577 |
| A Picture Framing Cramp | 578 |
| An Electrical Illusion | 579 |
| A Miniature Billiard Table | 581 |
| Science Notes | 581 |
| A Radio-controlled Model of the Royal Yacht | 582 |
| A Variable-position Bed Switch | 585 |
| Silhouette Pictures | 589 |
| Simple Water Motors | 590 |
| A Simple Sketching Aid | 593 |
| The Junior Chemist | 594 |
| Letters to the Editor | 597 |
| Trade Notes | 600 |
| Your Queries Answered | 601 |
| Information Sought | 602 |
| The Cyclist | |
| What I Think | 45 |
| Prepare Your Lamps for Winter | 46 |

CONTRIBUTIONS

The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Mechanics." Such articles should be written on one side of the paper only, and should include the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed: The Editor, "Practical Mechanics," George Newnes, Ltd., Tower House, Southampton Street, Strand, London, W.C.2.

FAIR COMMENT

FEAR OF AUTOMATION

SCIENTIFIC progress has always been regarded with suspicion and fear by those who feel that their livelihood will be affected. At the dawn of the industrial era, when machine methods began to replace manual labour, there were riots, and workers, feeling that they might be put out of work, wrecked the machines which they thought would bring that about. When Arkwright introduced the loom his machines were smashed, and many other industries suffered a similar fate. During the past two centuries, however, machines have gradually replaced manual labour, both skilled and unskilled, and two centuries of this development show that fears of unemployment are groundless. To take but one example from more recent times it will be recalled that the gramophone industry saw the extinction of the gramophone record industry when radio telephony started up in 1922. The fact is that more gramophone records are being sold today than ever before. Introduction of the printing press has created the demand for more and more compositors. Today, we enjoy a period of full employment, never before experienced in the industrial history of this country.

One would have thought that reflection upon these facts would have allayed any fear that the introduction of automation would create unemployment, but the fear, as in the past, is still there. The report of the Department of Scientific and Industrial Research has gone a long way to removing these fears, and the Minister of Labour, in his recent address to the International Labour Conference in Geneva, stated categorically that automation and technological developments should not bring wide-spread unemployment. He said that people must lose their fear of technological change if we were to make social progress, but the very real fear of many individuals, that their skill and experience would be rendered useless when machines do their job, must not be ignored. The plain fact is, however, that the introduction of machine tools has to a large extent destroyed the versatility of the craftsman and taken away from him the individual skill possessed by his progenitors. In its place comes a new kind of skill, possessed by a smaller number of people, yet enabling greater numbers to earn a better living in a shorter time with less skill.

TECHNICAL TEACHERS

IT is apropos to state that the present body of technical teachers comprises eleven thousand full-time and forty thousand part-time teachers, and it is estimated that by 1961 these figures will increase to eighteen thousand and forty-eight thousand respectively. This does not suggest a diminution in the demand for qualified artisans. Automation will increase demand and it should lower prices—subject, of course, to the nebulous factor of economic conditions. It is true that in some cases skilled men may be replaced, but there will be an equivalent demand for their services in other directions. Whilst, therefore, automation may result in some mutation of labour from one arena of activity to another, by all methods of prognosis there is no indication that labour is to be replaced.

OUR QUERY SERVICE

DAILY we receive letters asking for constructional details of articles which have been described in this journal many times. We have stated so many times that we cannot undertake, through our query service, to prepare special designs for readers nor to modify our designs to suit individual requirements. Some of the requests would need the preparation of special drawings and lengthy descriptions, and these cannot be considered as queries. May we also point out that all queries must be accompanied by a stamped and addressed envelope, the coupon cut from the current issue and a 6d. crossed postal order. We are receiving so many letters from non-readers who have heard of our service that we are compelled to insist upon a strict compliance with our rules.—F. J. C

POWER

in the Workshop

Equipment Available and the Work of Which it is Capable

By D. F. WOOD

THE production of large numbers of electrically driven tools, designed to appeal to the practical man, is a comparatively recent innovation, and the scope of operations which can be carried out by power in the home workshop, and for that matter in the house and garden, is not generally realised.

It is proposed, here, to deal with the types of equipment available, the jobs which can be mechanised, and to give a few hints

that holes can be drilled truly perpendicular to the work, which is usually fixed to the table of the stand (see Fig. 2).

Fences can be fixed on the table so that repetitive work can be done with the minimum of measurement. The reader will find that an extension to the table will be very useful, and this can easily be made of thick plywood securely fitted to the metal table. The extension can then be drilled as necessary to enable longer fences to be used where required. Fences can be easily made from a short strip of wood, secured by light bolts to the table.

Another use for the drill is as motive power for a lathe, which will produce light turning in wood, and can also be used for polishing round objects. The lathes

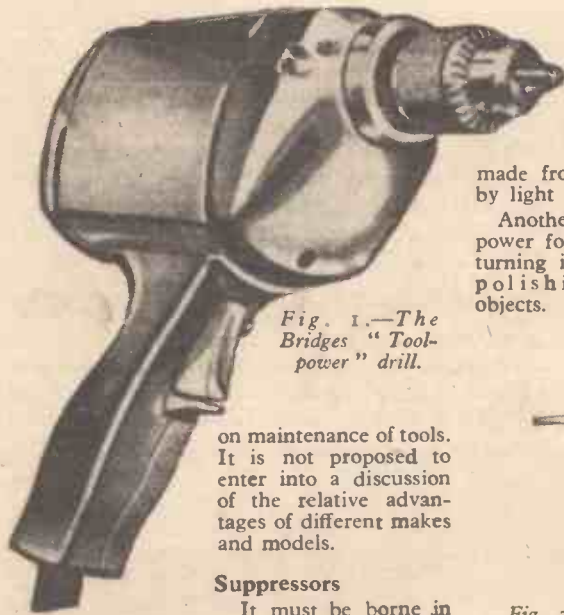


Fig. 1.—The Bridges "Tool-power" drill.

on maintenance of tools. It is not proposed to enter into a discussion of the relative advantages of different makes and models.

Suppressors

It must be borne in mind that whatever electrically driven equipment is used, it must not cause interference with nearby television sets. It is the owner's responsibility to arrange this. Most types of tools bought complete with motor are fitted with the necessary suppressors before leaving the factory, and the prospective purchaser should satisfy himself on this point before buying. The reader who connects his own motor to a tool, however, will have to do this for himself.

The present range of power tools can be divided up into two broad classifications. First comes the large group of multipurpose tools, which utilise one source of power to do many different operations. The other group consists of the tools designed for one job only.

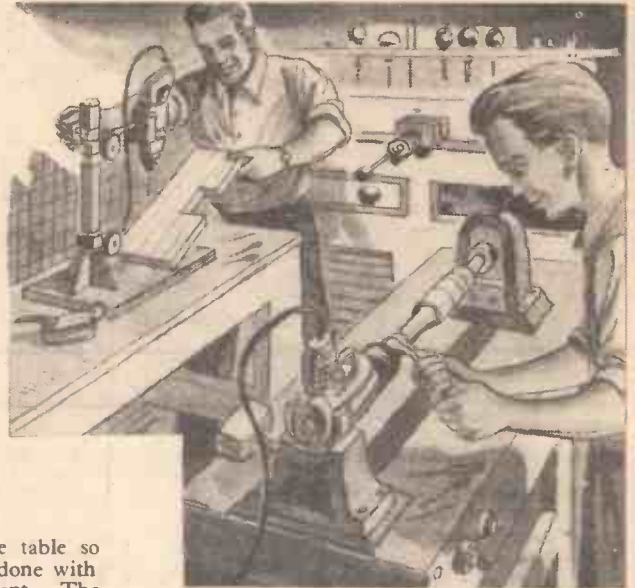
Portable Drill Outfits

These outfits are becoming increasingly popular, for the home handyman, because there are now on the market many accessories for household and garden chores, as well as those for use in the workshop. A typical drill is shown in Fig. 1.

The use of the drill for its original purpose is too well known to require comment. A useful adjunct to the drill, when used for its primary function, is the bench stand. This holds the drill in a vertical plane so

will not cope with metal turning or spinning.

Circular saw attachments are on the market for drills. They are of two distinct types, one complete with its own saw bench and table, which is adjustable for depth and angle of cut. This design is for cutting scantlings, etc. The other type is portable and consists of saw, motor, adjustable fence and guides, so that work may be done outside the workshop or on items too large to pass through the bench machine. The safety devices provided on a circular saw should always be used. A circular saw will usually have a maximum depth of cut



of one third its diameter, provided that it is adequately powered.

The other general applications of the drill as motive power are to sanding discs, emery discs, a large variety of different shaped grinding wheels, polishing mops and buffs, and circular wire brushes. There are also available planing attachments, and the drill in its bench stand can be fitted with a mortising bit for cutting mortise joints, slots and sinkings. This consists of a bit revolving inside a hollow chisel.

Elsewhere, the drill can be used, with suitable attachments, to polish floors and furniture, to cut hedges, and one maker has produced orbital sanding and kitchen mixer devices. An orbital sander is shown in Fig. 3.

Combination Woodworkers

For the man with a large programme of woodwork on hand these machines would save a lot of time and effort. They consist basically of a woodworking lathe in most cases, and will carry out a further series of operations by the addition of accessories and attachments, rather in the same way as an electric drill outfit. They are first and foremost lathes, and as such are of greater horsepower than a drill, and thus capable of carrying out heavier work. A typical example is shown in Fig. 5. The operations usually covered are:—sawing, planing,

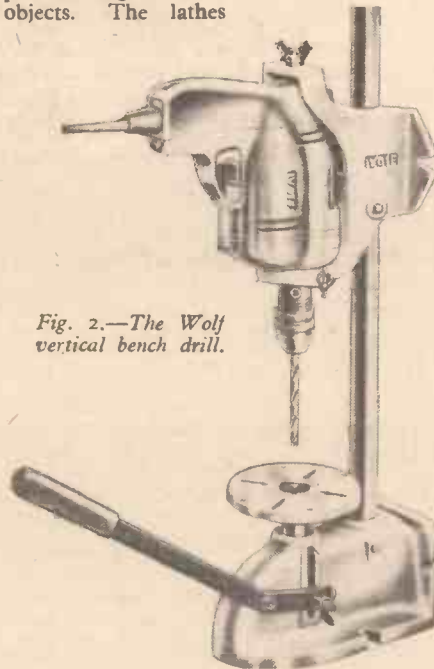


Fig. 2.—The Wolf vertical bench drill.



Fig. 3.—Black and Decker orbital sanding attachment.

boring, moulding, mortising and sanding. There are also a number of machines which, whilst not being basically lathes, will carry out a selection of the above jobs. The unit shown in Fig. 4 could be included in this category.

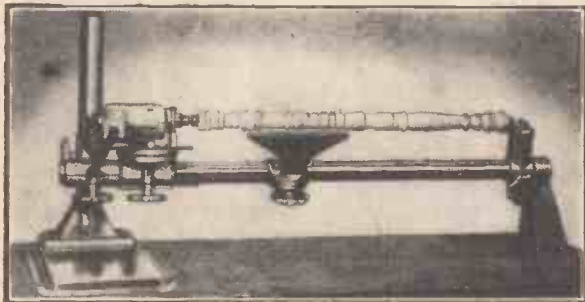
Apart from the above combination tools and outfits, there are, of course, many machines capable of one job only. These range from the handyman size, up to commercial sizes. We are only concerned with the smaller sizes here.

Portable Drills

The larger sizes of drills usually only have a bench stand as an accessory, and occasionally mortising bits.

Saws and Planers

Many sizes of circular saws and planers are available and are especially useful if a large amount of work is contemplated. Mention must be made here also of the petrol-driven chain saw, which is invaluable



to the property owner having many trees to fell and reduce to logs. Such saws are now obtainable in smaller sizes than before, and would merit consideration if the volume of work was on hand.

Sanders

These are of several different types, distinguished by the direction in which the machine moves the sanding medium. In the first case there is the revolving disc, which is the same as that obtainable as an extra to a drill. This sort is generally useful, but is not suitable for fine finishes, as the direction of cut is not wholly along the grain. The other designs are the orbital in which the movement is high speed in a very small orbit, reciprocating which is self explanatory, and the belt sander of the portable size, where the movement is straight line in one direction only. Sanding by hand is tedious, to say the least, and a machine is a good investment if funds permit.

Paint Sprays

There are a considerable number of paint sprays on the market for home use. They are of two types: electrically and vacuum driven, the latter for use in conjunction with a vacuum cleaner.

Electric Soldering Irons

These are a great help for home soldering jobs, as they are easier to use and give more consistent results than the ordinary pattern. There are many sizes, but the smallest is adequate for all but very large jobs.

Other Machines

A large selection of other types of tools is on the market for special work not usually undertaken in the home workshop. These include lathes for turning, screw cutting and spinning in metal, jig saws, bandsaws, power fretsaws, etc. These tools are of the specialist type normally found in small businesses.

Electrical Supply

In general the small drill sets and similar sized tools are suitable for connecting to a power plug of 13 or 15 amps. The larger tools, however, may require a special starter, which, by building up the speed of the motor slowly, minimises the starting current needed. The type of motor and the horsepower will be the governing factors in deciding whether a starter is required, and it is best in any case to consult the local electricity board, when in doubt. They will be only too pleased to help. Their inspection is also necessary of any extension of wiring carried out in installing power tools.

Installation of Power Tools

Tools which are designed for bench fixing should be provided with their own bench and not used clamped to the ordinary working bench. Installed thus, the tools are steadier, and no time is wasted in erecting them before use. The best type of tool bench to use is a narrower version of the usual working bench. The tools are permanently bolted to the bench top, ready for use. If desired, waterproof cloth or timber covers can be made for the tools.

Fig. 5 (Right).—
The Myford
Universal wood-
turning lathe.

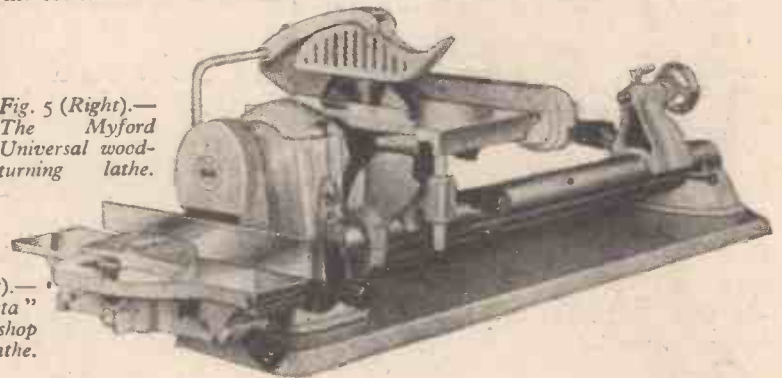


Fig. 4 (Left).—
The "Selecta"
home workshop
in use as a lathe.

Slot Machine Shaving

The Latest Automatic Device

THE path towards automation in masculine grooming has been blazed by Partwest Ltd., with their new Auto Shaver, an automatic electric shaver operating on a slot machine principle—6d. giving five minutes' use of a well-known brand of electric shaver, which has a rotary-action head for smooth shaving. Fixed to the wall, as shown in the photograph, the "Auto Shaver's" white cabinet incorporates a mirror at eye-level. The device is expected to find a wide application in hotels, restaurants, clubs, military, R.A.F., Fire Service and police messes; railway stations and trains, ships, airports and airliners, departmental stores, exhibition halls, Turkish and municipal baths, public conveniences, public houses, hospitals, working men's institutes, colleges and polytechnics, sports ground, ballrooms, etc. etc.

In the interests of hygiene the "Auto Shaver" has its own disinfecting system, which operates automatically after each shave.

Enquiries regarding purchase or hire on a percentage basis should be addressed to the makers at 50, Mount Street, London, W.1.

Maintenance

Power tools require more care and attention than hand tools, and the owner who is prepared to devote the necessary time to this rather tedious task will find his reward in the improved efficiency of his tools.

Tools are generally powered by an electric motor, and driven via gears or belting of some description, or a combination of both. Electric motors should be kept dry and free from damp and condensation. Brush gear, if any, should be regularly examined, and the brushes themselves replaced when worn. The motor should be oiled according to the maker's instructions, taking care to keep oil and grease away from insulation and contacts.

All moving parts of the machine where metal runs on metal, need lubrication, and especially such items as gears, bearings and bushes, unless the maker's instructions are to the contrary. Belting drives require no attention, other than the oiling of pulley shaft bearings.

In general, all tools must be kept clean, and it is best if portable items are stored in a cupboard, particular attention being paid to cutting edges of all descriptions.

The habit of inspecting all trailing electric cables before use is one that is recommended, and care should be taken with cables of portable tools.



The Auto Shaver in use.

A Chess Table



BY
A. E. SMITH

THIS chess table has a board made of red and yellow Marleyfilm offcuts, and is very attractive if neatly made. The board only could be made on a board could form the centre of a larger table, as shown in Fig. 1.

The Board

This is drawn in Fig. 2 and consists of a piece of $\frac{1}{2}$ -in.-thick plywood, $17\frac{1}{2}$ in. square, with an edging of $\frac{1}{2}$ in. wood glued and pinned on after covering. When the ply has been cut to size it must be glasspapered as smooth as possible as any unevenness will show through the Marleyfilm. The position of the $1\frac{1}{2}$ in. squares can then be marked out with a pencil. The easiest way to cut the squares from the Marleyfilm is to mark out on the back with a marking knife and steel ruler, cutting about halfway through the film. When all the marking has been done the film is folded along the cut lines when it will be found to break quite cleanly. The $\frac{3}{16}$ in. border strips are best left in a length and cut off as needed.

When heat is used to attach Marleyfilm it is inclined to shrink slightly so that this method is unsuitable for the chess board. The method used is to coat the board thinly with Marleyfilm adhesive and allow to dry.

Attractively Made
in Wood with
Imitation Inlaid
Playing Top

Each piece of film is then given a thin coat of adhesive and pressed firmly into place while still wet. A bone folder or an old knife handle is useful to press the pieces down and it will be found that the film can be stretched slightly to close any small gaps. Any adhesive on the upper surface can easily be removed later. It is best to start with a row of eight squares and then trim the edge with a sharp knife and straight-edge

before laying the next row. When all sixty-four squares have been stuck in position they are trimmed all round and the narrow borders cut and attached. The outer borders, which may be red or yellow, are mitred at the corners. The edging strip is mitred and fixed with glue and fine pins (gramophone needles are ideal for this). When the glue has set, any adhesive on the surface can be removed with petrol and the board smoothed with wet abrasive paper, using a very fine grade with plenty of water. Wax polish gives a final finish.

The Stand

This should be made of hardwood and polished, although softwood could be used and stained or painted. Plane all the wood to size and make the halving joint between the feet (B in Fig. 2). Note that allowance must be made for the reduction of thickness when the underside is shaped. Mark the mortice and the tenon ($1\frac{1}{2}$ in. square and $1\frac{1}{2}$ in. long) with a mortice gauge and saw the

Fig. 1.—The completed chess table.

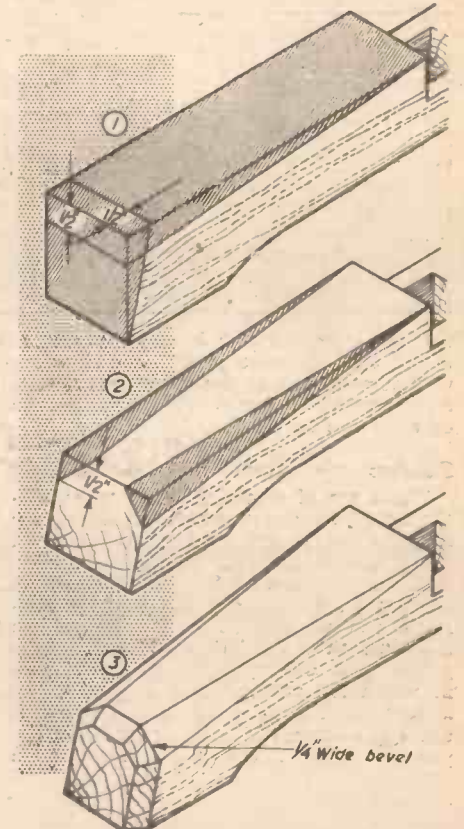


Fig. 3.—How the stand is bevelled.

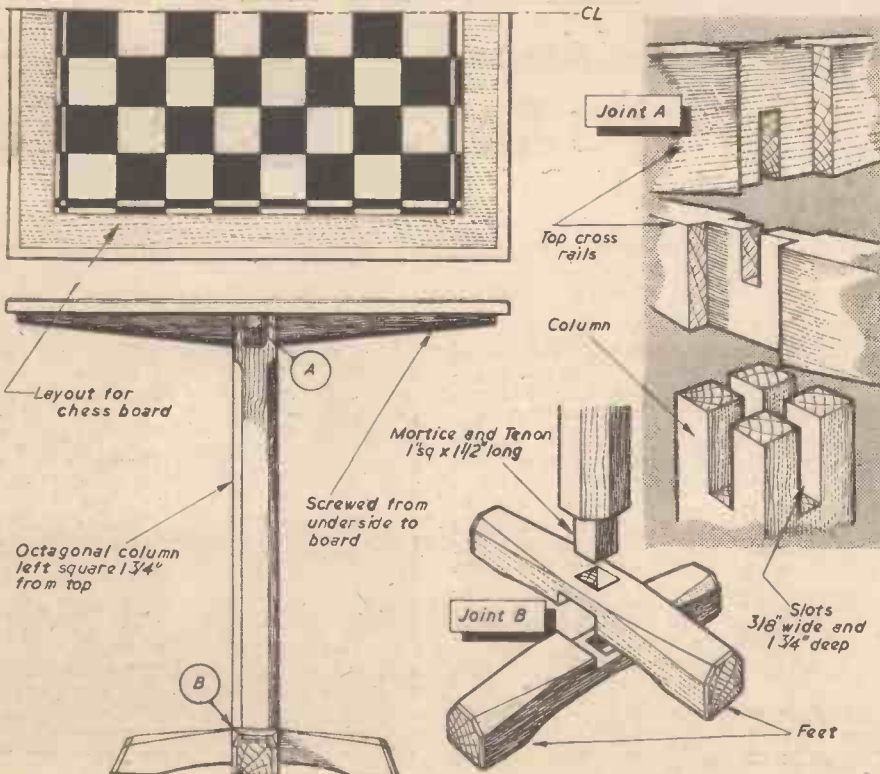


Fig. 2.—Constructional details and dimensions of chess board and table.

tenon. The mortice should be cut with the halving joint assembled. Bore a $\frac{1}{16}$ in. hole through the centre, taking care not to touch the lines, and remove the remaining waste with a chisel, working from both sides into the centre.

The Top Joint

The top joint shown at A in Fig. 2 is a combination of halving and bridge joints. The slots ($\frac{3}{16}$ in. wide and $1\frac{1}{2}$ in. deep) at the top of the column and the corresponding pieces on the rails are marked with a mortice gauge and cut with saw and chisel. Each rail is then fitted in turn into the column and the position of the halving marked so that it lines up with the slots. Gauge the depth of the halving, cut, and assemble the joint. Do not use too much force or the rails may be distorted or even split. It may be necessary to plane a thin shaving from the sides of the column to obtain a good fit. The top rails are tapered to $\frac{3}{16}$ in. at the ends and a $\frac{3}{16}$ in. bevel cut on the edges.

(Concluded on page 598)

DETERMINING ENLARGING EXPOSURE

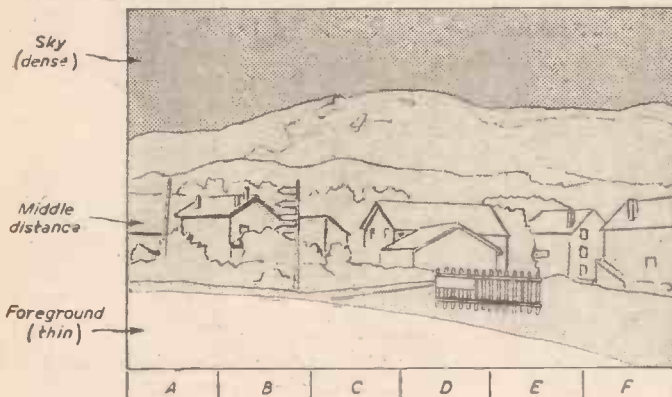
Test Strips : Illumination Meters : Illumination Standard and Photo-electric Meters

By F. G. RAYER

MOST darkroom work at home is done during the autumn and winter, when there is more time. The dark nights also allow an ordinary room to be used, which would be quite impossible during daylight without black-out screens or shutters. Care in enlarging will greatly influence the quality of the pictures finally obtained, and some method of determining the exposure, for each negative, is required. Several factors influence exposure, the most important being lens aperture, degree of enlargement, strength of illumination and density of negative. Except when doing repetition prints, or one size of enlargement from negatives of about equal density, it is neces-

Upon development A will probably be too thin and F too dark. Somewhere between these extremes will be a satisfactory section and a print is then made with this exposure.

It is also possible to give each strip the same increase in time. For example, the card may be moved at five second intervals, giving exposures of 5, 10, 15, 20, 25 and 30 seconds. This is easier to do without confusion



sary to find the correct exposure each time. Several ways of doing this exist. Each has its own advantages, so that adopted depends on circumstance.

It should be remembered that the exposure should always be such that full development of the print is possible. Taking a print quickly from the developer, to prevent it growing too dark, will result in dull enlargements. The print should, instead, be discarded and a new one made with shorter exposure, so that development does not need curtailing. Correct developing instructions will be found with the developer (usually being one and a half to two minutes at about 65 deg. F.) and should be followed.

Test Strips

Test strip exposures are often used and provide a number of exposures, of different length, on one print. This print is then developed, the best strip noted, and a complete print then made with this exposure. It is essential that each test strip includes a full range of tones found on the negative. For example, in Fig. 1, the print is divided so that each strip has dark, intermediate and light subject matter.

To make such a test the negative is focused in preparation for the final picture. The enlarger is then switched off and the bromide paper placed on the easel. The enlarger is then switched on and the paper covered up progressively with a large sheet of card or other opaque material. Each strip may receive twice the exposure of the previous strip. For example, A in Fig. 1 is covered up after two seconds; B is covered after two seconds more, making four seconds; C is covered after four seconds more, making eight seconds, and so on.

Fig. 1.—Test strip exposures.

can be for 20, 25, 30, 35 and 40 seconds only.

With a weak image (due to dense negative, much enlargement, poor light, or small lens aperture) it will be necessary to have longer exposures, and the test can be in ¼-minute intervals. If the illumination is so bright that even five seconds is too long, then it is best to stop down, in view of the difficulty

of error, but covers a shorter time scale. It is particularly useful, however, after a little experience. For example, if an exposure of 30 seconds is thought probably correct the test strips

paper through the aperture in the card. The paper is then moved along and a further exposure made, this being continued until the paper is all used. Upon development several pictures of different density will be obtained, according to the various exposures given. A full print can then be made with the best exposure time.

It must not be overlooked that the test

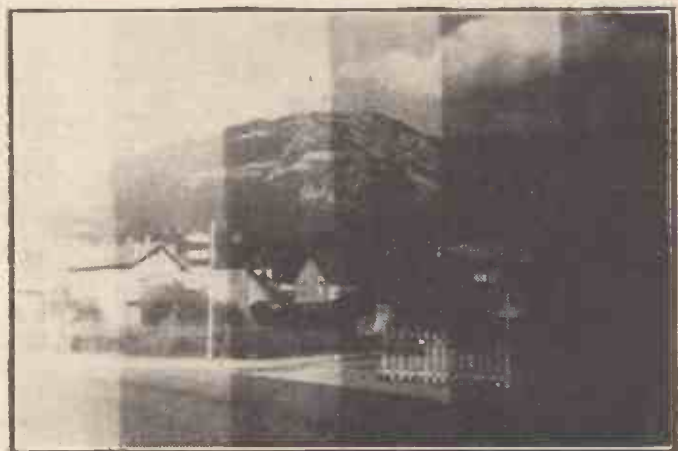


Fig. 2.—An example of a test strip photograph.

exposures must be made on paper of the same grade and manufacture as the paper to be used for the final print. The degree of enlargement and aperture must also remain unchanged.

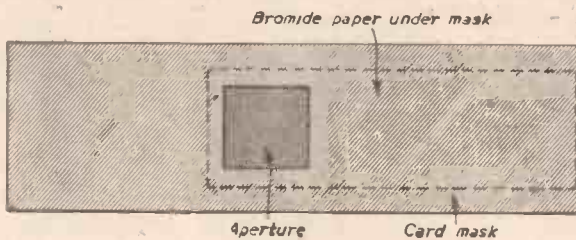


Fig. 3.—An alternative method.

of timing very short intervals correctly.

With upright pictures containing sky and foreground it will be necessary to take care that a full range of tones is found on each test strip. An example is shown in Fig. 2.

Another method is shown in Fig. 3, using small strips of paper about ¼in. by ¼in. cut from the full-sized sheets. After the enlarger is focused some important feature (such as a head) is exposed on the

Illumination Meters

Though the test strip is reliable and inexpensive, making and developing it takes a little longer than producing the final print. This can be avoided by other methods, one of which will become clear from Fig. 4. Here a shallow box contains a bulb and variable resistance or rheostat of about 10

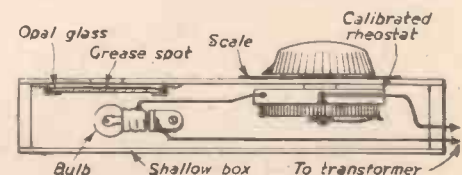


Fig. 4.—Grease spot illumination meter.

to 20 ohms, current being taken from a 4v. or 6v. transformer. A small piece of flashed opal glass diffuses the light and a slip of paper with grease spot is visible through an aperture in the box top.

In use, the meter is placed on the enlarger baseboard, the negative being in position in the usual way. The grease spot can now be moved under parts of the projected image and the rheostat adjusted until illumination from each side of the spot balances. After calibration the exposure can then be read off from the rheostat scale for a given grade of paper. Calibration may be in terms of exposure times which will just give full black on complete development. It is then easy to ascertain the exposure time for any part of the negative.

The grease spot will be a trifle nearer the enlarger lens than the bromide paper, but this will not make any significant difference at normal degrees of enlargement. If this slight error is to be avoided, the enlarging frame, to which the bromide paper is fitted, should be packed up so that the paper is the same distance from the enlarger baseboard as the grease spot in the meter.

Some instruments of this kind have a mirror at 45 deg. under the spot, illumination being controlled by drawing the bulb away on a graduated sliding scale. No rheostat is then required. This arrangement is equally effective, but more difficult to construct and less compact.

An Illumination Standard

A method of determining exposure which is quite successful after a little experience is shown in Fig. 5, making use of a low wattage bulb at a fixed distance from the enlarger baseboard. A "Nitelite" bulb is suitable, and can be operated directly from the mains supply.

To use, the image is focused upon a white card on the enlarger baseboard in the usual way. The illumination standard is then placed on the baseboard and switched on. When the image is brighter than the light from the bulb, it will still be visible. But as the lens is stopped down, a point will be

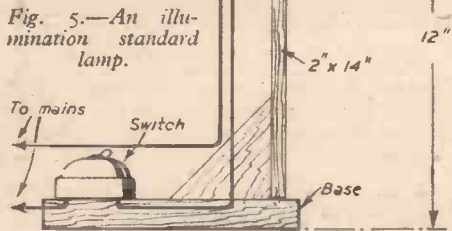


Fig. 5.—An illumination standard lamp.

reached where the image is just lost. This can readily be found by passing the hand across under the lens as the aperture is reduced.

A test strip is then made to determine the correct exposure for the enlargement. Once done, no further tests will be necessary. Instead, the lens aperture is adjusted until the image just disappears and the standard exposure, as already found, is given.

The distance of 12in. in Fig. 5 will cover all average degrees of enlargement with condenser illumination, a 150-watt lamp and f.3.5 or f.4.5 lens. If diffused illumination is used, with no condenser, it will be necessary to use a higher upright member or a very small bulb since the image will be relatively dim. One or two trials will immediately show how far the bulb needs to

be, to balance a normal negative at medium apertures, and the standard can then be made to suit this.

Photo-electric Meters

A simple method which can be used successfully when a good level of illumination is available is shown in Fig. 6. A selenium cell and sensitive meter are wired together. They may be in a single case or separate, with a flex lead between. After focusing the enlarger, the cell is placed upon a selected (e.g., average) portion of the image and the meter reading noted. The meter may be calibrated in terms of actual exposure or a scale drawn up showing exposures against meter readings.

This method is not suitable for enlargers with other than condenser illumination. An aperture not smaller than f.4.5 is required,

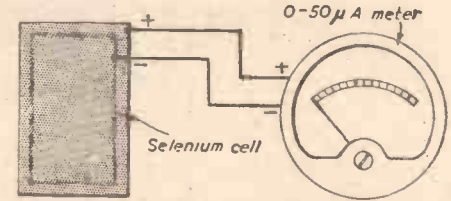


Fig. 6.—Photo-electric meter.

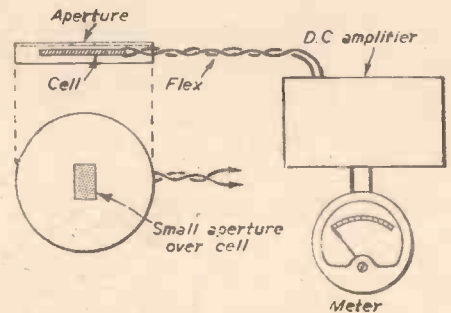


Fig. 7.—Photometer with amplifier.

and a 150-watt bulb, otherwise meter readings will be too small. The cell must always be covered against direct daylight or other powerful illumination.

It will be seen that the circuit resembles that in the usual photo-electric exposure meter used in photography, but the latter type of meter is not likely to be sufficiently sensitive. The cell or meter must be down on the enlarger baseboard, not held up towards the enlarger lens, where illumination will be much more powerful. Calibration will be simplified if only a few exposure times are found, since each calibration point will require test strips. For example, exposures of 2, 4, 8, 16 and 32 seconds can be used, and will cover most work. If the meter does not indicate any of these points, then the enlarger lens can be opened up or stopped down slightly until one of the calibrated exposures is correct.

With dense negatives, small apertures or poor illumination due to considerable enlargement, light is not sufficient to give any significant reading. An amplifier then becomes necessary, as shown in Fig. 7. A photo-electric cell is used, and illumination is through a small aperture in the cell case. This aperture can be about 1/4in. by 1/2in., and will allow the illumination of small areas of the image to be measured. Direct indications on the meter are obtained, thus avoid-

ing the need for any visual estimating of relative brightness. The simplest way to use such an arrangement is to focus the image at the desired size then read the brilliance of a bright area which will need to be completely black on the finished print. If the meter is calibrated in terms of the minimum exposure which will just give full black, this exposure will then be correct for a normal negative on normal grade paper.

An amplifier circuit suitable for this purpose is shown in Fig. 8, any pair of high-gain pentodes being satisfactory. Heater current is best drawn from a suitable transformer—e.g., 6.3v. for 6.3v valves. A metal rectifier will provide H.T. current, and the equipment will be isolated from the mains if the transformer also has a H.T. secondary for this purpose. Smoothing can be provided by two 16μF condensers and choke or 5K resistor.

The second valve serves merely to help eliminate errors caused by fluctuations in voltage, etc. The meter requires to be of sensitive type—about 250 or 500 microamps full-scale deflection. In use, the sensitivity control is set with maximum resistance in circuit, and the 5K control adjusted until the valves both pass the same anode current, as shown by zero meter reading, with the photocell covered. When the photocell is illuminated, the anode currents cease to balance, and a meter reading arises, its extent depending on the position of the 2K control. The latter is left unaltered once suitably set.

Since operation has to be adjusted to suit very low degrees of illumination, the photocell must not be exposed to strong light or the meter may be damaged. When making measurements, the cell should be screened from illumination by the darkroom safe-light. Care is also necessary when first switching on to see that the meter is not taken past full-scale reading.

Whatever method is used, it is best to make the exposure at the actual lens aper-

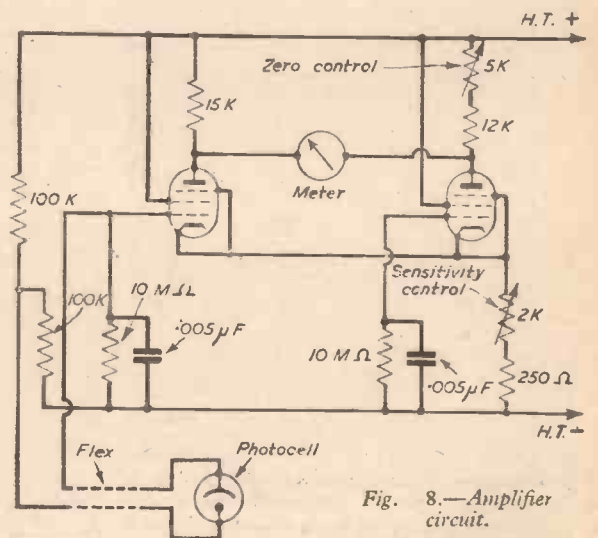


Fig. 8.—Amplifier circuit.

ture at which the time was determined. This is particularly so with condenser illumination, where a cone of powerful illumination passes through the centre of the lens. As a result, stopping down the lens will not give a regular reduction in image brilliance, as in a camera. The change in brightness will also depend on the distance between lens and condensers, which will change for each modification in the degree of enlargement. It is thus not safe to double exposure for each stop down, with an enlarger having condenser illumination.

A FOUR-WAY TABLE

THIS article describes the construction of a piece of furniture which can be put to any of the following uses: (1) as a breakfast tray; (2) as an occasional table; (3) as a table to fit over a fireside chair (for meals, playing solo card games, doing handicrafts, etc.); (4) as a sloping-surfaced writing or reading desk (also to fit over a fireside chair).

Before proceeding with the details, it must be pointed out that the unit as described has been designed for use in conjunction with a fireside chair of which the overall width is 22in., and the height of the arm-rests from the floor also 22in. If your chair's measurements are greater than these figures, the appropriate dimensions in the text must be modified.

The Bed Tray

Cut a piece of $\frac{3}{8}$ in. plywood, size 24in. by 15in., decide which side you are going to use as the top surface, then with this side uppermost drill and countersink ten holes of $\frac{11}{64}$ in. diameter, as shown in Fig. 1. Sandpaper the plywood smooth on both sides—this task is more easily carried out at this stage than when the tray has been assembled.

Now cut two 22 $\frac{1}{2}$ in. lengths of $\frac{3}{8}$ in. by $\frac{1}{2}$ in. wood and in each one drill the seven holes indicated in Fig. 2. Into each end of one length, drill a central hole $\frac{3}{8}$ in. diameter, $\frac{1}{2}$ in. deep, into which insert a 1 $\frac{1}{2}$ in. length of $\frac{3}{8}$ in. dowel and glue in place.

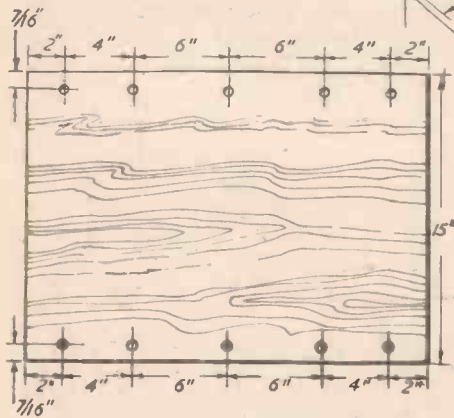


Fig. 1.—Location of drillings in tray.

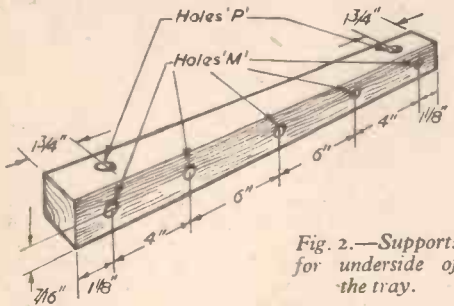


Fig. 2.—Supports for underside of the tray.

Place the two lengths on the bench approximately 13in. apart with holes "M" facing uppermost and holes "P" facing inwards. Lay the plywood across them so that the sets of holes coincide, then assemble, using 1in. No. 8 screws.



Versatile, Useful and of Simple Construction

By B. H. ELDON

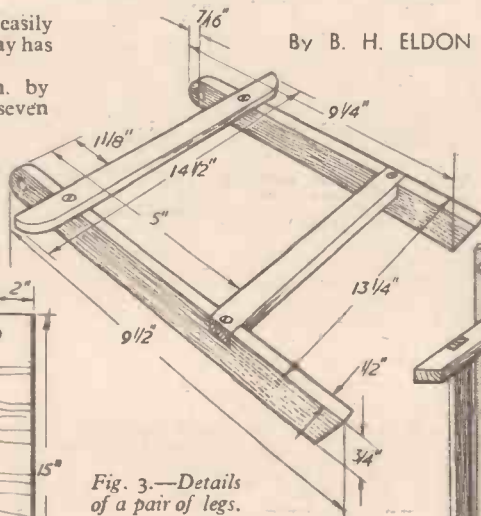


Fig. 3.—Details of a pair of legs.

Each pair of legs consists of two 9 $\frac{1}{2}$ in. lengths of $\frac{1}{2}$ in. by $\frac{1}{2}$ in., braced by two parallel bars, as shown in Fig. 3. To assemble, insert a 1in. No. 8

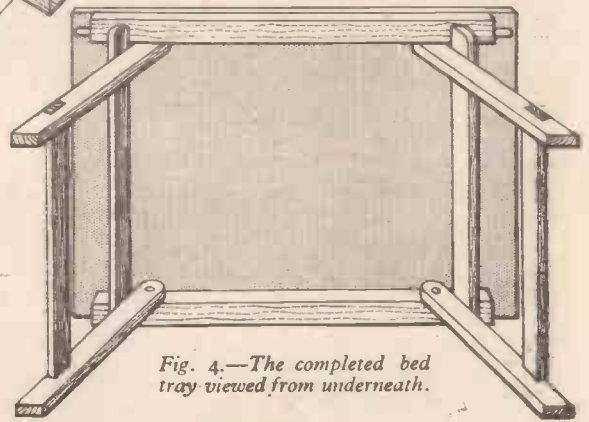


Fig. 4.—The completed bed tray viewed from underneath.

screw through the hole in each leg and screw into the hole shown as P in Fig. 2.

Now cut two strips 24in. long, $\frac{1}{2}$ in. wide, and two strips 15in. long, $\frac{1}{2}$ in. wide, all of $\frac{1}{2}$ in. thickness. Mitre the ends and glue to the top surface of the tray to form a raised edging. This will serve to prevent articles from sliding off the tray, and also hides the screw-heads.

The completed assembly should now be sandpapered smooth, painted or stained as desired, and when viewed from underneath should appear as illustrated in Fig. 4 and also in Fig. 5.

The Collapsible Stand

The stand shown in Fig. 6 is of 1in. wood throughout ($\frac{1}{2}$ in. after planing).

Cut four uprights, each 24in., and four rails, each 14in. The latter are then mortised and tenoned into the uprights to a depth of $\frac{1}{2}$ in. at the points indicated, thus forming the two side "gates." For the centre section, cut two uprights each 22 $\frac{1}{2}$ in., and two rails each 21 $\frac{1}{2}$ in., mortise and tenon to a depth of $\frac{1}{2}$ in. at the points indicated.

Lay the three sections on the bench or floor so that the bottoms of the uprights are exactly level, and join the "gates" to the centre section by two pairs of 1 $\frac{1}{2}$ in. by $\frac{1}{2}$ in. hinges. The assembly should now stand



Fig. 5.—A photograph of the bed tray.

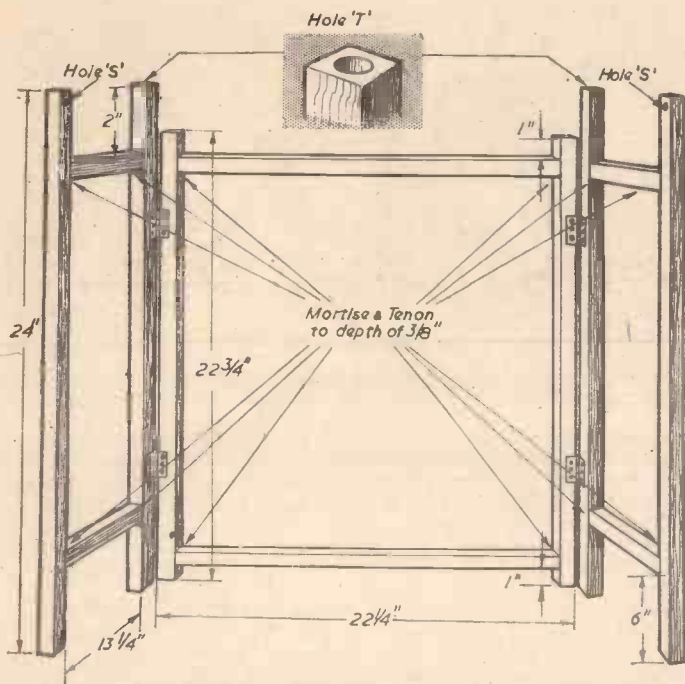


Fig. 6.—The collapsible stand.

to form three sides of a rectangle, and the uprights of the centre section should now be 1 1/2 in. below the four uprights of the two "gates." When satisfied that the assembly is correct, drill the holes marked "S."

With centre 1/2 in. below the top of the upright, drill right through, 1/2 in. dia. Drill the holes (T) centrally down the back uprights, 1/2 in. dia., to a depth of 1 1/2 in.

Knock out all mortise and tenon joints, glue and re-assemble. When the glue has set, sand-

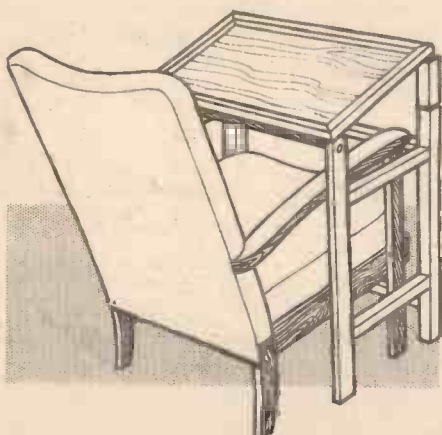


Fig. 7.—The unit set up as a desk.

paper the assembly and paint or stain as desired.

Finally, cut two small posts, each 3 1/2 in. long, and drill a central hole into one end of each, 1/2 in. dia. and 1 1/2 in. deep. Into this

open the collapsible stand to form three sides of a rectangle; insert the short dowels on the underside of the tray in the holes marked "S" in Fig. 6, and allow the tray to rest flat upon the four uprights. No further fixing is necessary, but remember when moving the table to lift by the rails of the stand, and not under the edges of the table. The table as assembled above can



Fig. 8.—A further view of the table.

hole insert a 2 1/2 in. length of 1/2 in. dowel and glue in position. This will leave 1 1/2 in. of dowel protruding, which should be sanded until it can be easily inserted and withdrawn, but it should be without sideplay when in position.

Method of Use

The use of the bed-tray component is obvious, and needs no explanation.

To assemble the unit as an occasional table,

also be used to fit round a fireside chair.

To convert the table into a writing desk, lift the back edge of the tray (allowing it to pivot upon the front dowels) and insert an extension post into each of the back uprights. Allow the tray to fall back into position, and it will be tilted at a comfortable angle for reading or writing, whilst the edging round it will prevent any books, papers or pencils, etc., from sliding on to the floor.

A general view of the desk is given in Fig. 7 and it is being used as a table in Fig. 8.

Few people ever bother to buy a bed tray because it is an item which is seldom used. Here it is in every day use as a table, but is immediately available for use in the sick room.

Rooflights in Small Sheds

By W. A. BROWN

EXTRA daylight in the workshop is a great advantage and here are details of an inexpensive method applied to a boarded and felted roof.

Expose the roofing-boards by removing the old felt. According to your needs and the spacing of rafters (A in Fig. 1, or purlins B) remove an area of boards. The boards must be cut to fit flush with the roof framework and added framing pieces. Do not cut any existing framing. Any roof members which pass under the opening must be brought up level with strips cut from the removed boards. Extra "bars" may be needed to give support to the Windolite, which is used instead of glass.

A length of new felt is laid loosely in correct position. Press lightly on this around the opening so as to give an indication where to cut the hole in the felt. Remove, and cut this.

The Windolite should now be tacked over

the opening, lapping about 2 in. all round. Where this is covered with felt apply a generous coating of sealing compound such as Seelastik.

The felt may now be laid finally in position and fixed, preferably with 1/2 in. galvanised tacks at 2 in. intervals.

The skylight may be edged with thin boards or ply to make a neat finish.

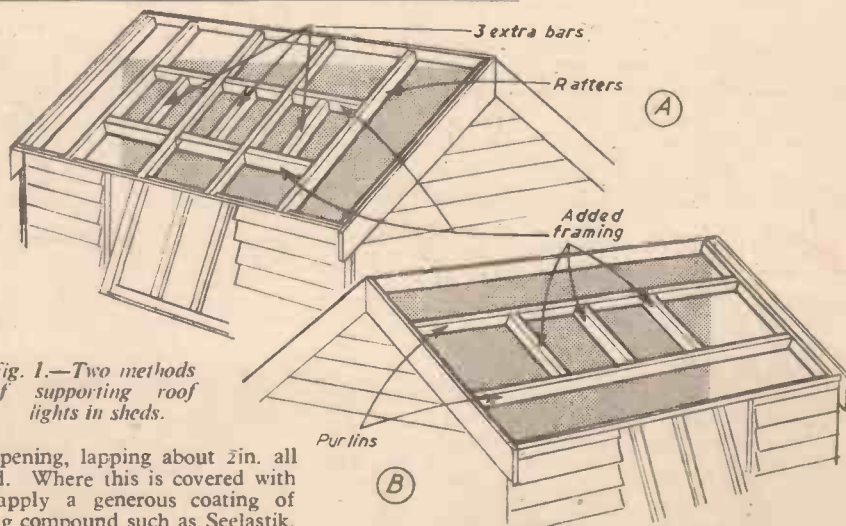


Fig. 1.—Two methods of supporting roof lights in sheds.

Precise dimensions and instructions cannot be given as obviously sheds differ widely in size and construction, but the method can be adapted to suit most small garden workshops, toolsheds, etc.



MAKING FULL USE OF YOUR CIRCULAR SAW

By J. VOSE

(Concluded from page 530, August issue)

IF tenoning is to be done regularly, a sliding jig can be constructed to enable the work to be done more accurately and safely. A simply-designed jig is shown in Fig. 22. The flat baseboard slides along the table, and the verticle fence, secured to it, slides along the normal ripping fence. A triangular gusset piece not only holds the two pieces firmly at right-angles, but it also forms a stop for the work. A "G" cramp can be used, if desired, to hold the work firmly in contact with the fence, or a lever action cramp could be devised in order to speed the work. The pieces must be cut off previously to dead length and the height of saw adjusted to cut up to the shoulder lines.

The shoulders of the tenons are cut with a fine cross-cut blade, the work being guided by the sliding fence, as shown in Fig. 17. Although the shoulder lines in this illustration have been squared over on the face of the work, this has only been done to make the operation clear. In practice, these lines need not be squared over, the setting-out lines on the edge being sufficient to enable the saw to be lined up accurately with them. An alternative method, useful when a lot of repetition tenoning is to be done, is to fix a stop to the sliding jig fence, at the required position to enable the end of the work to be butted up to the stop, when the shoulders may be cut without any setting out at all.

each shoulder line is determined from its fellow shoulder on the opposite side, instead of from the end of the work, thus ensuring absolute accuracy of the shoulders in relation to each other.

Pattern Sawing

It is sometimes necessary to cut a number of odd shaped pieces to identical shape and size. This may be done without any marking out, by the process known as pattern sawing. One piece should be cut exactly to the size and shape required. A couple of sharp pointed nails are

shown in Fig. 23. The outer face of the saw blade must be exactly in line with the edge of the guide block. Of course, only straight-sided figures can be cut in this manner, but outside curves can be roughly shaped by taking a number of straight cuts across the corners until the approximate curve is reached. No attempt should be made to negotiate a curve, however slight, on a circular saw, except by this process of gradually cutting away in a series of straight

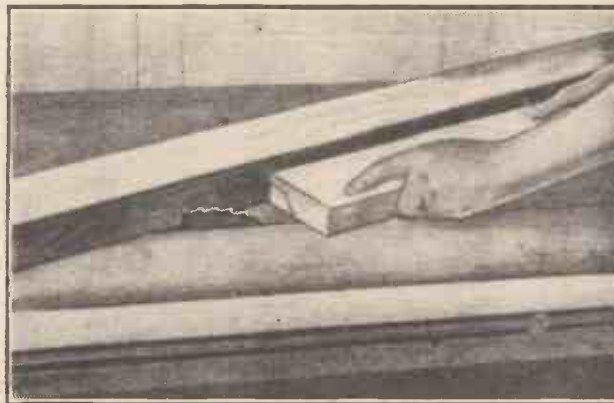


Fig. 24.—Cutting a cove moulding with the circular saw.

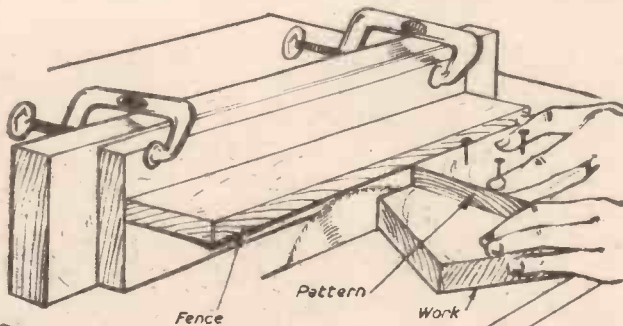


Fig. 23.—Pattern sawing.

driven through this piece until they protrude a little on the underside. This pattern is pressed down on to the work so that the nail points bite, to prevent any slip, and then the work, and the pattern, are passed through the saw, the pattern riding against a guide slip clamped to the fence. The guide may be in the shape of a Tee, formed by two boards screwed together, as

cuts. The final shape can be achieved with spokeshave, rasp, etc.

Cove Cutting

The operation being performed in Fig. 24 is in the nature of a trick, but it can be very useful when large coved mouldings are required for such purposes as coved skirtings or cornices.

A length of wood, to act as a fence, is secured in an oblique position to the table top by means of cramps at each end. The saw is set to project about $\frac{1}{4}$ in. above the table, and the work passed over it, sliding along the oblique fence. The saw is then raised another $\frac{1}{4}$ in. and a further cut taken, and so on until the required depth is reached. The angle of the fence, and the number of successive cuts taken, determines the finished profile of the coved moulding, which is actually part of an ellipse. Trial cuts should be made first, in a waste piece, until the required shape is obtained. As the saw is cutting mainly with the sides of its teeth, it should have more set than usual. Teeth-marks will be left on the work, but with a very light final cut, these should not be so pronounced that they cannot be removed with sandpaper.

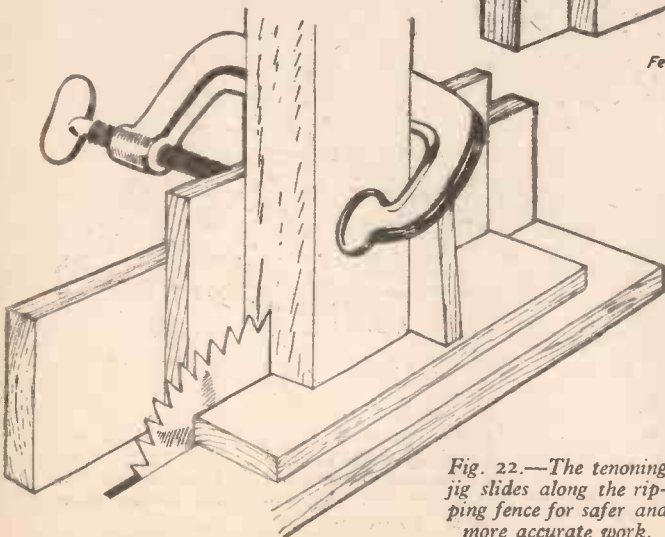


Fig. 22.—The tenoning jig slides along the ripping fence for safer and more accurate work.

Make This Simple Chandelier

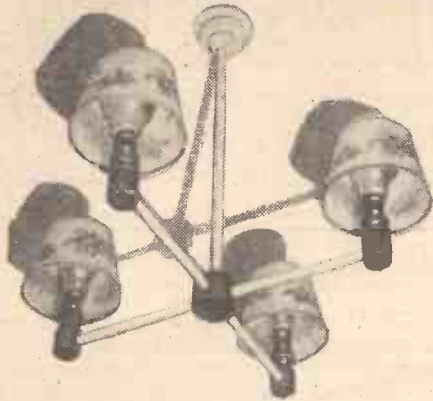


Fig. 1.—The completed chandelier.

THE completed chandelier is shown in the photograph, Fig. 1.

Make the vertical tube from a piece of brass tube $\frac{3}{4}$ in. outside dia. and 18 in. long. One end is saw-cut several times down the tube to enable a small flange to be formed (see Fig. 2). The saw-cuts should be about $\frac{1}{4}$ in. deep. To bend the flange it is necessary to heat the part over a flame, and when soft bend into shape with a pair of pliers. This flange forms a pivot in the ceiling rose. To carry the tube the hole in the ceiling rose will have to be increased in diameter. It is made large enough for the tube to hang freely, the flange preventing it falling through.

The four horizontal arms are made from $\frac{1}{2}$ in. o.d. brass tube, each $7\frac{1}{2}$ in. long.

To finish, the tubes can be chromium plated, painted, or the brass polished and then lacquered.

Wooden Blocks

One centre block and four smaller blocks should be made in a hard wood. The centre block (see Fig. 3) is 2 in. dia. x $1\frac{1}{2}$ in. long, has four equally spaced $\frac{1}{2}$ in. dia. holes drilled towards the centre. Another hole $\frac{1}{2}$ in. dia. is drilled in the top; this is allowed to break through into the passage of the smaller holes. The smaller blocks (see Fig. 4) have each two holes $\frac{1}{2}$ in. dia. drilled at right-angles and, as before, allowed to break through.

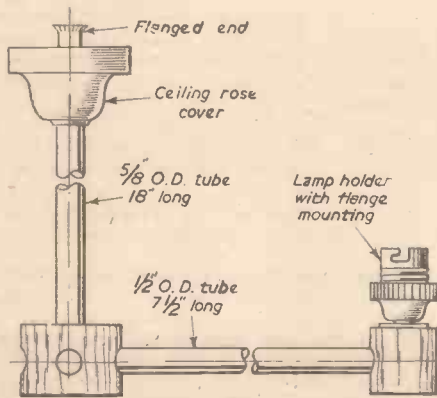


Fig. 2.—General view showing construction.

Before drilling the blocks try the wood drills in a spare piece of wood. The brass tubes should be a good push-in fit.

Construction

To secure the vertical tube into the centre block (see Fig. 6) push the tube $\frac{1}{2}$ in. into the block; then through the side of the

Constructional Details are Given By G. WILLOW

block, $\frac{1}{2}$ in. from and parallel to the top, drill a small hole. This should pass through the tube into the wooden block again, and in it a small pin should be fitted as shown. Rivet the end of the pin slightly so that it can be drawn out when required.

Glue is all that is necessary to fix the

| No. | Part | Material | Size |
|-----|--|----------|---|
| 4 | Horizontal tubes | Brass | $\frac{1}{2}$ in. outside dia. x $7\frac{1}{2}$ in. long. |
| 1 | Vertical tube | " | $\frac{3}{4}$ in. outside dia. x 18 in. long. |
| 1 | Centre block | Wood | 2 in. dia. x $1\frac{1}{2}$ in. long. |
| 4 | Lamp blocks (if obtainable, from a broken cricket stump) | " | $1\frac{1}{2}$ in. dia. x $1\frac{1}{2}$ in. long. |
| 4 | Lamp holders with tapped ends | | |
| 4 | Screwed flanges for above, with screws | | |
| 1 | Ceiling rose (existing one can be used) | | |
| 1 | Pin (use a cycle spoke) | Steel | $\frac{1}{16}$ in. dia. x $1\frac{1}{2}$ in. long. |
| 4 | Lamp shades | | |
| 4 | Lamps | | |
| 1 | Length of twin flex | | $2\frac{1}{2}$ to 3 yds. |

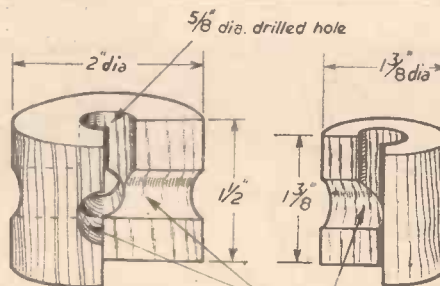


Fig. 3.—Cut-away view of centre block.

Fig. 4.—The lamp holder.

four lamp arms into the centre block and to secure the four small wood blocks.

The wooden blocks may be stained and polished, but if desired can be painted.

Wiring

To wire the chandelier, four lengths of twin flex are required together with a shorter piece for the mains connection. Remove the vertical tube by drawing out the small pin, and work down each lamp arm a length of twin flex. Connect up to the lamp holders. From each length of twin flex take one wire, bare the ends and solder together with one wire from the shorter piece of the twin flex. The remaining four wires should then be similarly treated. Insulate both joints with electrician's tape, making sure that they are well covered. Try to arrange the joints so that one is below the other approximately half-way down the vertical tube. This prevents the wires bulging and jamming inside the tube. The vertical tube, with the ceiling rose cover, should now be fitted into the centre block. Trim off the two wires, leaving a **b o u t** 3 in. to spare to connect to the mains.

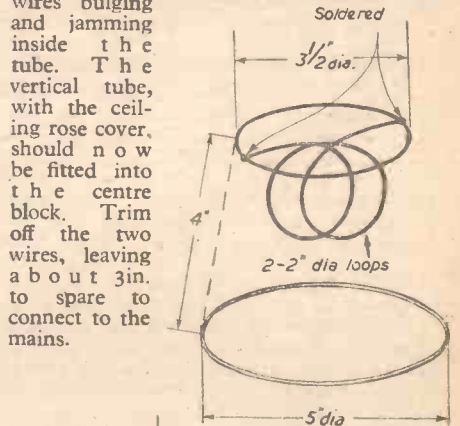


Fig. 5.—(Above) Frame for the shade.

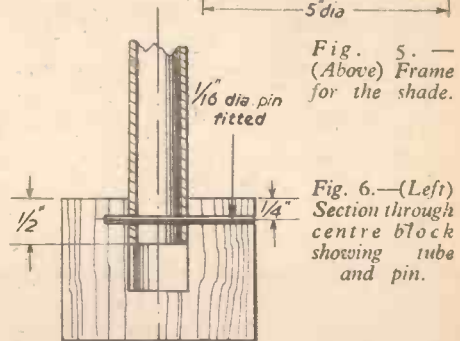


Fig. 6.—(Left) Section through centre block showing tube and pin.

Lamp Holders and Shades

Four lamp holders are required with four screwed flanges to secure them on to the wooden blocks. Four lamp shades can be purchased quite cheaply, but, if preferred, can be made.

The dimensions of the frame are shown in Fig. 5. Two hoops are required, one $3\frac{1}{2}$ in. dia. and the lower 5 in. dia. A length of wire is bent to form two 2 in. dia. loops, the ends of which are soldered to the $3\frac{1}{2}$ in. dia. hoop. The two loops form a fixture to clip on to the lamp. Plastic or parchment are best suited for the shades.

The National Do-It-Yourself Magazine

PRACTICAL HOUSEHOLDER

EDITED BY F. J. CAMM

September Issue Now On Sale

Principal Contents: Lock Repairing; Practical Veneering; A Child's Play House; Installing a Shower; Making an Oriol Window; Repairs to Plastered Surfaces; Build this Recessed Bookcase; Financial Assistance for House Improvements; Wiring Your House for Power; Concrete for Gardens, Paths, Floors; Forced Circulation Central Heating; Attractive Bench Seating; Building a Fitted Wardrobe; Repairing Electric Drills; Imitation Wrought Iron; Home Weaving—Building a Loom; Building Byelaws; A Quickly Constructed Cupboard; Vacuum Cleaner Maintenance; The P. H. One-bedroom Bungalow; The Selecta Home-Master; P. H. Test Reports; Letters to the Editor and many other interesting articles.



Modelling in Horn

Working the Material and Some Attractive Designs

By B. EVANS

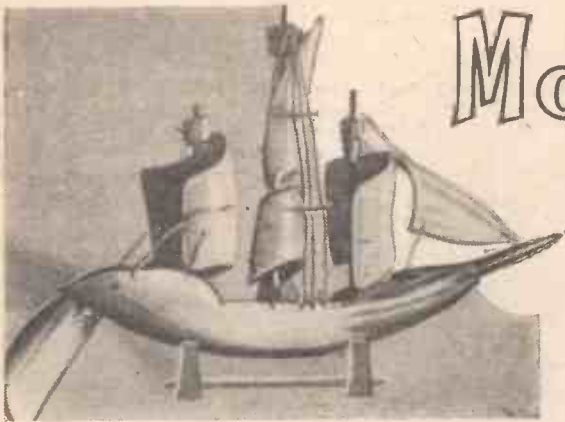


Fig. 1.—A galleon in horn.

IN bygone days horns had many uses other than the decorative and were frequently seen as drinking cups, snuff boxes, buttons, etc. They do not seem to be so popular in modern decor and one of the reasons for this seems to be that horn is generally considered hard to work. This is a fallacy, however, and all tools that can be used on wood can be used on horn. It is simple to saw, drill, sandpaper and polish.

As the horns vary in shape and size, there is a need for imagination, and the ability to create in the abstract becomes imperative. Horn modelwork, with its graceful lines and symmetry is in no way out of place with modern furnishings. The photographs Fig. 1 and Fig. 4 give some idea of the work which can be accomplished. All of these articles can be tackled with a little imagination.

The Galleon

Horns may be obtained from almost any local abattoir at usually a modest cost. Choose two gently curving, well coloured horns and set to

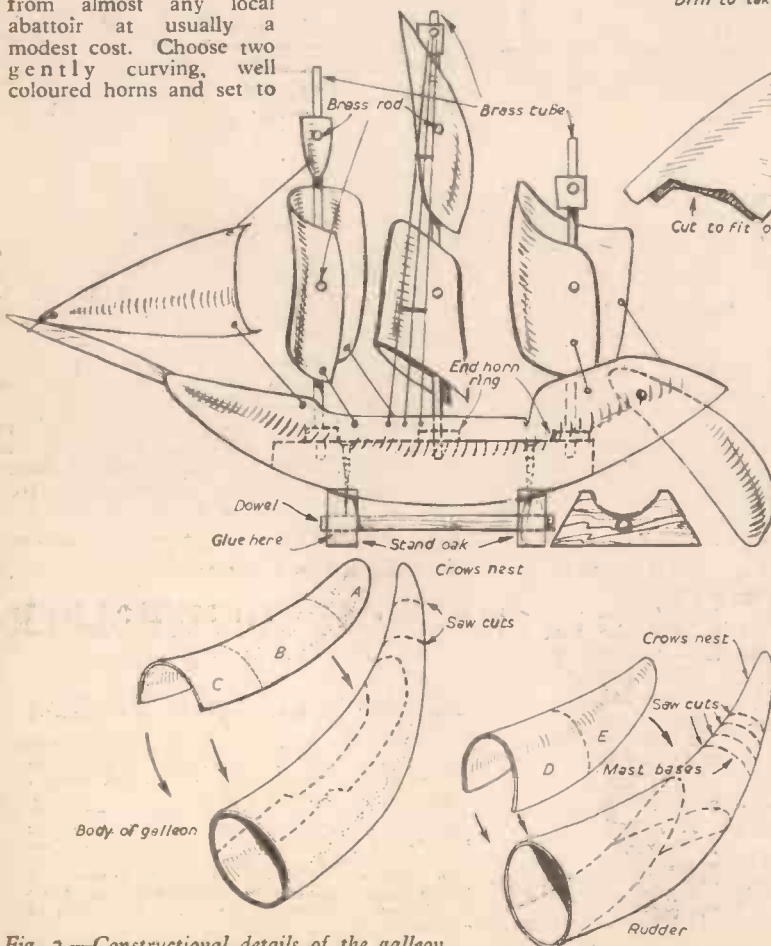


Fig. 2.—Constructional details of the galleon.

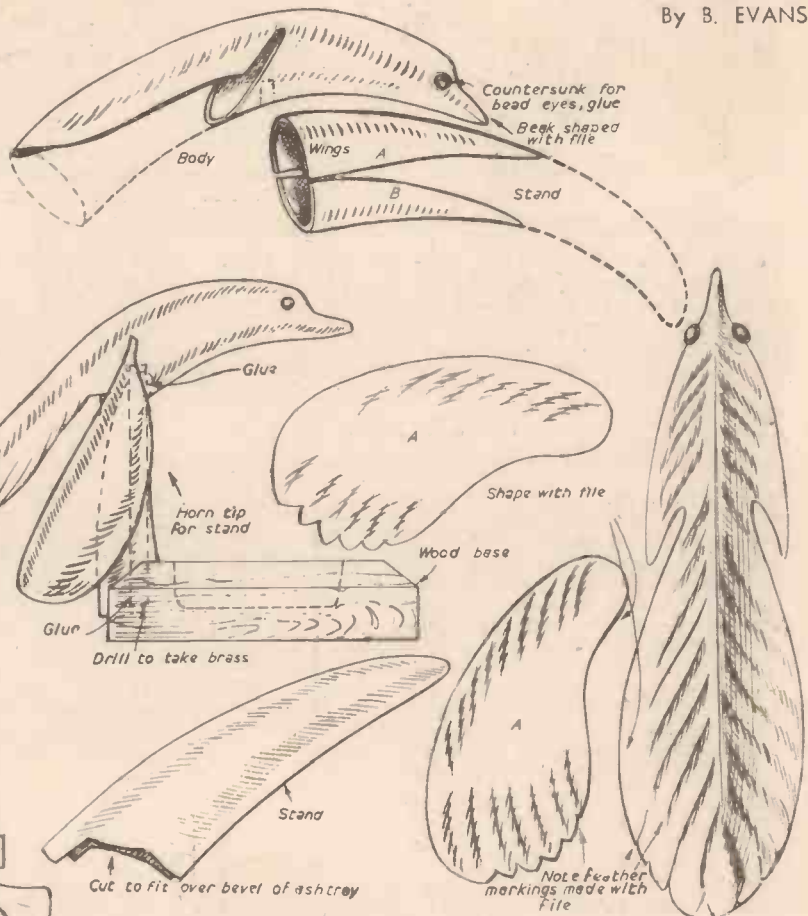


Fig. 3.—Constructional details of the bird.

work at once to prepare them for cutting. Hold the horn in a vice, and using a wood rasp shape it; then use varying grades of sandpaper until the smoothness required is obtained. The horn is then ready for cutting.

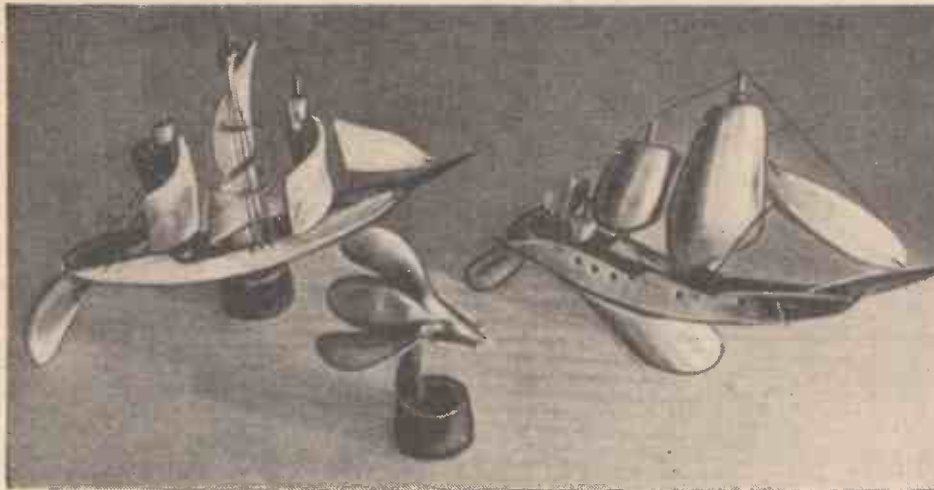
For making the galleon, two horns are required. From one the body of the galleon, the sails, A, B and C and two crows

nests are cut and from the other come sails E and D, the rudder and the mast bases. The inside surface edges are then smoothed, and the final assembling of the galleon is as shown in Fig. 2.

The Wooden Base

This is cut to fit the inside of the body of the galleon as can be seen in Fig. 2 and is screwed to any type of stand visualised by the reader, i.e., under a table lamp or over a concealed light, etc.

Brass tube is used for the masts, lengths being obtained by trial and error and then being highly polished. Over the masts are slipped the mast bases and the brass tubing is drilled to take brass rods which will carry the sails and crows nests. At the same time drill small holes in the corners of the sails to support the rigging. Holes are drilled in the hull for the same purpose and a further hole at the rear to hold the rudder. As can also be seen in Fig. 2, a shaped wooden spar carries the forward rigging. Small anchors and other ship's equipment can be made from odd pieces of horn and brass rod, all rigging being done in brass wire. Woodwork should be stained before assembly and the horn polished with wax



or clear varnished after assembly. This galleon is a rather complicated object for the beginner and it would be advisable to start with serviette rings or shoe horns as practice and progressing to the bird or abstract shown in Fig. 3.

Hints

The edge of a piece of broken glass used as a scraper on horn soon brings up a smooth surface.

A hacksaw is best used for all sawing jobs and metal drills for all drilling.

If flat pieces of horn are needed, boil the horn for several minutes, then place between two pieces of wood in the vice and squeeze tight. Leave until cold and the horn will stay flat. Horns can be bent into most shapes after boiling.

Fig. 4 (Left).—A group of the author's creations.

Making a Wool Winder

A Simple but Ingenious Device

By A. WILSON

THE wool winder shown in Fig. 1 eliminates the holding of the hank of wool by a second person, or the awkward manipulation of winding into the ball from the back of a chair. By placing the hank over the pegs on the wool winder one can wind wool quite easily, almost without effort as the arms rotate. The arms when folded and set apart from the base present no problem as regards storing, as may be seen quite clearly from Fig. 2.

Construction

The centre boss (Part A in Fig. 3) is drilled as shown so as to revolve freely around the nail (E). The blind hole should be drilled in the centre of the block and along its axis.

The arms (part B) when cut, are to be carefully positioned so that when screwed to Block (A) an upward movement of the arms is permissible, but when horizontal the lower left corner of each arm abuts against the adjacent one. Six $\frac{1}{8}$ in. holes for the pegs, at intervals of $\frac{1}{4}$ in. should be drilled along each arm, in the position shown in Fig. 3, so that the dowels (D) may be adjusted to suit various size hanks of wool.

The Base

A piece of wood $\frac{1}{2}$ in. square and $\frac{1}{2}$ in. thick provides the base (Part F) of the wool winder. Round nail (E), acting as a spindle on which the upper assembly rotates, is driven through the base (F) from the underside.

A further refinement would be the addition of four rubber buffers (Part G), fixed to the underside of the base in each corner.

A smooth finish to the woodwork will prevent the wool being damaged, due to catches, and improve the appearance.

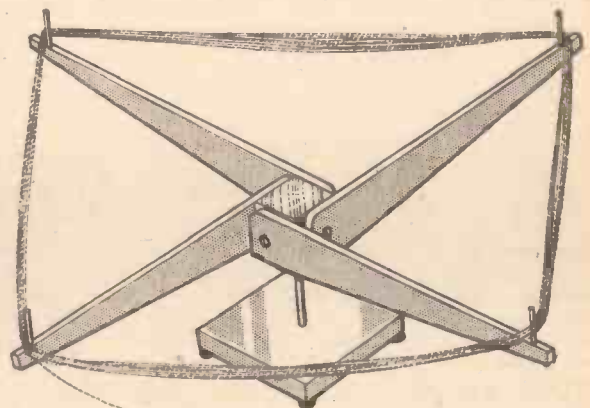
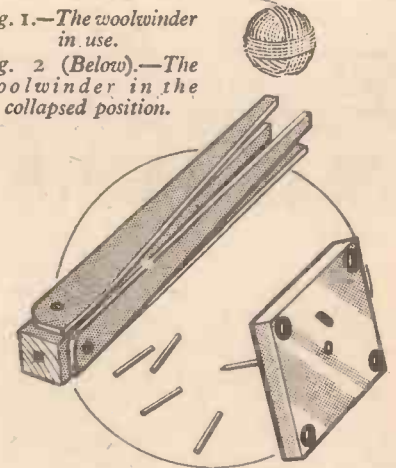


Fig. 1.—The woolwinder in use.

Fig. 2 (Below).—The woolwinder in the collapsed position.



New Radio Communication Method Possible

LIGHTNING produces audible radio waves, called whistlers because they make a sound like a whistle, steadily falling in pitch. This has been imitated and the man-made "whistler," which is radio energy in the very low frequency range, travels along invisible tubes of force in the earth's atmosphere from one hemisphere to another. All that is necessary to tune into these sounds is an aerial connected up to an amplifier. Whistlers travel 8,000 miles into space along the earth's magnetic lines of force on their journey to the opposite hemisphere.

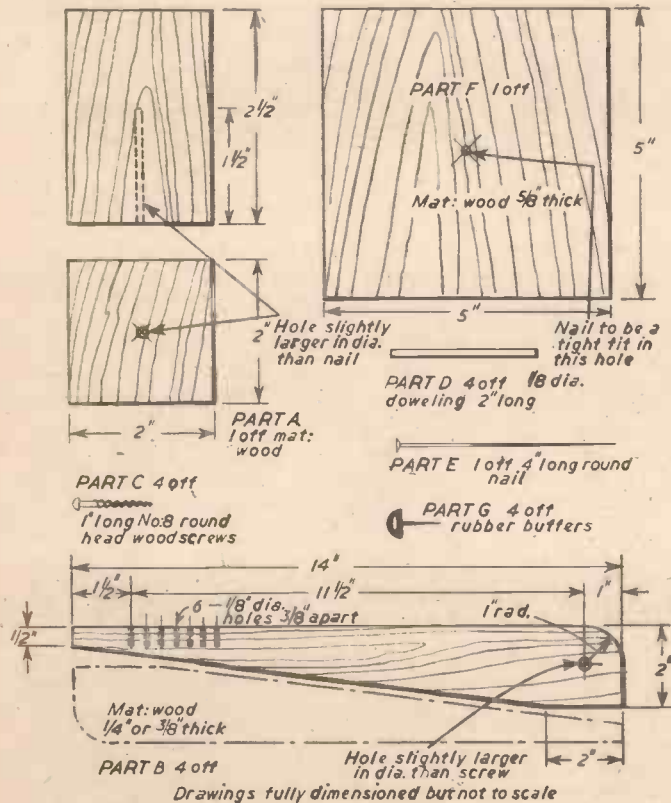


Fig. 3.—Constructional details and dimensions.

Popular Varieties of Tropical Fish

The Better-known Types and Their Characteristics

By I. W. BRASSINGTON

mentioned below are all too small to bully other fish.

Two fish which may be ranked with Neons and Glowlights for their wonderful, luminous markings are Harlequins (*Rasbora heteromorpha*) and White Cloud Mountain Minnows (*Tanichthys albonubes*). The Harlequin is a deep-bellied fish, 1½ in. to 2 in. long, with a warm, reddish-golden glow which is emphasised by a black triangle from tail to half-way along its body. The White Cloud used to be called the "poor man's Neon," for it resembles the Neon in shape, but the main reason for this name was, I

Guiana and Venezuela and owe their popularity to the fact that they breed readily. If the aquarium is well furnished with thickets of plant life, where young fish may hide in safety, the drab female will soon provide you with a fresh stock, no special preparations being necessary. The male fish is much smaller and more colourful. Though only a little over 1 in. in length, it is completely covered in dabs and spots of all colours.

Swordtails (*Xiphophorus hellerii*) are spectacular for the long, sword-like extension from the base of the tail fin, which only the males possess (see Fig. 2). The fish may be red, green or, sometimes, albino. They come from Mexico.

IT is important to know something of the background and characteristics of the popular varieties of tropical fish when breeding begins in order to reproduce the natural conditions as nearly as possible. A great deal of time and disappointment can be saved by getting to know the different types of fish at the outset. Below the more popular tropicals are mentioned with some relevant notes about each. It is obviously impossible, however, to include them all.

Characins

This family includes some of the best community fish, most of them being friendly, but some are timid. They are all egg-layers and for identification purposes most varieties possess either an adipose fin or teeth, and quite a few have both.

The Neon tetra (*Hypessobrycon Innesi*)



Fig. 1.—A Head-and-Tail Light.

is surely the most beautiful of all tropical fish. It is 1½ in. long and has a red line with a blue one above it, running the whole length of its body and shining with great brilliance, as its name suggests. It comes from the lime-free streams of Brazil and is a close relative of the Glowlight tetra (*H. gracilis*) which has a little more depth in the body than the Neon, appearing almost transparent except for the glowing red line running along the body and over the eye. The dorsal fin has a bright red leading edge. It is a most graceful and peace-loving fish.

The Beacon or Head-and-Tail Light (*Henniggrammus ocellifer*) is so called from the bright yellow spot near the eye and another at the base of the tail fin, joined by a less clearly marked line between the two. Coming from the Amazon, Beacons look particularly pleasing when a shoal of seven or eight are kept together. A Head-and-Tail Light is shown in Fig. 1.

Carp

Carp are all egg-layers, and although the larger members of the family are inclined to be aggressive, there are quite a few that will do no harm in a community tank, provided there are no fry around. The species



Fig. 2.—Male Swordtail.

think, that Neons defied all efforts to breed them in captivity for a number of years, and this meant that aquarists had to pay the cost of transport from South America, if they wanted to keep this fish, so that the difference in the price of these two fish was enormous. White Clouds are about 1½ in. long, have beautifully coloured fins and a shining golden line from head to tail.

Zebra fish (*Brachydanio rerio*) have probably gained a greater degree of popularity than any others. They are extremely cheap to buy, easily adapt themselves to new surroundings and are constantly on the move, darting in and out of plant thickets and chasing each other around the aquarium—quite playfully, of course, so providing a contrast in mood to the more leisurely inhabitants.

Tooth Carps

This family is well represented by the live-bearers, which are so easy to keep and, in most cases, to breed. One thinks of Black Mollies and often forgets that they are only one variety of quite a large genus, which provides fish in a variety of shapes and colours. The black ones are "sports" either from *Molliesia latipinna* or *M. sphenops*. Both originate in Mexico.

Guppies (*Lebistes reticulatus*) come from

Anabantids

These are a group of fish notable for their habit of laying their eggs in a nest of bubbles and the popular member of this group is the Siamese Fighting Fish (*Betta splendens*). The fish is a beautiful colour, either red or blue, and has large graceful fins (see Fig. 3). It will live peacefully

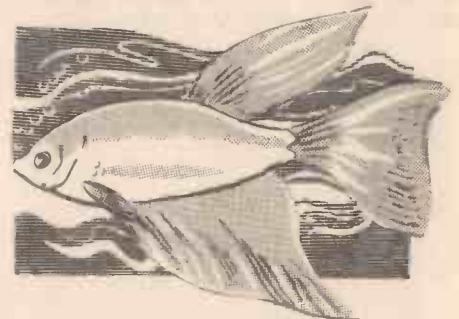


Fig. 3.—Siamese Fighter, showing enlarged fins.

in a community tank provided there is only one male of its own species. If two males are put together, they will fight to the death.

Cichlids (pronounced sick-lids)

This is a large family containing some very beautiful fish, which are unfortunately either too big or too aggressive for community life, with the single exception of the Angel fish (*Pterophyllum eimekei*). This aristocrat, with its wonderful trailing fins, needs no description since its debut on T.V. It comes from Guiana and the Amazon and will grow to 5 in. or 6 in.

NEW HARDER-THAN-STEEL MATERIALS

CALLED Pyroceram, these new materials are claimed to be harder than steel, lighter than aluminium and 15 times as strong as plate glass. They have been made from glass by an American firm, and will be used in the manufacture of nose cones for guided missiles. This revolutionary process turns non-crystalline glass into a hard, non-porous crystalline material. It

can be tailor-made with thermal expansions ranging from slightly negative to high enough to match those of heavy metals. It can have electrical insulating properties superior to those of the best dielectric ceramics. It can be transparent or opaque, its strength can be maintained at 1,300 deg. F. and it can be shaped by any of the usual glass-forming processes.

A PICTURE FRAMING CRAMP

By C. H. GOLDEN-HANN

Constructional Details of a Useful Device for Picture Framing at Home

THE measurements given may be modified according to wish and materials available.

Commence with the baseboard and mark off and cut the two corners. From the centre of the base line mark a point $3\frac{1}{2}$ in. Then with a set-square mark the lines AB, AC in pencil. C and B should be the same distance from their respective corners. Along these lines the two fixed cramp sides are to be fastened by glueing and screwing, but before doing so cut off a 45 deg. corner from each one, as in Fig. 1. This gives a parallel gap through which the corner of the picture frame can be seen while it is being "trued-up." Fix to the baseboard with glue and three 2 in. screws in each piece.

for about $\frac{5}{8}$ in. of its length from the end, drilled with one $\frac{1}{8}$ in. hole.

Next on the list are the cover plates. Each is made in exactly the same way from a piece of 1 in. x $\frac{1}{2}$ in. flat steel or iron 2 in. in length. In the centre drill a hole $\frac{1}{2}$ in. in diameter. Actually this should be slightly larger to take the end of the $\frac{1}{2}$ in. cramp screw, but it can be eased with a round file. At each side of the cover plate drill a hole to take a 1 in. woodscrew.

The cramp screws can now be partially assembled, two split pins to fit in the $\frac{1}{16}$ in. holes and two washers $\frac{1}{2}$ in. bore and not more than $\frac{1}{2}$ in. dia. are required for each screw. Put a split pin in the $\frac{1}{16}$ in. hole farthest from the end, then a washer, then a

truding beyond the cover plate should fit loosely into the recessed hole which has been made in the slide. Make sure it does, and then screw the cover plate to the slide.

The Corner Brackets

Each one is a $1\frac{1}{2}$ in. length of 1 in. x $\frac{1}{2}$ in. angle iron. In the centre of one side, $\frac{9}{16}$ in. from the base, mark with a centre punch, and then drill with letter O drill if B.S.F. threaded screws have been used or letter N drill for Whitworth. Make two holes in the base to take woodscrews. The single hole must now be tapped with a $\frac{1}{2}$ in. B.S.F. or Whitworth tap to correspond with the threaded screws.

When this is done thread the brackets on

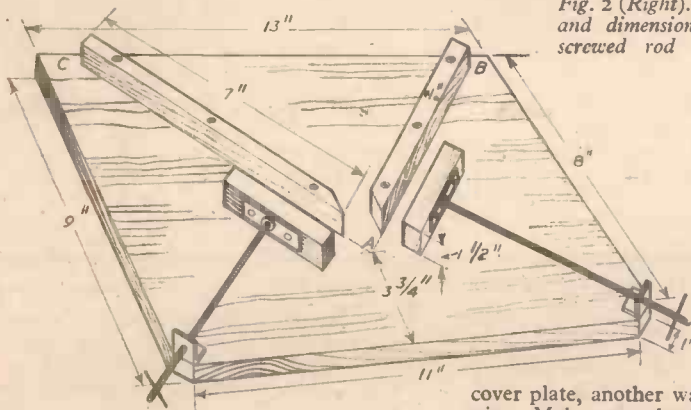


Fig. 2 (Right).—Details and dimensions of the screwed rod assembly.

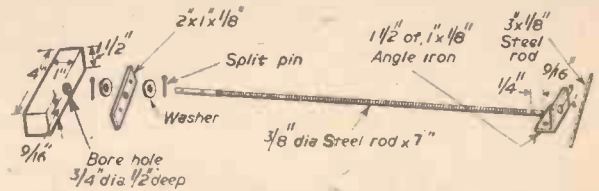


Fig. 1 (Left).—The completed picture framing cramp with dimensions of the board.

For the movable wooden cramp slides take a $\frac{1}{2}$ in. piece of $1\frac{1}{2}$ in. x 1 in. planed wood, and in the centre of the length mark a point $\frac{9}{16}$ in. from one edge with this as centre, cut a hole $\frac{1}{2}$ in. in diameter and $\frac{1}{2}$ in. deep. Repeat for the second slide.

The screws are made from $\frac{3}{8}$ in. steel rod and each one is 7 in. long. With a centre punch mark a point $\frac{1}{2}$ in. from one end, a second point $\frac{1}{2}$ in. from this one, and a third point $\frac{1}{2}$ in. from the other end. Drill the two points at one end $\frac{1}{16}$ in. and the point at the other end $\frac{1}{2}$ in. Thread the cramp screws with a $\frac{1}{2}$ in. B.S.F. or Whitworth die

cover plate, another washer and another split pin. Make sure the bifurcated ends of the split pins are bent outwards so that they will not work loose. The end of the rod pro-

ceeds to the screws and screw down the corner brackets to the baseboard.

The final job is to place a 3 in. length of $\frac{1}{2}$ in. steel rod through the $\frac{1}{2}$ in. holes drilled at the ends of the screws. Once again a little easing with a file may be necessary. Once having got the $\frac{1}{2}$ in. rod in position the ends may be flattened slightly with a couple of blows of a heavy hammer on an anvil to prevent them sliding out.

The framing cramp is now complete, and a finishing touch, dark stain is suggested and the wood left unpolished.

PUZZLE CORNER

A PULLEY is suspended in a sheave from a roof beam. A rope passes over this pulley and hangs equally each side. A monkey grasps one end of the rope. At the other end of the rope, a weight is attached exactly counter-balancing the monkey. The monkey starts climbing the rope. What happens—does the monkey reach the top first, or does he remain where he is and haul up the weight? Or do both reach the top together?

Suppose the weight of the monkey is 10 lb. and the balance weight also 10 lb. The weight of the rope must also be considered and this is presumed to be 10 ft. long on either side and to weigh .2 lb. per ft. run (i.e., 2 lb. per 10 ft. run). Thus each side of the pulley there is a total weight (monkey plus rope) of 12 lb., and—note this—there is thus a tension or pull of 12 lb. through each half of the rope. The rope is pulling

upwards with a force of 12 lb. on the monkey, though as the monkey and his side of the rope weigh 12 lb. the two forces remain balanced. But to ascend the rope the monkey must apply some additional force—i.e., muscular effort. The moment he does this he increases the tension in the rope which supports him. This force is transmitted over the pulley to the other side of the rope. The weight is consequently raised. If this were the end of the matter, both monkey and weight would rise together, but in hauling, a foot or so of extra rope gets over to the monkey's side, so that this side becomes heavier and overcomes the other.

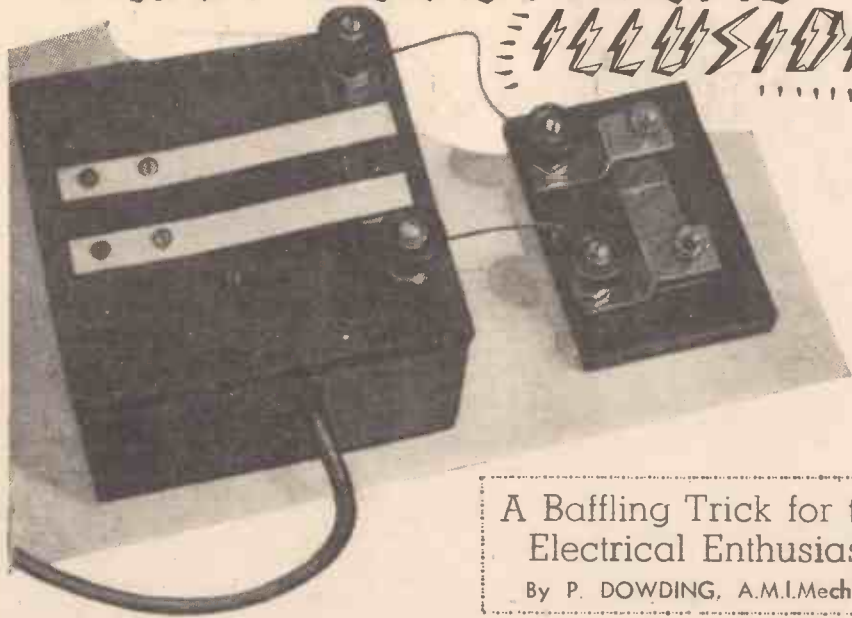
On one side there might be monkey (10 lb.) + 12 ft. of rope (2.4 lb.), total 12.4 lb., whereas on the other side we have weight (10 lb.) + 8 ft. of rope (1.6 lb.), total 11.6 lb. This procedure is repeated with every climbing effort of the monkey. Consequently the weight arrives first at the top. If the rope were in the form of an endless ring, both would arrive at the top together.

Some people argue that there is not sufficient data to work upon and therefore the problem is insolvable.

LIST OF MATERIALS

- 1 Baseboard, 13 in. x 9 in. x 1 in. planed timber or $\frac{3}{4}$ in. plywood.
- 2 Fixed cramp sides, 7 in. x $1\frac{1}{2}$ in. x 1 in. planed timber.
- 2 Moving cramp sides, 4 in. x $1\frac{1}{2}$ in. x 1 in. planed timber.
- 2 Pieces 1 in. x $\frac{1}{2}$ in. angle iron, $1\frac{1}{2}$ in. long, for corner brackets.
- 2 Pieces 1 in. x $\frac{1}{2}$ in. flat iron 2 in. long, for cover plates.
- 2 Pieces $\frac{1}{2}$ in. round steel rod, each 7 in. long, for screws.
- 2 Pieces $\frac{1}{2}$ in. round steel rod, each 3 in. long, for turn bars.
- 4 Washers, $\frac{1}{2}$ in. bore, $\frac{1}{2}$ in. diameter (maximum).
- 4 Split pins, $\frac{1}{16}$ in. diameter, $\frac{1}{2}$ in. length (maximum).
- 6 2 in. Woodscrews.
- 8 1 in. Woodscrews.

AN ELECTRICAL ILLUSION



A Baffling Trick for the Electrical Enthusiast

By P. DOWDING, A.M.I.Mech.E.

THE apparatus consists of two units connected by two wires only. The first unit contains a transformer in order that a low voltage circuit may be supplied from the mains, and has two key-

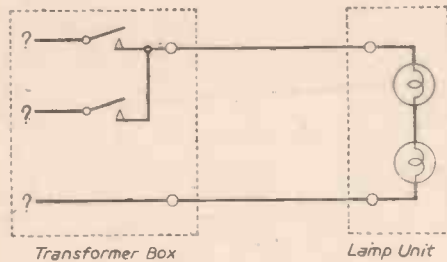
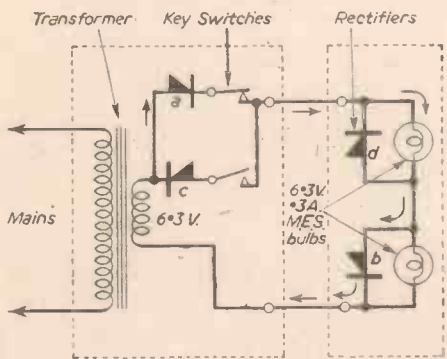


Fig. 1.—The apparent circuit.



Current flow when one switch is operated is shown by direction of arrows

Fig. 2.—Actual circuit.

type switches mounted on the top. The second unit consists of a piece of plywood on which is mounted two lamp.

The Effect

The apparent circuit is shown in Fig. 1 and the action is as follows. When the left hand key switch is depressed, the left hand lamp will light and similarly when the right hand key is operated the right hand lamp will light. The simultaneous operation of both keys causes both lamps to work, the brightness of each lamp remaining constant whether one or both lamps are on. On the face of it the whole thing appears to be

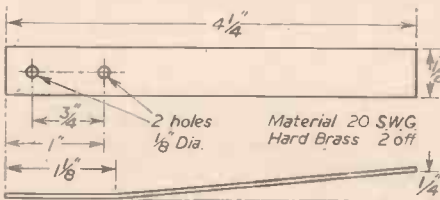


Fig. 3.—Details of the key switch.

quite impossible because the units are connected by two wires only. Many qualified electrical engineers have been completely baffled by this trick.

The Secret

The real circuit is shown in Fig. 2 and

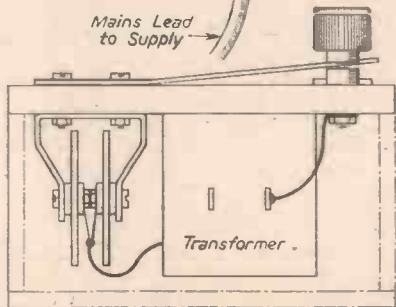
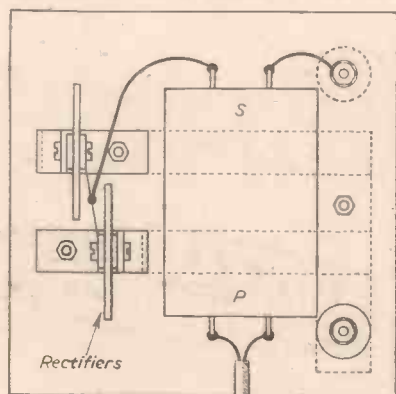


Fig. 6.—Assembly of transformer box.

relies on the directional properties of the rectifier. A low voltage alternating current is obtained from the transformer and, as is well known, has a sinusoidal waveform, so that the voltage output rises to a positive maximum value in the first half-cycle and to a negative maximum in the second half-cycle. The circuit is arranged so that one lamp will respond only to the positive part of the wave and the other to the negative part. Each switch allows only one half of the waveform to appear at the lamp unit. If the complete waveform were present, then both lamps would light together as in the case when both switches are operated. In the circuit diagram (Fig. 2), rectifiers "A" and

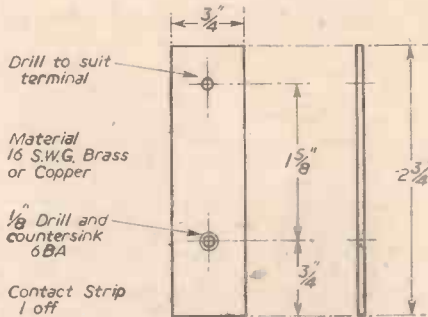


Fig. 4.—Details of the contact switch.

"B" will allow only positive current to flow and "C" and "D" only negative current. The arrows indicate the flow of positive current and show that the current passes through

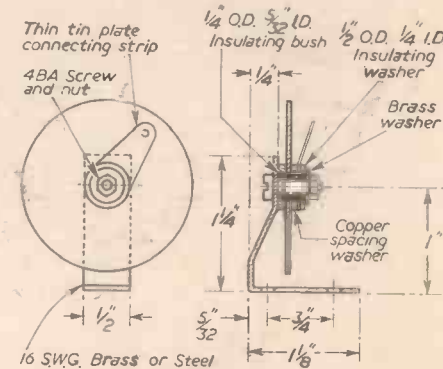
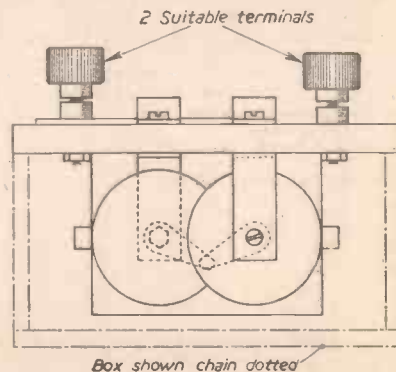


Fig. 5.—Plates assembled on supporting bracket.

the first lamp and by-passes the second. It is not necessary, however, for the constructor to understand the theory in order to construct the apparatus.

Components Required

The components may be obtained at little expense provided that most of the shopping is done in the ex-Government surplus market. The two major items are a transformer giving about 6 volts at .3 amp. and a bridge rectifier capable of passing .3 amps. The transformer



Box shown chain dotted

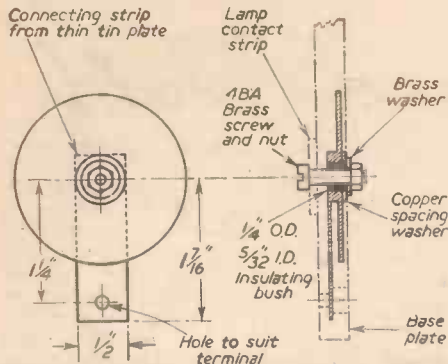


Fig. 7.—Assembly of rectifier and connecting strip. Two assemblies are required, one as shown and the other similar, but copper spacing washer and the rectifier reversed.

could be a radio heater type, a bell transformer or even a radio output transformer. The rectifier used was a Standard Telephone Co. selenium type with 47mm. dia. plates. Sometimes the individual plates may be purchased in which case four will be required. If the separate plates are obtainable they

made from 20 s.w.g. hard brass or phosphor bronze, as shown in Fig. 3, and the contact strip from 16 s.w.g. brass or copper (Fig. 4). Two brackets are formed from 20 s.w.g. brass or steel, as shown in Fig. 5, to support the two rectifier plates. If it is necessary to dismantle a bridge rectifier in order to obtain the individual plates great care must be taken to avoid separating each cooling plate from the disc which forms a complete rectifier element and the following procedure should be adopted. The nuts at one end should be held firmly in a vice and the other nuts removed with a spanner. In this way the plates will not be twisted relative to

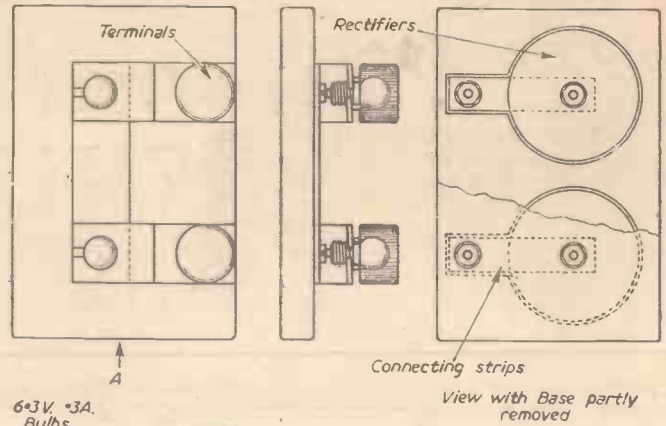


Fig. 11.—Lamp unit assembly.

whole arrangement is assembled on the lid of the box, as shown in Fig. 6.

The Lamp Unit

The lampholders appear to be mounted on a piece of solid plywood, but in actual fact the base is made in two halves in order that two rectifiers may be concealed in the wood (Fig. 7). Two pieces of 6mm. plywood are cut so that the surface grain, as shown in Fig. 8, and the final joint will be invisible. Each lampholder is constructed from 16 s.w.g. brass or copper and the ends are set, as shown in Fig. 9, so that the bulb will screw freely into the hole. The lamp contact strip should be made as in Fig. 10, and the completed lamp assembly can be seen in Fig. 11.

After the lampholders, rectifiers and terminals have been assembled with the top plate, the apparatus should be tested to make quite sure that proper contact has been made with the rectifiers, and that they are connected correctly. In the circuit diagram (Fig. 2) the rectifiers are shown as half of an arrow head in contact with a straight line. The straight line represents the positive plate of the rectifier and is, in fact, the large metal cooling disc, so that the connection to the positive plate will be made via the copper spacing washer in each case. After testing, the two halves of the base are coated with glue and clamped together. When the glue is hard the whole assembly should be glass-papered so that the joint is invisible. The unit may then be finished with a wood stain or varnish.

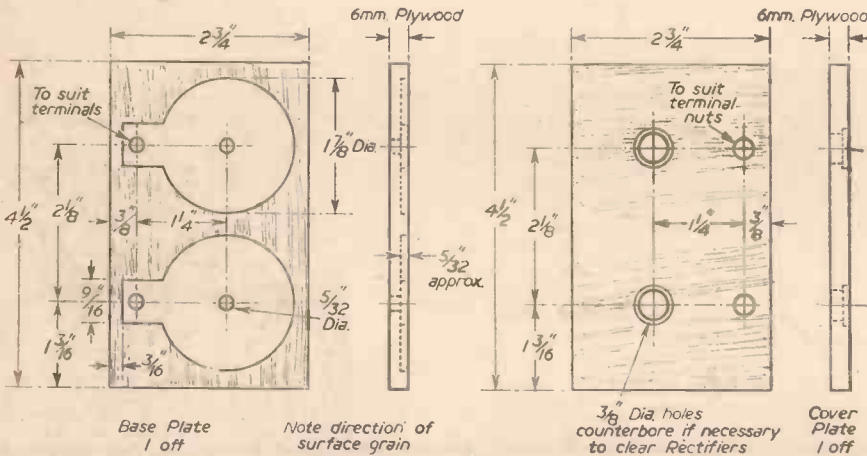


Fig. 8.—Details of base and cover plates.

should be used as this obviates the need to dismantle a bridge rectifier into its component parts. The other items required, apart from a few scraps of metal and plywood, are four suitable terminals and two 6.3v. .3a. M.E.S. lamps.

Transformer-box Construction

A box is made from plywood to house the transformer and two of the rectifier plates, the size is not given as it will have

one another. The cooling plates may then be lifted off the centre insulating tube and the copper spacing washers will fall out. Each cooling plate will then have a smaller disc adhering to it. On no account should these be parted or the rectifier will be spoilt. The copper spacing washers and the insulating tube should be retained.

Two plates are then assembled with the supporting bracket as shown in Fig. 5. The

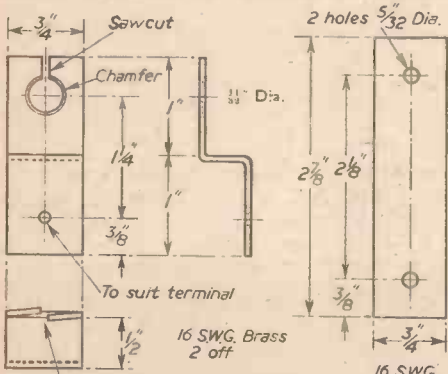


Fig. 9.—Lampholder details.

Fig. 10.—The lamp contact strip.

to suit the transformer to hand. All of the components are mounted on the lid of the box to facilitate wiring. The two keys are



PRACTICAL MOTORIST AND MOTOR CYCLIST

Edited by F. J. CANN
September Issue Now On Sale

PRINCIPAL CONTENTS

The Principles of Acceleration ; A Rear Wheel Extractor ; Studs—Uses and Removal ; Overhauling the Austin A70 and A90 Sports ; Fitting a Morris S:M Gearbox to the Ford 10 Engine ; Valves and Valve Seatings ; Fitting a Luggage Rack ; Carburettor Maintenance ; Legal Notes ; Car Body Repairs ; Overhauling the Lanchester II ; A Survey of Midget Cars ; P.M. and M.C. Data Sheets ; Motor Cycle Clutch Troubles ; A Garage Mechanic's Diary ; Our Experts Advise and many other interesting articles.

A Miniature Billiard Table

FIRST make the frame (Fig. 1) from 1in. square wood, gluing and pinning the joints. The bed is of $\frac{1}{4}$ in. hardboard, size 36in. x 18in., with the pockets cut to shape with a coping saw (Fig. 2). The bed is glued and pinned to the frame. Cover the bed with half yard of 36in. wide green table baize, which can be bought at 4s. 6d. per yard from any



to the cushions by $\frac{1}{2}$ in. netting staples (Fig. 4). Wrap a double turn of insulating tape around the curve of the brackets to protect the balls.

Finally, thread some small mesh net to the pocket brackets with fine string, securing one edge of the net to the frame. A set of 1in. dia. balls can be bought at a good sports shop and the cues tapered down from $\frac{3}{4}$ in. dowel rod. Draw in the balk circle and add silk spots.

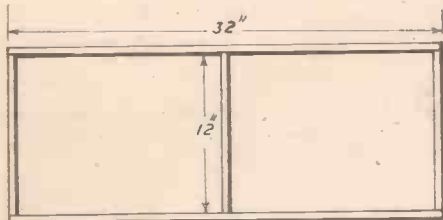


Fig. 1.—The frame.

Simply Constructed With a Hardboard Bed
By R. W. HARRISON

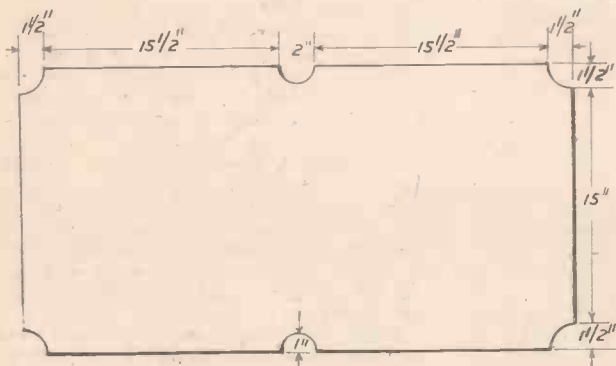


Fig. 2.—The shape of the bed.

are shaped at each end and faced with $\frac{1}{4}$ in. square catapult elastic glued across the centre of the face (Fig. 3). Cut the elastic slightly under length, taper the ends with scissors, and adhere to the wood with a plastic cement, pinning each end of the elastic with an ordinary $\frac{1}{2}$ in. dressmaking pin.

Secure the cushions with panel pins from the underside of the hardboard, having first applied colron dye or paint to the cushions for finishing.

large draper's. Make sure that the draper cuts it straight. It is fixed in position by smearing the hardboard thinly with a thin mixture of ordinary



Fig. 3.—The cushions.

carpenter's glue, smoothing the baize on to the bed and then leaving to set.

The Cushions

These are prepared from 1in. x 1in. finished size wood. Parana pine is recommended because it is knot-free. The pieces

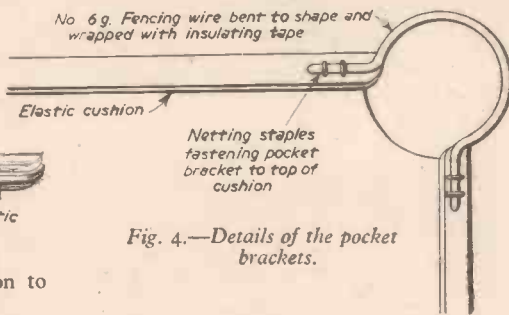


Fig. 4.—Details of the pocket brackets.

The Pockets

The pocket brackets are shaped from 9in. lengths of No. 6 g. galvanised fencing wire (stocked by any builder's merchants) secured



Fig. 5.—The completed table.

The marking out should be done with the aid of a black pencil or thick black crayon, finishing off with the spots cut from a piece of black silk, each being about $\frac{1}{4}$ in. in diameter.

Fig. 5 shows a photograph of the completed table.



New Aeroplane Steel

THE American National Bureau of Standards has developed an ultra-high-strength alloy steel that can withstand stresses up to 285,000 p.s.i. without becoming brittle. It contains titanium, silicon and boron.

Tiny Solar-powered Radio

A TINY transmitter-receiver built into a soldier's helmet and powered by the sun has been developed in the U.S.A. Silicon

water solar cells form the batteries and these are used in combination with a nickel cadmium storage cell to take over in cloudy conditions or at night.

New Refinery Process

HYDROISOMERIZATION is the name given to a new process for converting low octane portions of petroleum to high octane by passing them over a platinum catalyst. More high octane gasoline per barrel of crude oil will be obtained.

Bacteria Can Live in Martian Atmosphere

IN a Mars-like atmosphere produced in a laboratory, bacteria have been made to grow and reproduce. The bacteria containing soils are kept in bottles filled with dry nitrogen. The only water is a trace of moisture left in the soil and organic sub-

stances present form the food. The bottles are refrigerated at night and warmed by day.

Aircraft Windshield Development

A NEW covering for aircraft windshields has a low electrical resistance and a current is passed through it which heats the glass to melt ice and dissipate fog.

Radio Telescope Nearly Completed

SITUATED at Jodrell Bank, this radio telescope will be the world's largest. Its enormous 250ft. dish-shaped steel bowl has to keep its shape within close limits during rotation and while under the effects of strong winds and temperature changes. Astronomers will use it to search outer space beyond the limits of visual observation. It will pick up the radio waves from many types of heavenly bodies and can follow any desired point automatically.

WITH a large model of this type, lake-side storage facilities are virtually a necessity, as transport is difficult even with a fairly large car. The model, shown in Fig. 1, is more or less to scale, with a few modifications to enable the extra weight to be carried. Should the size of model described here be too large, it can be reduced to three-quarter or even half size, although in these smaller sizes it would be better to use one of the lighter types of intergear to reduce the total weight. With the 6ft. model, the total weight will be just over 40lb.

After considerable experiment it was decided to use a combination of methods of construction—a very light planked hull on frames with a solid bow and stern, coated inside and out with layer upon layer of strips of cotton bandages, liberally brushed over with one of the new "one-shot" resin glues. This gives an unbroken surface which can be polished to any degree of smoothness before painting.

The Drawings

Before beginning construction it will first be necessary to enlarge the drawings to the exact size which it has been decided to make the model. One set, enlarged up from Fig. 3, will show the hull lines and sections from which to make the frames and the other, enlarged up from Fig. 2, the profile and deck plan showing the disposition of the davits and boats, etc. This completed, hang them on the wall or other convenient place and all is ready to begin.

First a plank of wood of any convenient section is required as a building board, 4in. by 2in. being an excellent size. The plank should be slightly longer than the hull and if two strips of wood are nailed on each end this will give the stability of a wider plank, at the same time allowing sufficient room to get inside the hull. It must be planed up on all sides, clearly marked with a centre line along its top face and squared across at every section station. Mark the sections on the sides as well as the top and number each one so that they will be clearly visible from either side. All frames except one are cut with a fretsaw from 3/16in. plywood. Old tea-chests provide suitable cheap material, if in good condition.

Making the Moulds

To prepare the moulds, first plane up one edge of the plywood for the base line. At 5 1/4 in. from this edge, and parallel with it, draw in the L.W.L. At right angles to the base draw in the centre line, then draw in the outline of

A RADIO CONTROLLED MODEL of the ROYAL YACHT

Constructional Details of a 6ft. Long Boat, Electrically Driven

By G. W. PATTISON

the frame up to deck level, followed by the cambered deck line. The camber need be very small with such a large scale reduction, this is best drawn on cardboard and cut out to act as a template. Draw a line across a piece of cardboard 10in. wide and from the centre of this line and 3/16in. above it draw in the curve to meet the ends of the line, cut out to the curve and this will serve as a template for all sections. Simply place the template on the deck edges of the particular mould and draw the deck camber. Next mark out the recesses for the keel and deck stringers. From a point inside of these stringers draw curves to the base line. Then cut out the mould to the outline. All the moulds except Nos. 0, 19, 20 have the waste material cut out of their centres leaving only a 3/8 in. rim all round which is the actual frame. This waste piece is left in until planking is completed to add support for nailing. If the waste is cut round with a fine fretsaw as shown in Fig. 4, a junior hacksaw blade will easily cut through the holding piece later. A scrap of plywood

can be nailed on either side of the waste to grip the frame near the keel slot and prevent it getting out of line. These scrap pieces are not, of course, nailed to the frame proper, only to the waste. Fig. 4 also shows the position of the propeller shafts (section 4), the holes being drilled in the waste material which will be removed later. Use of these holes will be referred to when it comes to lining up the shafts.

After having cut out all the moulds a strip of 3/8 in. square wood is screwed to each at the base line, taking care that it is flush to ensure that it stands vertical when in position on the building board. The frame at station 0 is solid and is the only one cut from 3/8 in. plywood. It is slotted to straddle the keel and



Fig. 1

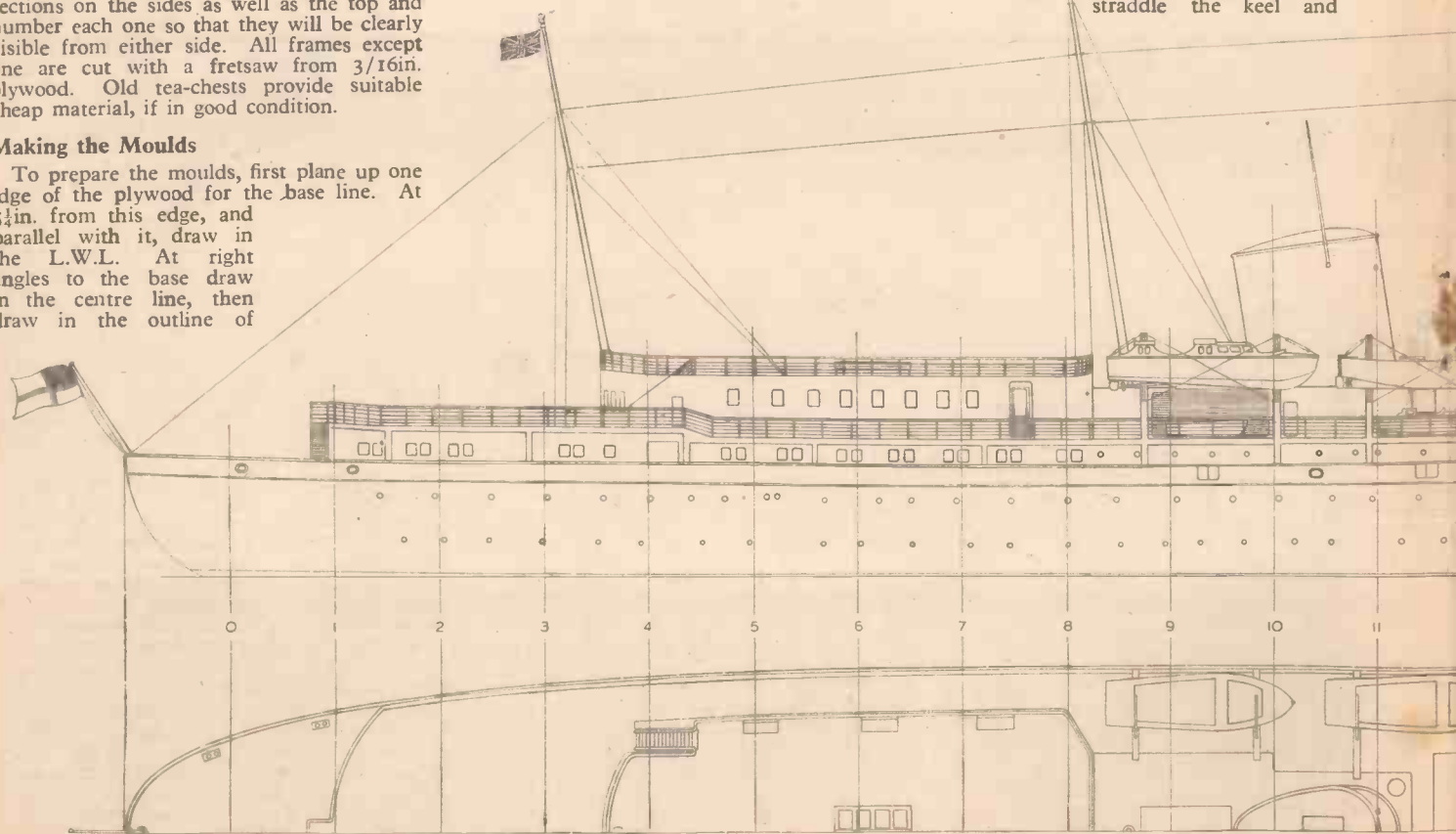
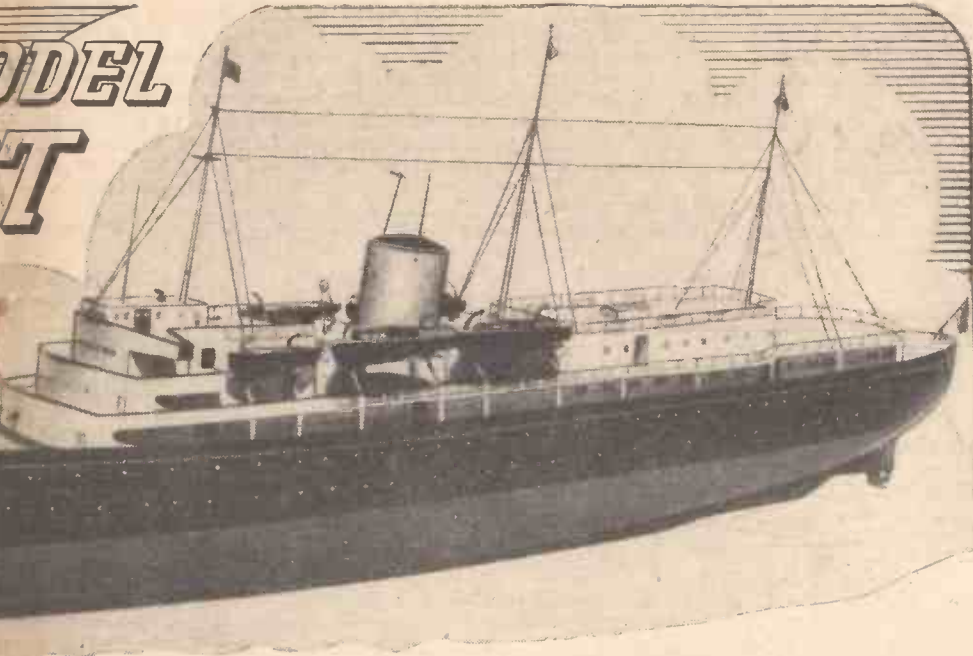


Fig. 2.—Side elevation and deck plan.



1.—A view of the completed radio-controlled model "Britannia."

stern piece and glued and nailed to the step cut in the latter. Frames 1 and 2 are treated similarly except that the waste is removed from above the step. No. 3 need only be cut to straddle the keel as it butts up against the end of the stern piece to which it is glued and nailed. Mould 19 at the bow is also solid and mould 20 is cut in half, a $\frac{3}{8}$ in. strip having been cut from its centre line, the remaining pieces are glued to each side of the stern piece. This section only serves as an outline for dressing up the solid bow.

The two solid frames 0 and

19 should be cut out around the cambered deck line and an extension piece screwed on each to enable them to be mounted on the building board, the extension piece being removed later. Note that these extension pieces are screwed on the inner side of the moulds. Nail all the moulds to the building plank with a couple of panel pins in each. Moulds 0 to 9 are placed to the left or aft of the lines drawn on the plank, and those marked 10 to 20 to the right or forward of the lines. They can be chamfered as the curve of the planking proceeds to stem and stern although, due to the use of only $\frac{3}{16}$ in. material, very little will have to be removed. Make certain that the centre line of the moulds and that of the building plank exactly coincide

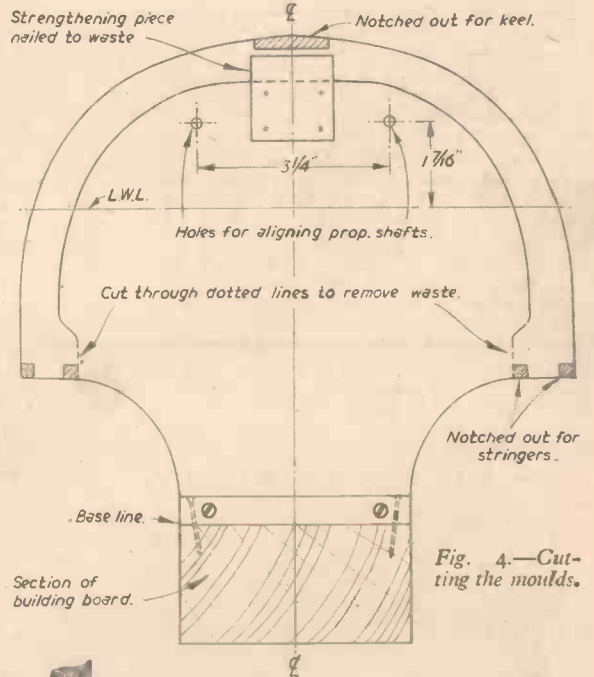
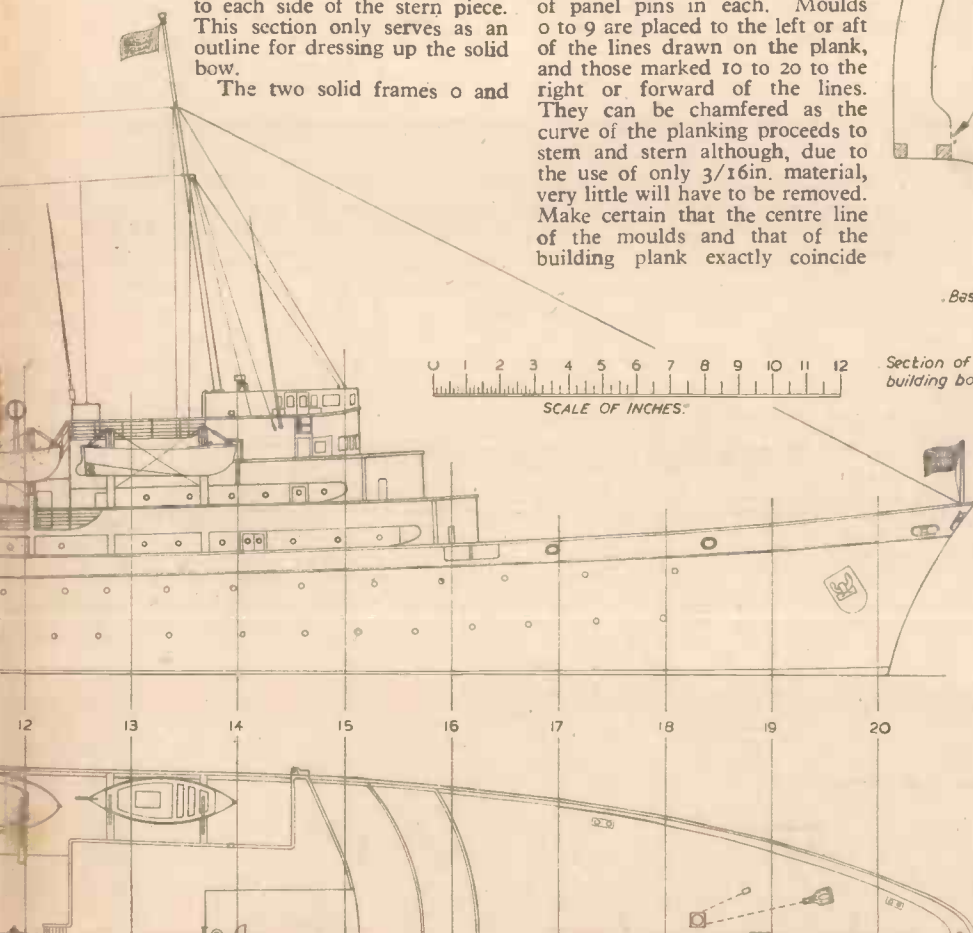


Fig. 4.—Cutting the moulds.



and are at right angles to it. If care is taken here it will be found that the keel will fall into place easily without having to pull any moulds into line.

Stem and Stern Pieces

The stem piece is cut from $\frac{3}{4}$ in. plywood and extends from station 16 right to the profile of the bow. It butts up against mould 16 and is stepped to accommodate Nos. 17, 18, 19. The waste cut from moulds 17 and 18 need only start above the step. This stem piece only reaches to deck level but at the extreme bow, continues about $\frac{1}{2}$ in. wide to base line, through which a screw can be driven obliquely into the building board. This can be sawn off later.

The stern piece, which is in one with the false keel or dead wood, is also cut from $\frac{3}{4}$ in. resin-bonded plywood and again a $\frac{1}{2}$ in. extension piece is continued to the base line and similarly attached to the building board with a screw. Drill the hole for the rudder post at this stage and fit the tube, which should accommodate an $\frac{1}{4}$ in. diameter shaft without binding. It has a flange soldered to its top end and secured by two screws. If the tube is of heavy gauge there is a danger of the hole weakening the stern piece, so keep it as light as possible. Should light-gauge tubing be difficult to obtain strengthen the sides of the hole by gluing a piece of plywood to either side.

The Keel

The keel is $1\frac{1}{2}$ in. wide, cut from mahogany or oak and extends from $\frac{1}{2}$ in. forward of station 19 to just aft of station 0. It has a $\frac{3}{8}$ in.-wide slot cut along its centre from station 3 to the after end. This slot accommodates the stern piece to which it is nailed on both sides, taking care that the keel follows the correct curve. If care is taken the stern piece and keel can be joined together before finally placing in position on the moulds. In this way screws can be driven through from inside the keel between station 3 to the forward end of the false keel. It can then be placed in position and glued and screwed to moulds and stem piece. When all is set up the keel should be dressed along the edges to follow the curve of the moulds. It will be found rather difficult to drive nails through the moulds into the steps at stem and stern, but with care a flat file will drive the nail's far enough to hold until the glue sets. Later,

when the hull is removed from the board, they can be punched home.

The outer deck stringers come next, being secured to the beam ends of all the moulds and to the stem and stern pieces. The inner stringer may be fitted later. There now remains the solid nose and stern. Pieces of 3/4 in.-thick pine can be used, layer upon layer, to build up the space between moulds 19 and 20 and from 20 to the bow. Glue securely and when set trim to the shape of the bow. This solid nose is only carried up to the deck line, a brass bulwark and deck plate being fitted later. Treat the stern from aft of station 0 similarly, again only to deck line. Both stem and stern block may be lightened considerably by drilling one or two large holes, going down as far as possible without breaking through, but this can only be done later.

Planking may be carried out by any method the reader prefers. Many boat builders prefer diagonal planking due to the short lengths of very thin material used in this method. In a boat of this type, however, the bulwark, more or less to scaie thickness, has to stand up on its own without any other support. Thus with single-skin planking from stem to stern, the sheer

plank can be made reasonably wide, and being securely fastened to all frames, the bulwark, which is part of this sheer plank, is quite strong enough to stand without further support. It also has a brass rail, which again adds to its strength. It was mainly to get this unbroken bulwark that it was decided to plank by the single-skin method.

The planking material used was 3/64 in. resin-bonded mahogany plywood, which is exceedingly light and flexible, although any similar wood up to 1/16 in. thick could be used. The first plank put on is the sheer plank and, as mentioned, is made fairly wide, about 2 in. at its broadest part, tapering slightly at stem and stern. It stands a little proud of the top of the bulwark to allow for trimming to sheer line afterwards. Treat each side of the hull in turn, in this way

having cut one plank a duplicate can be cut for the other side using the first as a template. The garboard strakes come next and these are joined along the centre line of the keel. From then onward any convenient width of plank can be used so long as it can be made to follow the curve of the hull. No rabbet need be cut in the solid stem and stern block to accommodate the plank ends.

(To be continued)

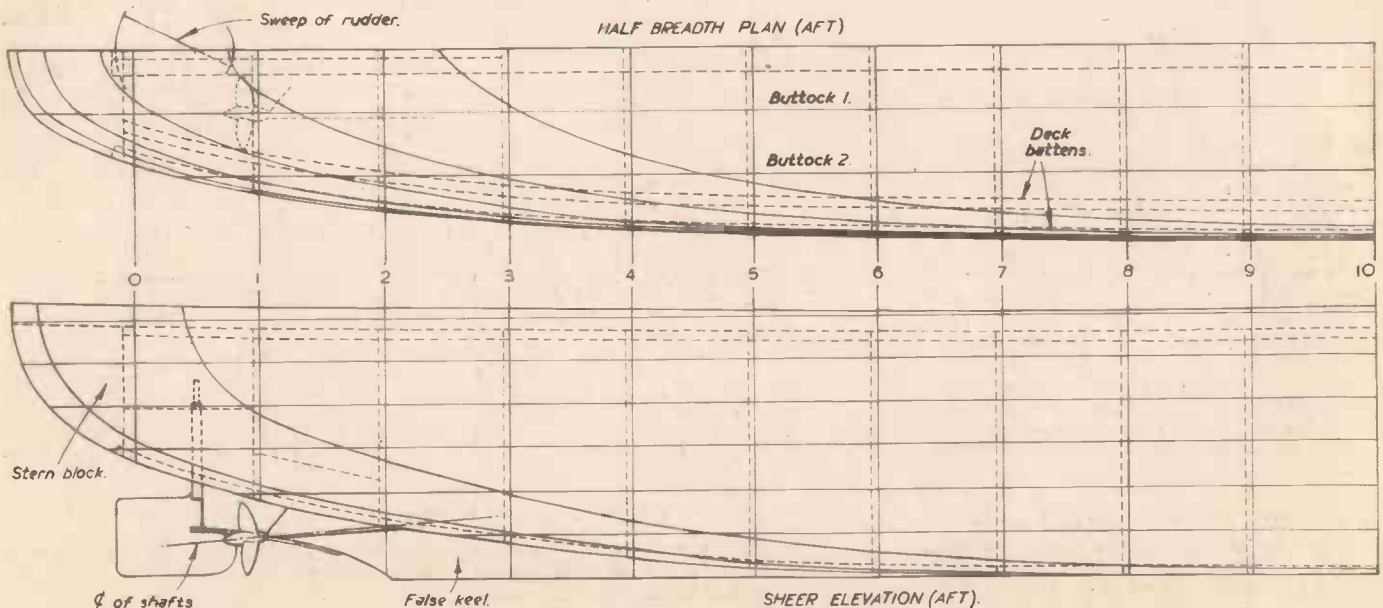
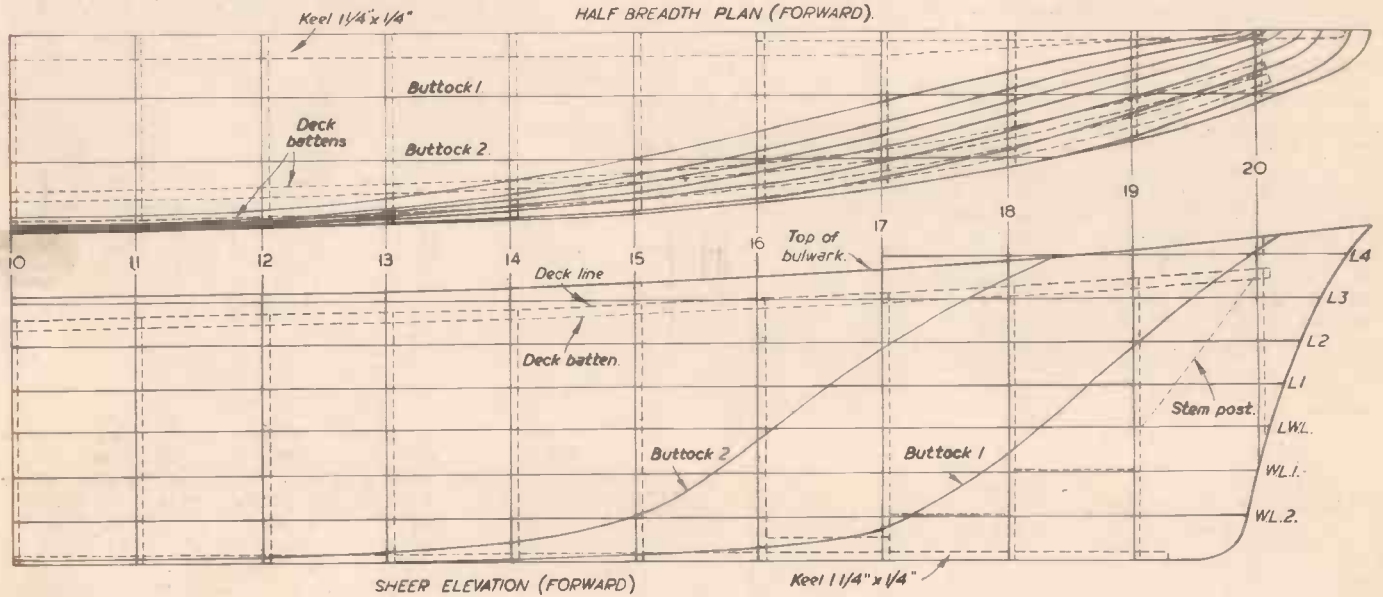
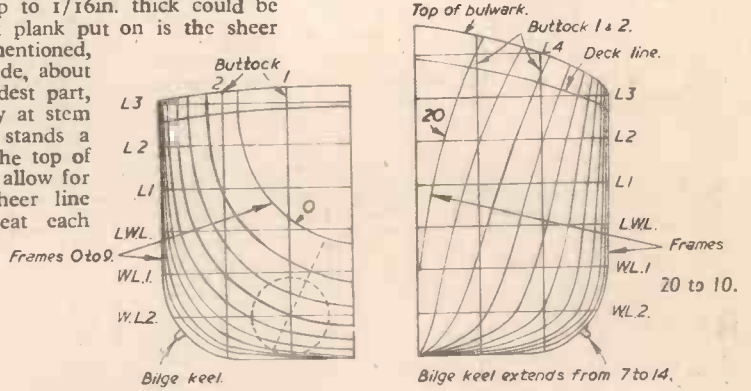
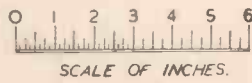


Fig. 3.—Half breadth plan and sheer elevation.

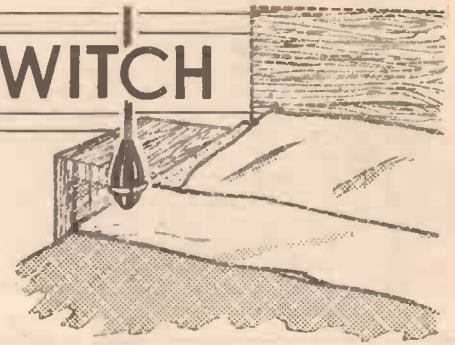
A VARIABLE POSITION BED SWITCH

Add to the Convenience and Comfort of Your Bedroom!

By J. L. WATTS

SOONER or later most householders consider the desirability of fitting a two-way switch in the bedroom so that the light can be switched on or off independently from the bed or from the wall switch as required. However, the wiring altera-

lead C taken can be either lead connected to the tumbler switch A if there are only single leads connected to the two terminals of the tumbler switch; but if there is more than one lead connected to one terminal the single lead connected to the other terminal,



C can then be drawn up into the loft, together with the leads E and F. In a convenient position on the ceiling rafters nearly above the wall switch should be fitted the single-pole, two-way cord-operated switch G. This switch should be fitted on a wooden block which allows the cables to enter at the side of the block and through the block into the base of the switch. Two fixed contacts of this switch are connected together to a common terminal. The cable C should be cut off to a suitable length and connected to this common terminal. The other two cables E and F should be connected to the other two terminals of the ceiling switch. A pulley is then fitted on the roof rafters immediately above the ceiling

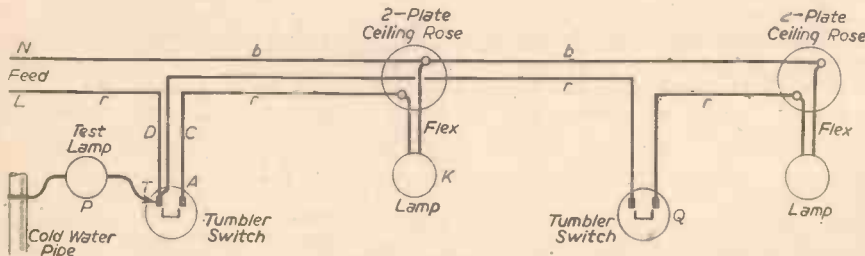


Fig. 1.—Normal wiring with two-plate ceiling roses.

tion necessary in fitting such a two-way switch deters many householders from having this convenience, and expedients such as a cord from the wall switch, or a single-way cord switch attached to the lampholder, are often adopted. Such arrangements necessitate the lamp being switched on at the point where it is switched off, and are usually unsightly. The simple arrangement to be described will enable two-way switches to be fitted in a bedroom and, in addition, will enable the light to be controlled from any position in which the bed may be placed without having long cords or trailing leads around the bedroom. The only items required are a single-pole two-way tumbler switch to replace the existing single-pole

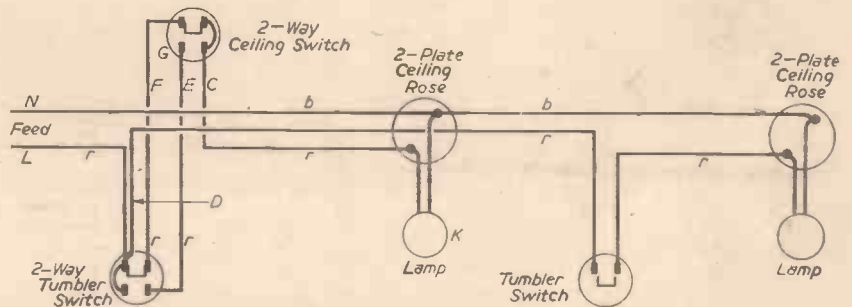


Fig. 2.—Modified wiring with two-plate ceiling roses.

ing switch, whilst another pulley is fitted on the roof rafters vertically above a hole, about 3/16in. in diameter, which is drilled through the ceiling above the required control point at the bed head, and the operating cord threaded through, as in Fig. 5. The single-way tumbler switch A should then be replaced by the two-way tumbler switch H, as in Fig. 2 or Fig. 4. The lead or leads D which were left in position should now be connected to the common terminal of the new two-way switch which is connected to two fixed contacts. The leads E and F are now connected to the other two terminals of the

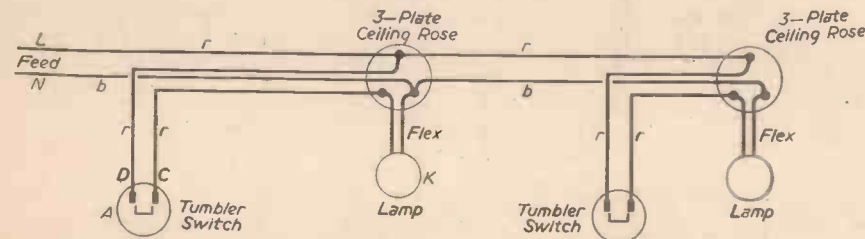


Fig. 3.—Normal wiring with three-plate ceiling roses.

single-way switch, a single-pole two-way cord-operated ceiling switch, and about five yards of single core 1/0.044 or 3/0.029 V.R.I., P.V.C., or T.R.S. sheathed cable, together with two small pulleys.

The existing wiring may be arranged with either two-plate ceiling roses, as in Fig. 1, or with three-plate ceiling roses as in Fig. 3. So far as the fitting of a two-way switch is concerned the only difference is that with the two-plate ceiling rose there may be more than one cable connected to one terminal of the tumbler switch, as at D in Fig. 1. This does not apply with the three-plate ceiling rose system shown in Fig. 3.

Connecting up the Two-way Switches

First switch off at the main lighting switch. Then disconnect the lead C at the existing tumbler switch for the lamp K, which requires two-way switching. The

is to be taken as the lead C. The disconnected end of the lead C should then be secured to one end of the two new leads, E and F, each about 2½ yd. long. The lead

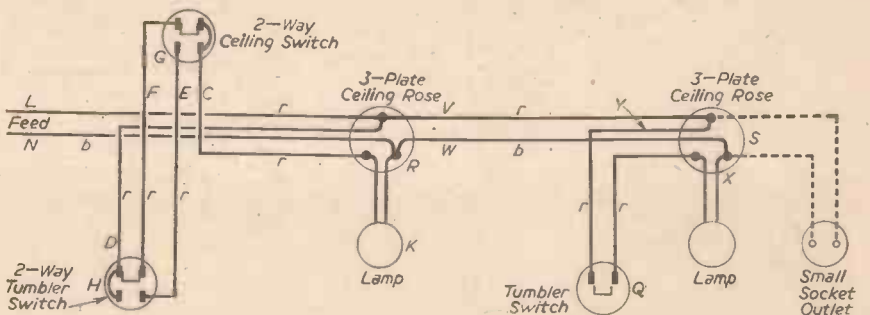


Fig. 4.—Modified wiring with three-plate ceiling roses.

new two-way switch H. The installation is now complete and the main switch can be closed.

Many housewives like to alter the arrange-

ment of the bedroom furniture occasionally. If this is done it is merely necessary to drill another small hole in the ceiling above the new bed position and alter the position of the pulley J (in Fig. 5) to correspond.

Checking the Switch Connections

The diagrams show the correct arrangements of the wiring, N indicating the neutral pole of the feed, whilst L indicates the "live" pole of the feed. The colour of the leads should be as indicated by the letters r and b, r indicating a conductor with red insulation, whilst b indicates a conductor with black insulation. Single-pole switches should always be connected in the "live" pole as shown, otherwise one contact of the lampholder will be "alive" when the controlling tumbler switch is off. However, it sometimes happens that the connections are incorrect, so that the switch is connected in the neutral pole. In some cases the cable colours may also be incorrect. The switch connections can be tested as follows. In order to test the switch connections for the lamp K the lamp is removed from its holder and a mains-voltage test lamp P connected between a sound earthing point, such as a cold water pipe and a test lead T, as in Fig. 1. If the switch A is correctly connected the test lamp P will light

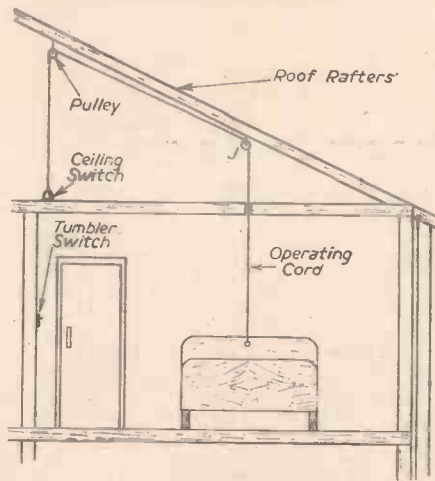


Fig. 5.—Arrangement of operating cord.

when the lead T is placed on one particular terminal (the "live" terminal) of the switch A. If the test lamp does not light the switch A is wrongly connected in the neutral. If this condition is found it would be wise to repeat the test at all the

switches in the same way. Should all the switches on one circuit be wrongly connected the two main connections for that circuit should be changed over at the fuse box. If one switch only, say the switch Q in Fig. 4, is wrongly connected, this can be rectified by changing over the leads V and W at the ceiling rose R from which the lamp circuit is fed, or changing over the leads X and Y at the ceiling rose S.

Adding a Low-current Circuit

It may be noted that, with the three-plate ceiling rose system, another circuit can be fed from any ceiling rose, which is a very convenient arrangement. For instance, it is then a simple matter to connect a two-amp socket-outlet to the two terminals of the ceiling rose R or S, to which the feeds V and W are connected, as shown dotted in Fig. 4. This could be used for a dressing-table light if required, or a socket-outlet could be connected up for an electric clock. With the two-plate ceiling rose system shown in Figs. 1 and 2 an additional circuit would have to be fed from the "live" pole at a switch and the neutral pole at the ceiling rose of the controlled lamp. It must, however, be emphasised that the current rating of any additional circuit connected must not be such as to overload the circuit.



A SHOWER ATTACHMENT



Make This Bathroom Accessory
By HERBERT STONELEY

TWO lengths of rubber tubing, 18in. or 2ft. in length, are required, and two lengths of metal pipe 9in. long, one end of each to be threaded, a "T" joint, which can be either a simple "T" joint or, better still, a reducing "T" joint, with a stem 1/2in. less in dia. than that of the two pipe lengths mentioned already. This size will depend upon the outlet size of the taps in the bath. Next will be required a length of rubber tubing 3 or 4ft. in length, and finally, a small rose of the type sold by hardware stores for fixing on to garden watering cans, or a garden hose.

Rubber hose of the same colour as the bathroom tiling can be obtained and a metal rose and tubes of chromium or staybright materials. Alternatively, ordinary metal tubing will do, so that it may be painted to match the existing colour scheme. It is felt, however, that polished chromium fittings, with the usual white rubber piping is most effective.

When the outlet size of the bath taps is known, fix firmly on each tap the 18in. lengths of rubber hose of the appropriate size. Fix the rubber hose over the bath taps firmly by pushing it far enough on the taps to ensure that water does not escape. Take the "T" joint and screw the 9in.

lengths of pipe into the top piece. Now force the unthreaded ends of the 9in. pieces of pipe into the ends of the pieces of hose attached to the taps, fix next the 3 or 4ft. length of rubber tubing to the free end of the "T" joint. Make sure it is fixed firmly;

water forcing them off. As an additional safeguard, the rubber joints on the metal tubes can be wrapped with two or three turns of wire, pulled tight with a pair of pliers, though this will probably be unnecessary.

Finally, into the far end of the 3ft. rubber tube fix the rose, which is the last part of this additional bathroom luxury fitting.

Care must be taken here to ensure a really tight joint. As all the fittings will probably be purchased from the same hardware store it should be possible to obtain rubber tubing slightly smaller in diameter than the tubes to which they have to be fixed. This may make it a slightly harder job to get the rubber tubes on to the metal ones, but it makes a neater finish, and a safer joint.

The complete attachment is shown at D in Fig. 1.

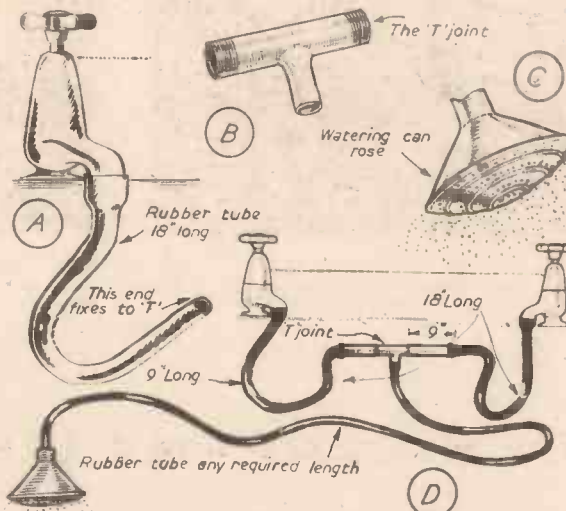


Fig. 1.—(A) Short rubber tube; (B) T-joint; (C) Watering can rose; (D) Complete attachment.

losing 1/2in. of tube does not matter. The firmer all these rubber joints on metal are fixed, the less chance there is of the jet of

**WATCHES:
ADJUSTMENT AND REPAIR**

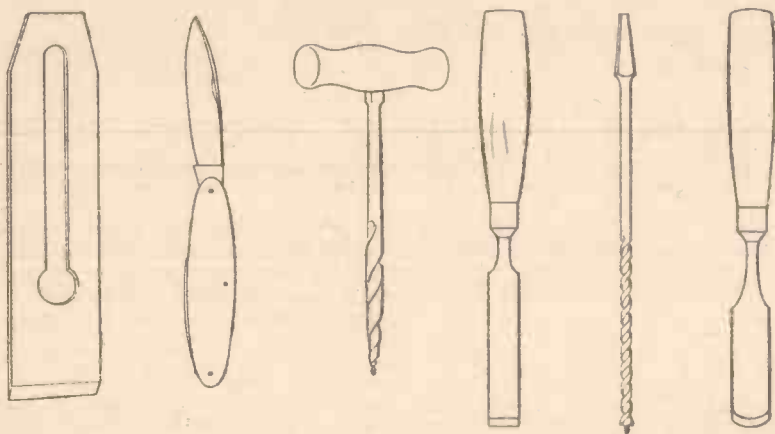
By F. J. Camm
6th Edition

A book dealing with modern methods of repair, adjustment and timing and including information on the adjustment of a watch for passing the Kew "A" Test.

6/-, By Post 6/6

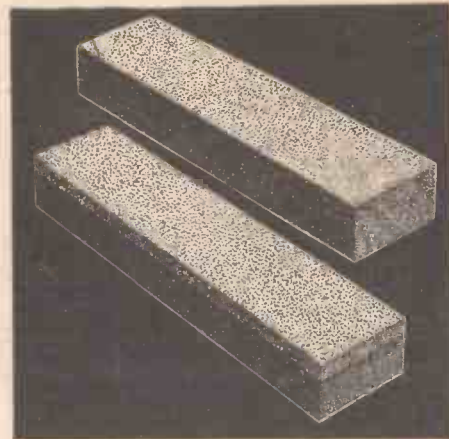
From George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

For Every Cutting Tool



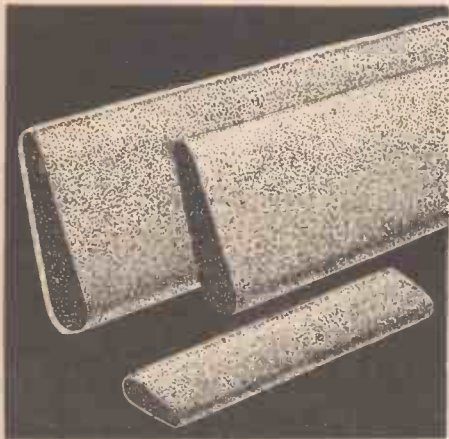
.. there's a

Sharpening Stone by CARBORUNDUM

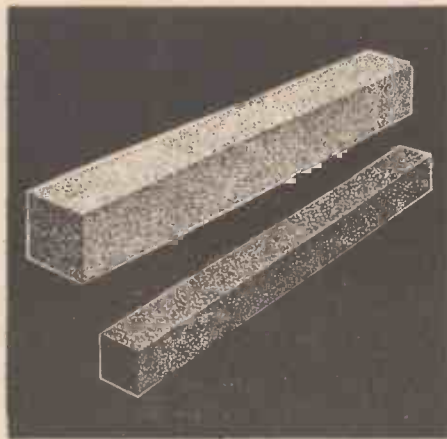


FOR CHISELS AND PLANE IRONS
Flat stones suitable for sharpening any flat-bladed tool, and for outside-bevelled gouges. In coarse or fine grits of silicon carbide or of ALOXITE abrasive. Combination coarse and fine stones are also available.

FOR GIMLETS
Bore two holes in hard wood before the gimlet is blunt enough to make hard going of it. When the gimlet eventually needs sharpening work it in one of the prepared holes with silicon carbide grit (120 to 180) and oil. Repeat in the second hole, using silicon carbide grit without oil.



FOR GOUGES WITH INSIDE BEVELS
Slipstones of various sizes, in silicon carbide or ALOXITE abrasive, for tools that need sharpening on an inside curve.



FOR AUGER BITS
Auger bits should be sharpened so that the bevel is on the upper side of the cutting blade.



FOR SMALL TOOLS
CARBORUNDUM make a complete range of sticks of different sections, and different grit sizes, for sharpening every small tool.

THE CARBORUNDUM COMPANY LIMITED

TRAFFORD PARK, MANCHESTER 17



SOLD AT ALL GOOD TOOLSHOPS AND HARDWARE STORES

Write to Department H for a free pamphlet 'The Art of Sharpening'. Responsible organisations may borrow a 16 mm. sound film on the same subject. This instructive film is in colour, and is entitled 'Here's How'.

A WONDERFUL MONEY-SAVING OPPORTUNITY FOR READERS OF PRACTICAL MECHANICS!



**FULL LENGTH
FULL SIZE**

Now's the time to join the
**Scientific
Book Club**

121 CHARING CROSS RD., LONDON, W.C.2

A FIRST-CLASS SCIENTIFIC
BOOK EVERY MONTH FOR
ONLY 4/-

FREE GIFT PIERRE-JOSEPH REDOUTÉ'S ROSES

When you join the Scientific Book Club you can obtain a copy of Pierre-Joseph Redouté's ROSES (24 full-colour plates, suitable for framing) FREE if you enrol a friend. Send your friend's name and address with 4s. 9d. (4s. plus 9d. for postage) for his first book, mentioning this offer, and your gift will be sent to you.

ALL THESE EXCELLENT TITLES

Recent and forthcoming selections include:



AUTOMATION : ITS PURPOSE & FUTURE

by Magnus Pike

Published at 16s.
4/- TO MEMBERS



THE MOUNTAINS OF PHAROE

by Leonard Cotterell

Published at 16s.
4/- TO MEMBERS



A GUIDE TO THE EARTH'S HISTORY

by Richard Carrington

Published at 21s.
4/- TO MEMBERS



THE MEN BEHIND THE SPACE ROCKETS

by Heinz Gartmann

Published at 18s.
4/- TO MEMBERS

Each month, the Scientific Book Club brings to its members the fascinating story of the march of modern science, told in thoroughly dependable books by the front rank scientific writers of our time—vivid, vital, constructive contributions to Man's unceasing struggle to solve the problems of the Universe. And although the ordinary editions of these Books are sold to the general public at 12/6, 15/- or 21/-, THE PRICE TO MEMBERS OF THE SCIENTIFIC BOOK CLUB IS ONLY 4/-. Remember, too, that Scientific Book Club selections are full-length and unabridged. They are printed on good quality paper, well-bound, with an attractive picture jacket. These are, we say with certainty, books that you will be glad to read, proud to own. The Scientific Book Club brings these great books to you each month; helping you to build up, at remarkably low cost, a first-class collection of scientific books. Now is the time to join!

'EXTRA' BOOKS, TOO!

Members are also privileged to buy splendid 'additional' books (fiction and non-fiction) at special bargain prices.



EXCELLENT PRODUCTION

Legible modern type; good quality paper; attractive binding.

In addition to the selections listed left, Scientific Book Club members have received books by these great authors:

Dr. J. Bronowski
Prof. J. B. S. Haldane
Ritchie Calder
Sir Harold Spencer Jones
Dr. Julian Huxley
John Crompton
Kenneth Walker

FILL IN THIS ENROLMENT FORM TODAY

To The Scientific Book Club, 121 Charing Cross Road, London, W.C.2.

I wish to join the Scientific Book Club, and agree to purchase the book issued each month to members at a cost of 4s. (postage 9d.). I agree to continue my membership for a minimum of six books and thereafter until countermanded.

*I will pay for selections on receipt. *P. Mechs./Sept., 1957.*
Or if you wish to save time, postage and postal-order costs you may send an advance subscription. 6 months 28s. 6d.; 12 months 57s.

*I enclose 28s. 6d./57s. (Strike out amount not applicable.)
* Place ✓ in the space above, as required.

NAME
(Block letters, please)

ADDRESS

Overseas enrolments (prices as for inland) should be accompanied by an advance subscription.

SILHOUETTE PICTURES

Using Newspaper Illustrations and Black Gummed Paper

PICTURES in silhouette may be made and used for very many different purposes, from subjects for decorative use, to designs meant for items such as hand-made posters. The designs which accompany this article are useful for room decoration or as suggestions for the beginner. The whole art of the silhouette lies in two things: first the "eye for

and select those which show a side view. You will soon learn which to choose. Cut them out of their background with a pair of small scissors. The kind known as "embroidery scissors" are very useful for this job. Next take a brush and some Indian ink and brush it over the cut-out figure. This wipes out the photographic detail in a startling way and produces something which is, in its own way, equally artistic. Fig. 2 is a typical example.

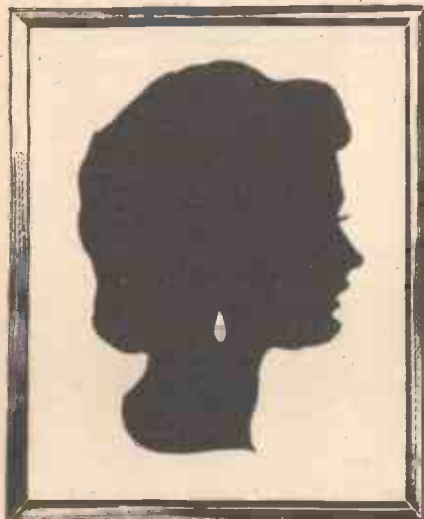


Fig. 1.—An example of silhouette portraiture.

design," which can see just where and how to choose a figure or an object that will make a good result; and second, the skill with the simple tools required.

Origin of the Silhouette

The silhouette is named after a Frenchman who was very clever in cutting out portraits in this manner, black against white. This was before the day of photography, and nowadays the cheapness of the photograph has vanquished the artist who cut the silhouette portrait. The old method was to seat the subject between a lighted candle and a sheet of paper, trace his shadow and cut out very carefully and accurately. This was then gummed against a background and framed. The experienced artist, however, could cut a silhouette just by looking at the sitter, and thus do it on a smaller scale than life size. You can try your hand at making this shadow tracing. Remember that a side view is best because it gives more of the details of the face, the features which give character and allow subsequent recognition. A method of producing silhouette portraits was given in our Junior Section of the March, 1957, issue, and an example of a typical portrait is shown in Fig. 1.

Using Newspaper Illustrations

For the decorative type of silhouette, there is another method which produces excellent results. Secure some old illustrated papers. Examine them for figures of men or girls in all sorts of positions of active movement

Arrangement

Now comes the real test of your skill. Having cut out and blacked a number of figures, arrange them on a background of white paper in a composition. You can place them in a row, not touching or overlapping. This is the best way to begin, but when more experience has been gained, they can overlap slightly. It may be found then, that the figures somehow do not look natural, and this is because of the perspective effect. If you have a ground line the smaller figures must as a rule be placed

way. The sheets may be, say, 10in. x 8in., or four times that area, 20in. x 16in. The paper should not be too thin. It can be purchased ready gummed on one side, which makes it much easier to stick down on its white background. Many excellent silhouettes, however, are not stuck down but mounted by one edge or by two corners in a folding mount which protects them from tearing. As will be seen, the great



Fig. 3.—The type of silhouette cut direct from a sheet of black paper.

higher up. The best way is to use figures of about the same height, allowing for bending and for the difference in size between men and women.

danger is the possibility of tearing the picture. Fig. 3 shows this type of work.

The completed silhouette pictures, when mounted in narrow black frames, make a sophisticated form of wall decoration.

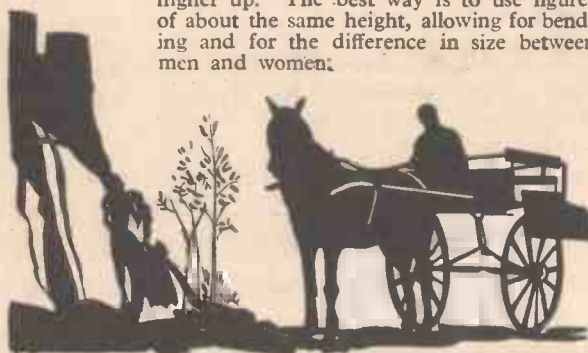


Fig. 2.—An attractive silhouette made from a magazine illustration.

So far we have considered various ways of getting the right kind of feeling for making silhouettes; now we come to the more difficult method. This is the silhouette which is cut by the artist, direct from one sheet of paper (usually black) with only his pair of scissors and a few lines, perhaps to guide his labour. Some really wonderful results have been achieved in this

—FOR THE MODEL MAKER—
BY F. J. CAMM

THE MODEL AEROPLANE HANDBOOK
12/6 (13/- by post)

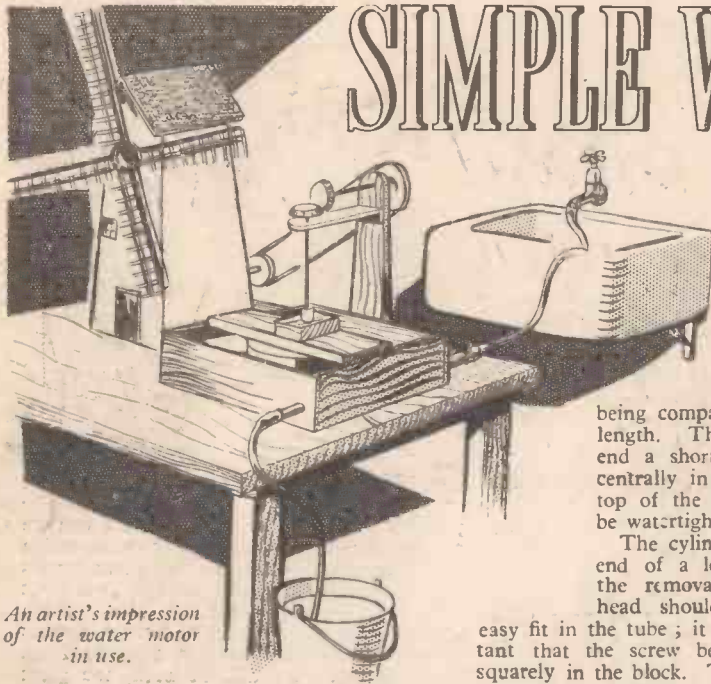
MODEL BOAT BUILDING
Constructional details of Model Sailing and Power Boats. 5/- (5/8 by post)

THE HOW-TO-MAKE-IT BOOK
12/6 (13/- by post)

MODEL ENGINEERING PRACTICE
17/6 (18/- by post)

From George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2

SIMPLE WATER MOTORS



An artist's impression of the water motor in use.

THE first model demonstrates the principle of reaction, whilst the second model illustrates the application of the principle for the production of power. Primitive motors of this type are still used daily for driving agricultural machinery—they involve a principle known to mankind for nearly 800 years.

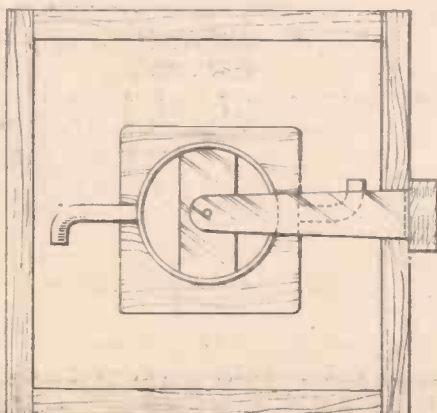
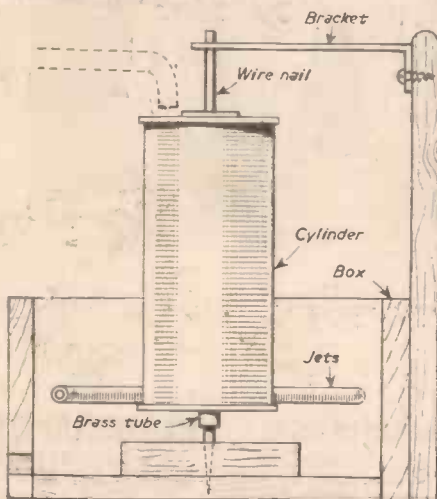


Fig. 2.—The bearing.

If the cylinder is filled with water, then the column of water will represent a certain pressure on the bottom of the cylinder but since the pressures on the inside of the cylinder are balanced no movement of the latter takes place.

The Cylinder

Suppose now that two holes are drilled through the cylinder, the holes being near the bottom and diametrically opposite; the pressures within the cylinder will no longer be balanced, and will in consequence move in the direction of the unbalanced pressures.

To demonstrate this insert and solder in position two small bent tubes, these being arranged to point in opposite directions. Provided the model runs freely the water issuing from the ends of the tubes will by reaction cause the cylinder to rotate.

To maintain a continuous flow of water from the jets the cylinder may be connected by a pipe to the water supply; a hole cut in the box will at the same time allow the spent water to escape.

The Second Motor

The two views in Fig. 3 show the arrangement of the second motor. The "runner" is a shallow cylindrical box; a strong tin having a good fitting lid may be used if at

Two Designs—One to Show the Principle and One to Demonstrate It

Referring to Fig. 1, the chief item of the motor consists of a long cylinder, the diameter

being comparatively small in relation to the length. The cylinder carries at its lower end a short length of brass tube soldered centrally in the bottom of the former; the top of the tube must be plugged so as to be watertight.

The cylinder is supported on the rounded end of a long screw or nail, which, after the removal of the head should be an

easy fit in the tube; it is important that the screw be inserted squarely in the block. To reduce friction to a minimum a small ball or bead is introduced between top of the screw and the plug of the tube as shown in Fig. 2.

The upper end of the cylinder is supported by a wire nail, soldered to a metal strip, which in turn is soldered to the cylinder. To maintain the revolving member in an erect position it will be necessary to bend up a bracket from sheet metal, the foot of which is screwed to an upright fastened at its lower end to the box collecting the water issuing from the jets.

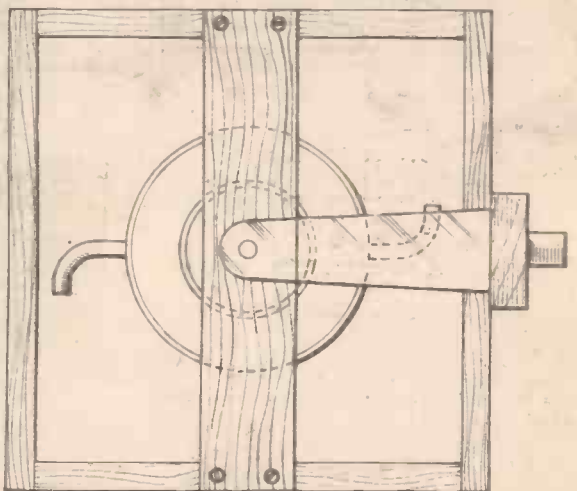
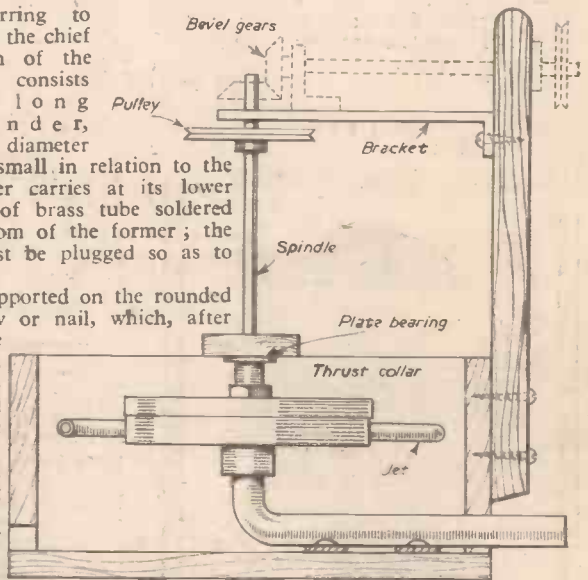


Fig. 3.—The working motor.

hand, the lid being well soldered to the tin.

The water under pressure is led by a bent pipe into the interior of the box, from whence it is discharged by the curved tubes. To minimise leakage of the water on entry to the box a piece of tube slightly larger than the outlet tube is soldered centrally to the bottom of the box. This expedient considerably reduces the leakage that would otherwise occur; the ideal arrangement would, of course, be a stopping-box and gland.

The Spindle

To secure the water pipe in position two feet "F" are soldered to it. The spindle passes through the top of the box and is attached by nuts on either side of the lid; the spindle is supported at its end by a plate bearing screwed to the cross-member.

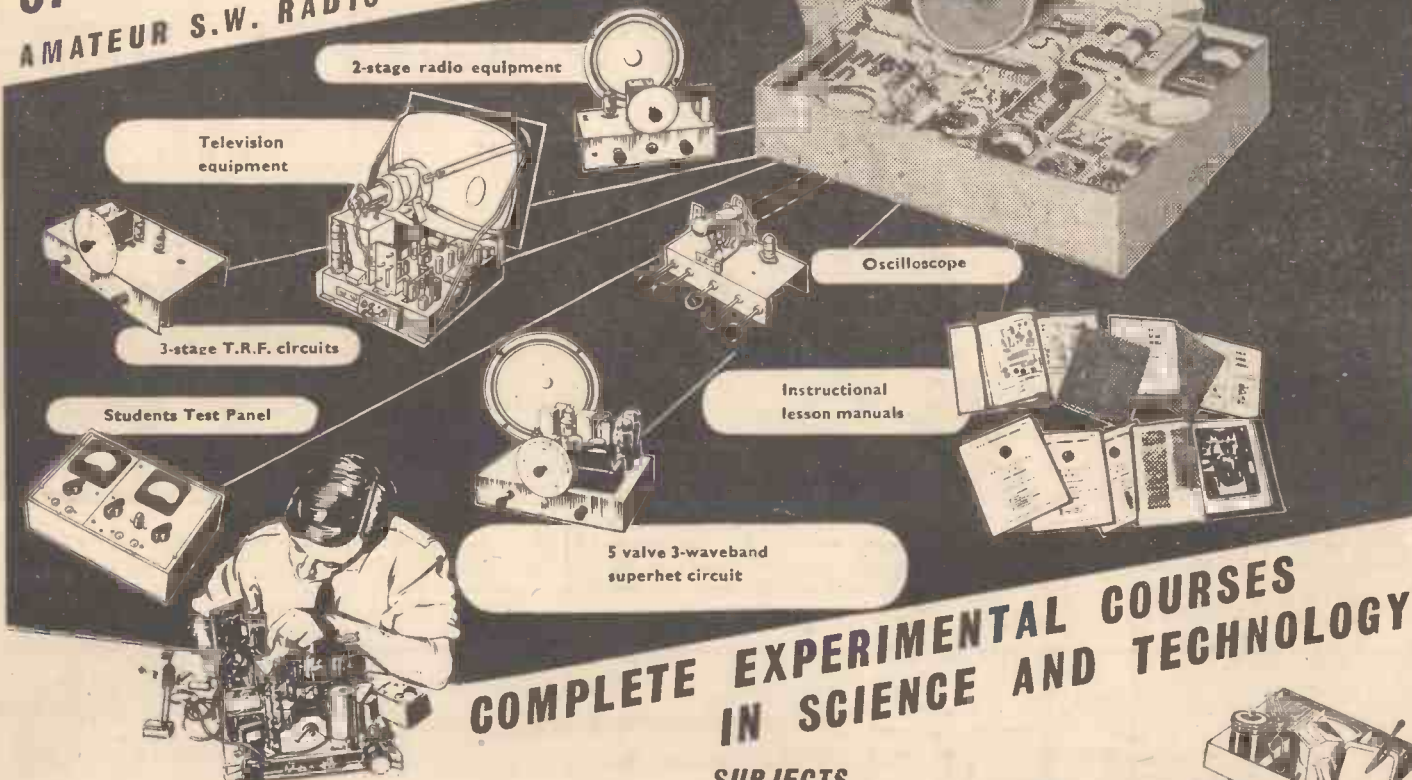
To receive the upward thrust of the box when subjected to water pressure, a small

(Concluded on page 593)

Fig. 1.—Details of the demonstration model.

NEW! — THE PRACTICAL WAY

of learning **RADIO · TELEVISION · ELECTRONICS**
AMATEUR S.W. RADIO · MECHANICS · PHOTOGRAPHY · CARPENTRY · ETC · ETC



COMPLETE EXPERIMENTAL COURSES IN SCIENCE AND TECHNOLOGY

NEW — completely up-to-date methods of giving instruction in a wide range of technical subjects specially designed and arranged for self-study at home under the skilled guidance of our teaching staff.

NEW experimental outfits and lesson manuals are despatched on enrolment and remain the student's property. A tutor is allotted to each student for personal and individual tuition throughout the course.

In the case of radio and television, specially prepared components are supplied which teach the basic electronic circuits (amplifiers, oscillators, detectors, etc.) and lead, by easy stages, to the complete design and servicing of modern commercial radio and television receivers.

If you are studying for an examination, wanting a new hobby or interest, commencing a career in industry or running your own full-time or part-time business, these practical courses are ideal and may be yours for moderate cost. Send off the coupon to-day for a free Brochure giving full details. There is no obligation whatsoever.

The only Home Study College run by a World-wide industrial organisation.



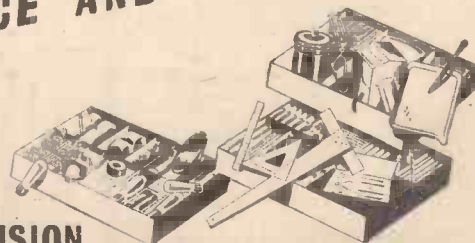
E.M.I. Factories at Hayes.

EMI INSTITUTES

— Part of "His Master's Voice", Marconiophone, etc., etc.

SUBJECTS INCLUDE —

- RADIO**
- SHORT WAVE RADIO · TELEVISION**
- MECHANICS · CHEMISTRY · PHOTOGRAPHY**
- ELECTRICITY · WOODWORK · ELECTRICAL**
- WIRING · DRAUGHTSMANSHIP · ART etc.**



COURSES FROM 15/- PER MONTH

FILL IN COUPON FOR **FREE PROSPECTUS**

E.M.I. INSTITUTES Dept. 144x London, W.4.

NAME

ADDRESS

Age (if under 21)

BLOCK CAPS PLEASE

I am interested in the following subject(s) with/without equipment.

(SEPT./57)

We shall not worry you with personal visits

TC66

*Make it
or Mend it—
you can't go wrong*

MAKE MODELS



Mend anything from crockery to cricket bats with Rawlplug DUROFIX, the colourless cellulose adhesive that's waterproof. Strong, almost invisible join—for good!

RAWLPLUG DUROFIX

Tubes from 9d Tins from 2/9

MEND MODELS

Mend or model with Rawlplug Plastic Wood—pliable as putty, yet when dry—it's wood! You can saw, plane, sand-paper, paint or polish. Moulds to any shape; strong, weatherproof.

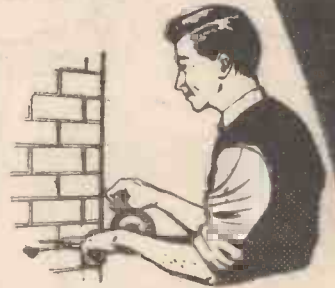


RAWLPLUG PLASTIC WOOD

Tubes 1/- Tins from 2/3

DRILL BRICK

Drill brick, tile cement, etc., with astonishing ease and speed with Rawlplug DURIAM-tipped Masonry Drills. Can be used in hand or suitable electric drills; ideal for making holes for Rawlplugs



RAWLPLUG DURIAM-tipped DRILLS

8520 FROM YOUR IRONMONGER OR HARDWARE STORES **THE RAWLPLUG CO. LTD** · LONDON · S.W.7



A "FERROUS" ELECTRIC ARC WELDING SET will complete your workshop equipment. For joining and reinforcing, from approx. 1/16" up to any thickness, Mild Steel, Wrought or Malleable Iron, Type F.M.80 Heavy Duty complete with all equipment 190/240v. Single ph. 10/15 amp. (or domestic power supply) delivered free, ex stock. Cash (or C.O.D.) **£23.10.0** H.P. Terms available. Illus. leaflet from manufacturers.

FERROUS PRODUCTS (M.E.C.) LTD., Church Rd., Croydon, Surrey. CR0 3B5/3

RADIUM SCINTILLOSCOPE

A fascinating pocket Scientific Instrument which reveals the actual splitting of Atoms. Countless invisible ALPHA PARTICLES, powerfully expelled by disrupting Radium atoms, raise incessant showers of brightly flashing points of light on colliding with a luminescent film. Guaranteed harmless, the sparkling scintillations seen through the lens will remain active a hundred years. Complete instrument as illustration but 2in. long x 1in. diameter, inclusive interesting explanatory leaflet and "History of Radium." Price 14/8, registered post free.

ATOMLIGHTS
36, Montpelier Cres., Brighton, Sussex

RATCHET & REVOLUTION COUNTERS

PLEASE ASK FOR CATALOGUE Instrument Division **B. & F. CARTER & Co., Ltd.**, Bolton 5 Patented Design

SAVE ON REPAIRS WITH **GLASS FIBRE**



DEMONSTRATIONS ON STAND 226

ALL MATERIALS SUPPLIED. KITS, WITH FULL INSTRUCTIONS, FROM 15/- plus Postage.

"Glass Reinforced Plastics" Booklet, 1/9 inc. Postage.

WESTPOLE MOTORS LTD.

Westpole Avenue, Cockfosters, Barnet, Herts. Barnet 3615 & 9474.

BRASS, COPPER, DURAL, ALUMINIUM, BRONZE ROD, BAR, SHEET, TUBE, STRIP, WIRE

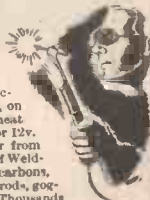
3,000 Standard Stock Sizes. NO QUANTITY TOO SMALL. List on application.

H. ROLLET & CO. LTD.

6, CHESHAM PLACE, LONDON, S.W.1 SLOane 3463 Also at LIVERPOOL LEEDS MANCHESTER BIRMINGHAM

THE FAMOUS **HARRIS ELECTRIC WELDER** and Complete Kit

For Welding, Soldering, Brazing and metal construction & repairs in the home, on the car or cycle. Instant heat 6,000° F. Works from 6v. or 12v. car battery or transformer from A.C. mains. Complete kit of Welding Tool, 9 ft. cable, clip, carbons, cleaning fluid, fluxes, filler rods, goggles, instructions, hints. Thousands in daily use. As supplied to Depts. of H.M. Government, L.C.I., Standard Telephones, etc. Welds all Metals. Up to one-eighth inch. **57/6** C.O.D. IF REQUIRED. Terms Available. (Post Free U.K. only) **HARRIS ENGINEERING CO.** (Dept. P.M.16) 269 Kingsland Road, London, E.2.



BATTERIES

PAY AS YOU USE

GOLDEN R.G.W. VERY HEAVY DUTY. 2 years' unconditional guarantee with the new micro porous rubber separators! and new hard rubber container! 20/- 6v., 30/- 12 volts deposit and only four monthly payments 6v. 13/9, 12v. 23/9. Illus. catalogue free. Express delivery.

R.G.W. BATTERY COMPANY 164 High St., Brentford, London. Tel.: Ealing 8711

SPARKS' DATA SHEETS

Constructional Plans of Guaranteed and Tested Radio Designs.

A.C. SHORT WAVE 4-VALVE T.R.F. Rx.

Cathode-Coupled Regen. Super-Sensitive. Send S.A.E. for Release Date & Full Spec. **L. ORMOND SPARKS (M)** Valley Road, Corfe Castle, Dorset

piece of tube is slipped on the shaft to serve as a thrust-collar between the nut and the bearing. The upper end of the spindle is supported by a single bracket screwed to the column, as in the previous model: if the model is to be used for driving small mechanical contrivances, either a pulley or bevel gears may be fitted. For smooth

running it is important when erecting the parts to ensure that the centre of the vertical spindle is concentric with the outlet pipe. When this type of motor was installed for power purposes it was placed at the bottom of a deep shaft, the supply of water being conducted down to the motor to create a good pressure—2½ ft. represents a

pressure of about 1 lb. per sq. in.

Since the mechanical details of these models may be modified to suit the tastes of the constructor and the material at hand the drawings have not been dimensioned.

(Readers should note that in some districts the water authority should be notified.—Ed.)



An impression of the device in use.

A Simple Sketching Aid

A Device to Ensure Correct Proportion and Perspective

and read off the distance as before and draw the roof line on the paper.

Moving the Slides

Movement of the horizontal slides will now indicate the width of the church, and the points on the roof where the steeple rises from. The crossbar can now indicate the height of the steeple and you will have the body of the building drawn in correct proportions. Details, such as windows, etc., are put in in the same way.

Hardwood is used for the work, 1 in. by ½ in. in section, the main dimensions being given in Fig. 1. The rod is a piece of ¼ in. or ⅜ in. dowel rod glued in a hole bored in the lower crossbar with an inch projecting below; this fits tightly in a similar hole bored in the horizontal bar. To provide a firm seating for this part of the rod, a

THIS useful instrument will be found a great aid to the sketch artist. It is intended to be screwed to a tripod stand in use. Fig. 1 is a view of the instrument minus the stand; it consists of a horizontal bar of wood with a vertical rod at one end and a sliding view-point at the other. On the rod are two crossbars, the top one capable of movement up or down the rod, and itself fitted with two horizontal slides.

Suppose you desire to sketch a building of some kind, say, for example, a church. Look through the eyehole and arrange the height of the tripod until the edge of the lower crossbar coincides with what will be the baseline of your sketch. Slide down the top crossbar until its front edge appears to touch the ground line of the church. The rod is marked in quarter inches, read off the distance between the crossbars and draw a line on your paper this distance above the baseline already drawn. Raise the crossbar to a level equal to the roof of the church

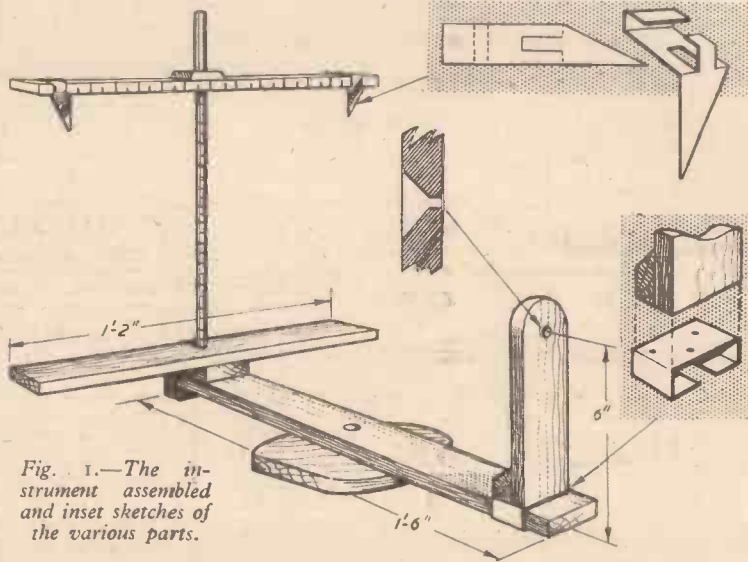


Fig. 1.—The instrument assembled and inset sketches of the various parts.

thickening block, ½ in. thick, is glued at the end of the bar.

The rod is accurately marked into inches by lines scratched half-way round, ¼ in. lines being a quarter of the way round and the ½ in. lines being short cuts between.

The top crossbar is similar to the bottom, and should slide easily up and down the rod. This can be effected by lining the hole with a piece of cloth or rubber.

The pattern for the slides at each side is

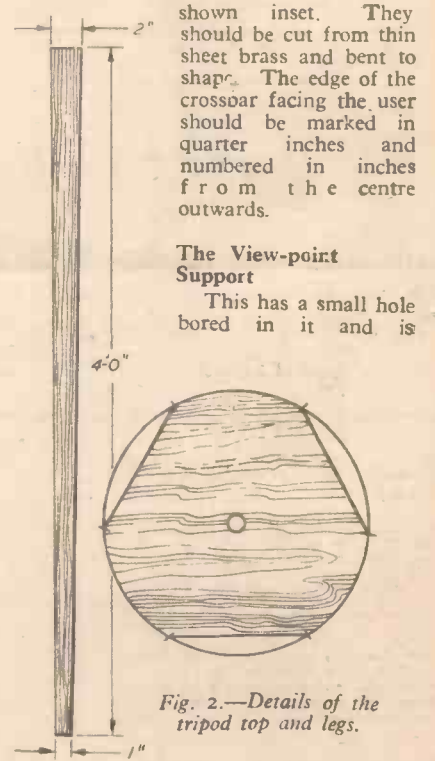


Fig. 2.—Details of the tripod top and legs.

screwed to a sheet brass slide, bent to the shape shown inset in Fig. 1.

Bore a hole in the centre of the main bar for a tripod screw, and varnish.

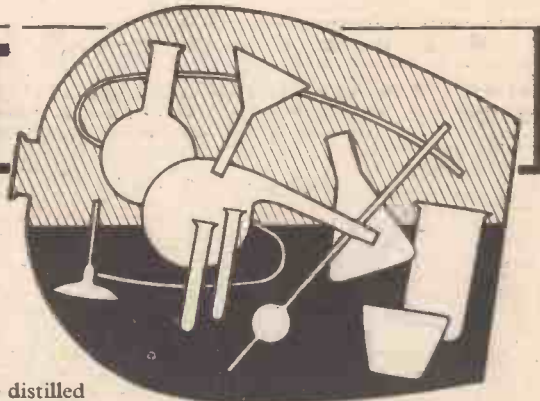
For the tripod stand, cut three legs from wood ½ in. thick to the dimensions in Fig. 2 and at each of the lower ends drive in a wire nail. Cut off the heads of these nails and file the shanks to a point, thus forming a spike to prevent the legs slipping. To the tops fix a 2 in. brass hinge.

The method of marking out and cutting the tripod top is indicated in Fig. 2; use wood about 1 in. thick, bore a hole in the centre for the tripod screw and hinge the legs below.

For a tripod screw use a brass or iron ½ in. bolt with a butterfly nut. Varnish like the instrument and glue a piece of velvet or baize to the top of the tripod. The instrument can be taken to pieces and strapped to the tripod for easy carrying.

THE JUNIOR CHEMIST

No. 10.—Elementary Chemical Analysis



PROFESSIONAL analysis is very complicated, but the elementary tests are simple enough to be performed by amateurs. Only the detection of common substances will be dealt with.

Apparatus Required

This will include six test tubes $\frac{1}{2}$ in. by $\frac{3}{4}$ in., a test tube stand, a spirit lamp, a glass rod, glass bottles for storing solutions, strips of blotting paper (about $\frac{1}{2}$ in. by $\frac{3}{4}$ in.) and a book of blue litmus papers.

The spirit lamp may be made at home, as shown in Fig. 1. The test tube stand as shown in Fig. 2 was described in the first instalment of this series.

Chemicals Required

All the chemicals should be pure.

| Common Name | Chemical Name | Quantity |
|---------------------|---------------------|--------------------|
| Washing soda | Sodium carbonate | — |
| Bicarbonate of soda | Sodium bicarbonate | — |
| Glauber salts | Sodium sulphate | 1 oz. |
| Salt | Sodium chloride | — |
| Nitre | Potassium nitrate | 1 oz. |
| Hypo | Sodium thiosulphate | 1 oz. |
| Green vitriol | Ferrous sulphate | 1 oz. |
| Chromate of potash | Potassium chromate | $\frac{1}{2}$ oz. |
| Slaked lime | Calcium hydrate | 1 oz. |
| Ammonia | Ammonium hydrate | $\frac{1}{2}$ pint |
| Vitriol | Sulphuric acid | 4 ozs. |
| Aqua fortis | Nitric acid | 1 oz. |
| — | Silver nitrate | 1 gram |
| — | Methylated spirit | $\frac{1}{2}$ pint |
| — | Distilled water | 1 quart |

It will be noticed that many of the above substances are present in every household, while hypo is used for "fixing" in photography.

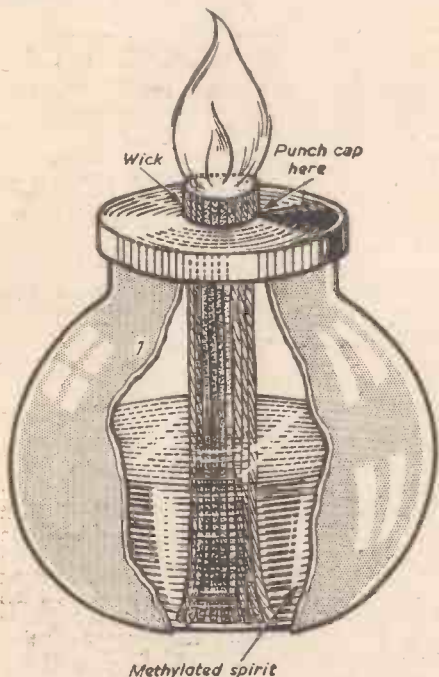


Fig. 1.—A simple method of making a spirit lamp.

Precautions.

Keep all acids and poisonous salts out of reach of small children. Use acids with great care; if an acid is spilt on the hands, wash immediately, and if on clothes, dab the spot with a cloth which has been dipped in a strong

solution of washing soda. Never add water to concentrated sulphuric acid, nor pour hot concentrated sulphuric acid down a sink, but wait until it is cold. Do not taste a chemical, or an unknown substance, unless you are sure it is not poisonous. Use distilled water when preparing solutions, and rinse test tubes and bottles with distilled water before use. This is important, because tap water is not pure enough. All solutions with the exception of lime water should be labelled "Poison."

Sulphuric Acid

Make a dilute solution of sulphuric acid by adding 1 oz. of acid to half a tumbler (half pint size) of distilled water. Do not add the water to the acid, but pour the acid into the water very carefully, a little at a time, stirring with a glass rod after each addition. The precaution is necessary, because the concentrated acid has a great attraction for water, and reacts violently. Remove the dilute acid to a bottle and label "Sulphuric Acid. Dilute."



Fig. 2.—A test tube rack.

Nitric Acid

Now wash the tumbler and glass rod with tap water and then distilled water. Half fill with distilled water and then add 1 oz. of nitric acid; stir well and remove the dilute acid to a bottle and label "Nitric Acid. Dilute."

Silver Nitrate

As this salt is poisonous it is advisable to prepare the solution in the store bottle (which should be red or blue, because silver nitrate blackens on exposure to light).

Rinse the bottle with distilled water and then pour in a quarter of a pint of distilled water. Now add one gramme of silver nitrate and shake until dissolved.

Barium Chloride

Barium chloride is very poisonous. The solution may be prepared in a similar manner to the silver nitrate. Dissolve $\frac{1}{2}$ oz. of barium chloride in $\frac{1}{2}$ pint of distilled water.

Potassium Chromate

Proceed as with barium chloride. Dissolve $\frac{1}{2}$ oz. of chromate in $\frac{1}{2}$ pint of distilled water.

Calcium Hydrate

A solution of this substance is commonly known as "lime water."

Obtain a bottle which will hold about $\frac{1}{2}$ pint of solution. Now put in 1 oz. of slaked lime, and let stand for two or three days, shaking occasionally. Pour off the clear liquid into another bottle. Again fill the first bottle with water and shake with the sediment remaining from the first solution. Thus a fresh supply can be obtained when required.

Preliminary Experiments

The compounds, such as sodium chloride (common salt), possess what is known as a metallic radicle and an acid radicle. The metallic radicle of salt is "sodium" and the acid radicle "chloride."

Detecting Acid Radicles

To become efficient in this branch of analysis it is necessary to know the properties of gases. The following experiments will help you to become acquainted with them. These experiments should be performed in test tubes.

Carbon Dioxide

One-third fill a test tube with lime water. Now add dilute sulphuric acid to solid sodium carbonate (washing soda) in another test tube. Then hold both test tubes by their top-ends in one hand and shake gently. As the gas formed is heavier than air, the test tube containing the lime water must be held below the other tube. The lime water should be turned milky; if the solution remains clear, put your thumb over the test tube and shake. This is the best test for carbon dioxide.

Sulphur Dioxide

Try the effect of dilute sulphuric acid on a strong solution of sodium thiosulphate (hypo).

Notice that a white or a light yellow solid is formed in the solution. When a solid is produced in this manner it is called a "precipitate." In the above instance it was a precipitate of sulphur.

Now smell the gas issuing from the test tube. Notice the smell of burning sulphur.

Prepare a chromate paper by dipping a strip of blotting paper in potassium chromate solution. Next, introduce this paper into the gas in the test tube (not into the solution); the chromate paper will be turned green.

Hydrochloric Acid

Take a small quantity of sodium chloride (salt), and add a little strong sulphuric acid and warm. Carefully smell the gas and notice the acid tang. Blue litmus paper becomes red in the presence of acid, so one would expect a blue litmus paper to turn red in the gas. Moisten a blue litmus paper with water and then put it at the mouth of the test tube. (Do not touch the test tube with the paper because a little acid will still be remaining on the glass.) The litmus paper will become red, proving that it is an acid gas.

Dip a clean glass rod into a bottle of ammonia. Hold the rod at the mouth of the test tube. White fumes of ammonium chloride will be produced.

Nitrogen Peroxide

Warm a small amount of potassium nitrate with a little concentrated sulphuric acid. Nitric acid vapour will be formed, which will decompose into nitrogen peroxide, oxygen and water.

(To be concluded.)

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

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

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

NUTS, BOLTS, SCREWS AND WASHERS for Mechanics, 2 B.A., 4 B.A., and 6 B.A., 7/- packet, 432 parts, post 1/4. Available Hex. Hd., Rd. Hd., C. Hd. and Csk. Stock which, 3 or more packets post free. 1,000 item list free. K. R. Whiston (Dept. P.M.S.), New Mills, Stockport.

CHEMICALS AND APPARATUS. Send 2d. stamp for catalogue and details of special offer. Scientific & Technical Supplies Ltd., Dept. P.M., 9, Wellington Circus, Nottingham.

SEND s.a.e. for free list New Tools, Drills, Taps, Dies, Reamers, Milling Cutters, Thread Chasers, at bargain prices. A. King, 152, Halfway Street, Sidcup, Kent.

TELESCOPE MAKING.—Non-Achro Object Glasses, 3 1/2 in. diam., 40 in. focus, 14/6; x 70 Ramsden Eyepieces, 27/6; s.a.e. for list of Achro O.G.S. Mirrors, Eyepieces, W. Burnet, Grand Sluice, Boston, Lincs.

BENDIX HAND GENERATOR or geared motor, as specified for "Practical Householder" Washing Machine, August, 1957, brand new, 30/- each; Moving Coil Pocket Voltmeter, 2 ranges 0-15, 0-250v, D.C., 17/6 each; Pressure Gauges, 5 in. dial, 6,500lb. sq. in., 17/6 each, plus postage; Garrard Gram. Motors, governed, 150v, A.C., but will easily run on 230v., 15/- each; Skin Grafting Knife, removable blade, adjustable guard to regulate thickness of cut, will cut or carve anything, wooden boxed, brand new, 15/- each; Time Delay Switch, manual or electric, 24 volts, Ref. No. 27N/56, 12/6 each; American Periscopes, brand new, 7/6 each, plus postage; s.a.e. for list. H. James, 175, Brettenham Road, Walthamstow, E.17.

SITUATIONS VACANT

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.

HANDICRAFTS

MUSICAL MOVEMENTS

from 12/9 post free. Grand piano kits, 29/- post free. **THE SWISSCROSS CO.** (Dept. V), 116 Winifred Road, Coulsdon, Surrey

THE WORLD'S GREATEST BOOKSHOP
FOYLES
 FOR BOOKS
FAMED CENTRE FOR Technical Books
STOCK OF OVER THREE MILLION VOLUMES
119-125 CHARING CROSS RD., LONDON WC2
 Gerrard 5690 (20 lines) Open 9-6 (Inc. Sats.)
 Nearest Station: Tottenham Court Rd.

ELECTRICAL

ALL TYPES OF ELECTRICAL GOODS at extremely competitive prices, e.g. 5 amp. Twin Cable, 48/- 100 yards; Lampholders, 7/- doz.; 5ft. Battens, 51/6; quality and immediate despatch guaranteed. Request list. Jaylow Supplies, 93, Fairholt Road, London, N.16. (Telephone: Stamford Hill 4384.)

BRAND NEW BROOKS ELECTRIC MOTORS
 Single Phase, 1 h.p. 1,425 r.p.m. £7.5 0
 2 h.p. 3,000 r.p.m. £9.5 0
 1 h.p. 3,000 r.p.m. £10.10.0

Fully guaranteed by makers, approval against cash. Carriage paid mainland. State voltage. **FREE**. A Three-step "V" Pulley with each motor.

P. BLOOD & CO., ARCH STREET, RUGELEY, STAFFS.

BRAND NEW guaranteed Electric Motors at lowest prices. 1 h.p. to 1 h.p. Ball Bearings, single-phase and three-phase; also Bench Grinders and Polishers. Ask for trade discounts. Gill, 48, High Street, Brighton, Sussex.

SPARES, REPAIRS, REWINDS. Replacement Armatures and Fields for most Vac. and Drills. Emergency Rewinding Service. Up to 30 h.p. available. Hodson (Croydon) Ltd., 75A, George Street, Croydon, Surrey.

MODEL ELECTRIC MOTORS. Amazingly powerful and economical. "Minimo" 9.6, "Maximo" 13.6, post paid, 3 to 6v and 3 to 9v, speed 4/5,000 r.p.m., size 1 1/2 in. x 1 1/2 in.; weight, 14oz. Drives: Boat Propellers, 1in. and 1 1/2 in.; Aeroplane, 5in. and 8in. Model Electric Motors (Dept. F.), "Highland", Alkington Green, Middleton, Manchester.

WOODWORKING

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.

ARE YOU LOOKING FOR A RELIABLE FIRM for Timber, Plywood, Wallboard, 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.)

STOP!

Before buying that woodworking machine it will pay you to see the Mylbo range. **Sawbenches, Planers, Bandsaws**, stocked by many leading tool merchants. Write for lists or better still call in for a demonstration. We know we can interest you.

P. BLOOD & CO., ARCH STREET, RUGELEY, STAFFS.

SAWBENCHES, 6in., motorised, complete, £13, multi-purpose, convertible for sanding, mortising, drilling, turning, dovetailing, polishing; 12in. Joiner's Sawbenches, £12; motorised, £27; 12in. Portable Petrol Sawbenches, £44; Saw Spindle Assemblies from 37/6. Planers, Engines, Motors; deferred terms. Send 1/6 for Handbook-Catalogue. Price list free. Beverley Products, Sturton-le-Steeple, 8, Notts.

PHOTOGRAPHY

ENLARGER and Camera Bellows supplied; also fitted. Beers, St. Cuthbert's Road, Derby.
PHOTO-ENLARGER Castings and Bellows, for 35mm., 2 1/2 in. x 2 1/2 in., 2 1/2 in. x 3 1/2 in., 3 1/2 in. x 3 1/2 in., s.a.e. for details. V. J. Cottle, 54A, Chaplin Road, Easton, Bristol, 5.

WATCHMAKERS

WATCH REPAIR SERVICE, unrivalled for reliability and speed, coupled with reasonable charges. Part jobs welcomed. Material supplied. Hereford Watch Co., 13, Castle Street, Hereford.

LEARN to be a Watch and Clock Repairer in your spare time and earn extra money at home. We can supply everything you need at unbeatable prices, including instructional books. Swiss watchmakers' tools, watches, watch and clock movements, lathes, cleaning machines, all spare parts for watches and clocks, etc. We also have a fine selection of musical box movements and kits. Send 9d. P.O. for bumper bargain catalogue. The Watchmakers Supply Company (Dept. P.M.), Carterton, Oxford.

WATCHMAKERS! Use genuine replacement parts. Catalogues of Tools, Parts, etc., free. T. G. Loader, Dept. B, Milstone Rd., Carterton, Oxford.

SEVEN-DAY SERVICE, Watches and Motor Clocks expertly repaired and cleaned and overhauled. Moderate charges. Estimates free. I. Podgorney, 11, Hatton Garden, E.C.1.

TEN ENGLISH LEVER WATCH Movements from gold and silver cases, 25/- the 10; 10 Swiss Lever Movements, 25/- the 10; 5 1/2 Plate Centre Second Giant Size English Lever Movements, £2 the 5; from 18ct. cases. Merke's, Jewellers, Gray Street, Newcastle-on-Tyne.

HOBBIES

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. Technivision Publications Ltd., 125, Oxford Street, London, W.1.

MAKING YOUR OWN? Telescopes, Enlargers, Projectors or, in fact, anything using lenses. Then get our booklets "How to Use Ex-Gov. Lenses & Prisms," price 2/6 ea. Comprehensive lists of optical, radio and scientific equipment free for s.a.e. H. W. English, Rayleigh Rd., Hutton, Brentwood, Essex.

ILLUSTRATED CATALOGUE No. 13. Containing over 450 Items of Government Surplus and Model Radio Control Equipment, 2/2, refunded on purchase of goods; 2/6 overseas sea-mail. Arthur Sallis Radio Control Ltd., Department P.M., 93, North Road, Brighton.

SEREN ASTRONOMICAL MIRRORS, 12 Jeymer Drive, Greenford, Middx. Top-quality Parabolic Mirrors, Diagonals, Eyepieces, Spiders, focusing Mounts, Do-It-Yourself Kits, sold home and abroad; s.a.e. for details. (Airmail, 6d., British P.O.)

ASTRONOMICAL Telescope Mirrors, 6in. diam., 48in. F/L, aluminiumed, £7/7/-; Plates, Spiders, etc. Rock, 56, Cemetery Road, Cannock, Staffs.

MAGIC

RETIRED PROFESSIONAL "Escapologist" has for sale. Handcuffs (various kinds), Leg Irons, also several valuable Manuscripts explaining "Telepathy" and "Second-sight" performances. Stage Illusions, Secrets, Lists, 3d. Deville, 12, Carlton Avenue, Romiley, Cheshire.

SAW SALES AND SERVICE

SAW SERVICE BY POST.—Circular Saws set and sharpened, 5d. per in. diameter; tensioned, set and sharpened, 8d. per in.; recut, 1/3 per in.; minimum charge per saw, 2/6. (Prices include return postage.) 48-hour postal service; cash with order.

SAW SALES.—Special offer. Circular Saws made to your requirements, e.g., 5in., 12/6; 6in., 15/-; state bore and if rip or crosscut tooth; cash with order; postage paid. Dept. "C", J. A. Powie, 18-22, Bell Street, London, N.W.1. (Established 1840.)

TOOLS

THE NEW 1957 fully illustrated Catalogue of Hand Tools, Portable Electric Tools and Machinery. Now available, price 6d., postage 3d. Parry & Son (Tools) Ltd., Dept. P.M.6, 329, Old Street, London, E.C.1.

EDUCATIONAL

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. PM47, London, W.4.

FREE! Brochure giving details of Home Study Training in Radio, Television, and all branches of Electronics. Courses for the Hobby Enthusiast or for those aiming at the A.M.Brit.I.R.E., City and Guilds, R.T.E.B. and other Professional examinations. Train with the college operated by Britain's largest Electronics organisation. Moderate fees. Write to E.M.I. Institutes, Dept. PM28, London, W.4.

GRAMMAR SCHOOL Entrance Examinations. Free Attainment testing for children 7-13. Write for details of Simplified Postal Courses to the Registrar, Mercer's Correspondence College (Dept. CG1), 69, Wimpole Street, London, W.1.

PATENTS

PATENTING Services. Advice. Qualified agent. C. L. Browne, 114, Greenhayes Ave., Banstead, Surrey.

MISCELLANEOUS

BUILD YOUR OWN REFRIGERATOR, all components available at reasonable prices. Frigidaire flowing cold units, £5; small units, Kelvinator, etc., £4; 1 h.p. heavy duty Motors, £3; Chrome Cabinet fittings, new, £1; money back guarantee; s.a.e. for list and schematic diagram. Wheelhouse, 13, Bell Road, Hounslow. (Phone: Hounslow 3501.)

AQUALUNG and Compressor Equipment. Ballraces and Miscellaneous Items. Lists 3d. Pryce, 157, Malden Road, Cheam.

! A GOOD IDEA!
CAN MAKE MONEY FOR YOU
 LET US ASSIST YOU
 PROFESSIONALLY TO SELL YOUR INVENTION.
WRITE FOR FULL DETAILS.
PATENT DEVELOPING & MARKETING CONSULTANTS
 16, Gore Court Rd., Sittingbourne, Kent.

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

SUPERTONIC SUNLAMPS, listed £7/10/-; 80/-; s.a.e. brochure. Scientific Products, Dept. 1, Cleveleys, Lancs.

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

BOWMONK FIREPROOF GARAGES

 From £33.10.0 with FREE delivery
STEEL FRAMED—FIREPROOF—EXTENSIBLE
 For protection and easy maintenance. All garages fitted with anchors, shelf, door retainers, Yale lock. FREE site plans. **LOWEST TERMS** of any manufacturer including FREE Security Insurance. **FREE Illustrated Catalogue & Prices from BOWSER, MONKS & WHITEHOUSE LTD. (Dept. ME2), Spring Gardens, Doncaster**

THE PEOPLES ARC WELDER

£15-12-0d
Complete with all accessories shown Ready for plugging into 10 amp socket 200/250v a.c. maintains infinitely variable control of welding current by hand-wheel. Works up to any thickness down to 22g sheet. For the Motorist, Householder & Engineer.
E15-12 0d 12s 2d 2d 2d 2d 2d
CARRIAGE APPROX 7" AFTER DELIVERY
Uses Hs & Kg Standard Flux Coated Electrodes. One bundle of each supplied with Welder. Extra Electrodes 7" 2d 2d 2d 2d 2d

HARMSWORTH, TOWNLEY & CO.,
Jordan Street, Knott Mill,
MANCHESTER, 15.

92,000 PIANISTS

have learned to play the piano beautifully with the aid of my POSTAL lessons. Everything is so clearly explained that, even if you do not know a note, you will, with only half an hour's practice each day, become a proficient pianist in 9-12 months. Ordinary music: no freakish methods. My class is seldom less than 2,000 pupils. I have taught over 92,075 and I CAN TEACH YOU. Free Book and advice. Say if Beginner, Mod. or Adv.
Mr. H. BECKER,
298, The Hall,
Centurion Road,
Brighton, Sussex.

ROGERS 31 NELSON ST. SOUTHPORT

- 5in. Rubber Sanders. 4in. drive. 5/-
- Abrasive Discs. 5in. Ass'd. doz. ... 3/6
- Terminal Blocks. 12-way ... 1/3
- Transformers. 6/12v. 20 amp. ... 38/6
- Motorised Pumps ... 69/-
- Thread Gauges. 28 arms ... 4/9
- Whitworth Screws. 144 Ass'd. ... 5/9
- H.S. Drills. 12 Assorted. 10 48 ... 4/8
- Fibre Washers. 144 Assorted ... 3/6
- Meter Rectifiers. A.C. to D.C. ... 3/9
- Self Tap Screws. 100 Assorted ... 3/6
- Copper Rivets. 12 doz. Assorted ... 1/4
- Saw Bench Tops, with ball race spindle, pulley etc. 18in. x 10in. 52/6
- Rectifiers. 5/12v. at 6 amps. ... 18/-
- Meters. 0-15 v. or 0-25 volts M/c. ... 10/6
- Air Jacks. 5in. stroke ... 17/6
- Boost Gauges for Car Use ... 6/9
- Winker Units. 6 or 12 volt ... 6/6
- Circular Saws. 6in. 11/6; 7in. 12/8, etc.
- Races, Belts, Valves, Pulleys, Pumps, etc.

May we send our free list of hundreds of interesting items? Stamp please.

FOR ALL YOUR TRICKY PROBLEMS

The greatest advance in modern times. An entirely new CRYSTAL CLEAR adhesive that STICKS ALMOST ANYTHING TO ANYTHING, and never becomes brittle.



Tubes 1/6-2/9. Larger tins available.
TURNBRIDGE LTD., LONDON, S.W.17 (Est. 1922)

FREE! PORTABLE BUILDING CATALOGUE 48 pages

- GARAGES** from £43-5-0 or 179/- down.
 - SHEDS** from £11-10-0 or 46/- down.
 - GREENHOUSES** from £21-5-0 or 85/- down.
 - POULTRY HOUSES** from £8-5-0 or 33/- down.
- Also Aviaries, Birdrooms, Pigeon Lofts, Greenhouse Heaters, Ladders, etc.
EASY TERMS.
PARK LINES, LTD. (Dept. 28),
717-719, Seven Sisters Rd., London, N.15

AUTOMATIC (TIME) SWITCHES
New and reconditioned 15 day clock-work and electric switches
from **35/-**
Send S.A.E. for illustrated details to —
DONOHUE (TIMERS)
GEORGE STREET, NORTH SHIELDS,
NORTHUMBERLAND

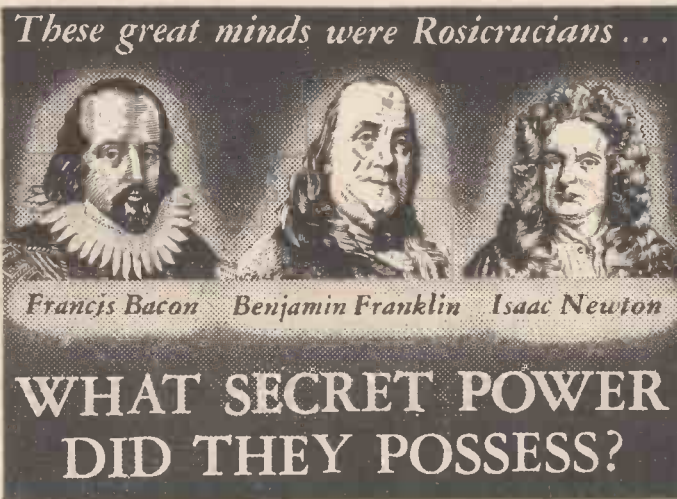
WORLD WIDE RADIO RECEPTION

FOR THE AMATEUR RADIO ENTHUSIAST
TUNE IN WITH THE
MALVYN SINGLE VALVE SHORT WAVE COMMUNICATION RECEIVER

All-Dry Battery operated : Extremely low running costs : Band Spread Tuning : Attractive Front Panel : Full operating instructions included.

PRICE OF COMPLETE RECEIVER, 74/6 (Batteries and Phones Extra). Post Free U.K. Money Back Guarantee. Send S.A.E. to actual Manufacturers for Free Descriptive Literature.

MALVYN ENGINEERING WORKS
Radio and Electronic Engineers
Tel. : Hertford 2264 7 Currie Street, HERTFORD



Why were these men great?

How does anyone—man or woman—achieve greatness? Is it not by mastery of the powers within ourselves?

Know the mysterious world within you! Attune yourself to the wisdom of the ages! Grasp the inner power of your mind! Learn the secrets of a full and peaceful life!

Benjamin Franklin, statesman and inventor . . . Isaac Newton, discoverer of the Law of Gravitation . . . Francis Bacon, philosopher and scientist . . . like many other learned and great men and women . . . were Rosicrucians. The Rosicrucians (NOT a religious organization) have been in existence for centuries. Today, headquarters of the Rosicrucians send over seven million pieces of mail annually to all parts of the world. Address: Scribe E.W.J.

The ROSICRUCIANS

25 Garrick St. (AMORC) London, W.C.2, England
Scribe E.W.J.
The ROSICRUCIANS (AMORC)
25 Garrick St., London, W.C.2, England

Please send me the free book, *The Mastery of Life*, which explains how I may learn to use my faculties and powers of mind.

Name _____
Address _____
City _____ State _____

METWOOD for
—a complete range of Swiss Musical Miniatures.
Movements by THORENS AND REUGE of Switzerland ranging from 1 tune/18 teeth—3 tunes/72 teeth, and have a 12 months guarantee.
Trade Enquiries invited.
POST TODAY :
for **FREE** super 16-page illustrated Catalogue and Tune List (please enclose 2d. stamp for return postage) also plans to make your own Musical Box available. 1/- postage free. P.O. please.
METWOOD ACCESSORIES (PM9)
65 Church Street, Wolverton, Bucks.
(Importers and Manufacturers)

GENERAL CERT. OF EDUCATION
THE KEY TO SUCCESS & SECURITY
Essential to success in any walk of life! Whatever your age, you can now prepare at home for the important new General Cert. of Education Exam., on "NO PASS—NO FEE" terms. You choose your own subjects—Educational, Commercial or Technical. Recently announced big extension of subjects gives everyone the chance to get this valuable Certificate.
SEND FOR FREE 136 PAGE BOOK
Full details of how you can obtain the General Cert. are given in our 136-page Guide—Free and without obligation. Personal advice on request. Write today, School of Careers, Dept. 109 29-31, Wright's Lane, London, W.8.
"NO PASS—NO FEE"

OBTAIN YOUR METAL FROM US
Brass, Copper, Alloys, etc.
Sheet, Strip, Rod, Tube, Wire.
Small quantities only.
GEORGE WILDEN LTD.
170 PITSFORD STREET
BIRMINGHAM, 18

PORTASS LATHES
DIRECT PERSONAL SERVICE
LARGE DISCOUNT FOR CASH
NO INTEREST CHARGED for easy terms.
CAN ANYONE DO BETTER!
1/- for Lists, please. Dept. P.M.
BUTTERMERE WKS., Sheffield, 8

CHEMISTRY APPARATUS
Send 3d. stamp for COMPLETE PRICE LIST
Booklets :
"Experiments" 1/2
"Formulas" 1/2
"Home Chemistry" new ed. 2/9
(Post Paid.)
BECK (Scientific Dept. A)
60 HIGH STREET
Stoke Newington, London, N.16

ACCURATE HARDHITTING
Webley
AIR PISTOLS
AIR RIFLES · ACCESSORIES
Write for catalogue WEBLEY & SCOTT Ltd.
106, WEAMAN ST., BIRMINGHAM 4, ENGLAND



Letters to the Editor

Address letters to The Editor, "Practical Mechanics," Tower House, Southamton Street, London, W.C.2

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

The Mantell Incident

SIR,—Re the recent correspondence on Capt. Mantell and "Meteor." How anyone can reconcile the meteoric explanation with the Capt. Mantell incident of January 7th, 1948, is beyond my comprehension. There is, of course, every possibility of a meteor behaving in the manner postulated by Mr. Kershaw, but we must not advance this explanation without first considering the established facts of the case in question, and when I say established, for this particular incident I will accept those which are officially accepted. Briefly, what are the facts? The time was a little before 15.00 hours and several officers in the control tower at Godman Field were on the look-out for a "huge unidentified object" which had been reported by hundreds of people and police flying towards the base. All the witnesses agree that the object was "huge" or "tremendous," and this latter word was used by Mantell when he had it in full view, and also stated that it was metallic and travelling at "half my speed." He gave chase up to a height of 20,000ft. after a final report that the object was climbing and travelling at some 400 m.p.h.

The objections to Mr. Kershaw's meteoric "explanation" are multitudinous and obvious. One or two will suffice: firstly, any meteor which had decelerated to a velocity of 300-400 m.p.h. (usual speed anything from 2 to 40 miles per second) could never again accelerate enough to escape from the Earth's gravitational influence or to complete another orbit around our planet; it would plunge to the surface within minutes at the most. A multitude of other facts taken singly would serve to dissolve Mr. Kershaw's "explanation," but perhaps we may mention with a smile that the U.S. Air Force never even gave it a thought, considering "Venus" ridiculous enough.

Mr. Kershaw's point on the scores in the fuselage remains of Mantell's plane are worthy of mention. The condition of the wreckage has never been clearly ascertained, so one cannot give a decision on this point, but we might say that all UFO's have not been observed to travel at 25,000 m.p.h., and point out that the ejection of a reaction mass would adequately satisfy the speed attributed to the object Mantell was chasing.

Capt. Howard and the other witnesses of the famous Labrador incident would be the first to deny the "foo ball" nature of the phenomenon they observed, and once again careful study of the facts will render this explanation untenable.

May I suggest to Mr. "K" that he reads

Aime Michel's "The Truth About Flying Saucers," Major Ruppelt's "The Report In the U.F.O.," and the book just published, by Max Miller, "Flying Saucers, Fact or Fiction"—then think again. —D. WIGHTMAN (Wigan and District Flying Saucer Group).

Gas Cooker Safety Fence; Junior Work Bench

SIR,—Fig. 1 is a recent photograph of our gas cooker. Six years ago I fitted a safety fence to prevent our infants from pulling down hot pans with boiling liquids, etc. It is made from a short length of low-level garden fence, as obtainable from most ironmongers. The appliance is still in use. It is fitted between the removable top and the rest of the cooker, the weight of the top holding it down. The same picture also shows a pair of asbestos gloves, which are very useful for removing hot dishes from the oven. They are obtainable from tool shops like Buck and Ryan (Euston Road), and cost 7s. 6d.

Fig. 2 shows two views of a home-made work bench for our two boys, aged six and eight years. It is foldable and rawplugged to the wall. When folded it serves as a blackboard. It is made from an old kitchen



Fig. 1.—The gas cooker safety fence.

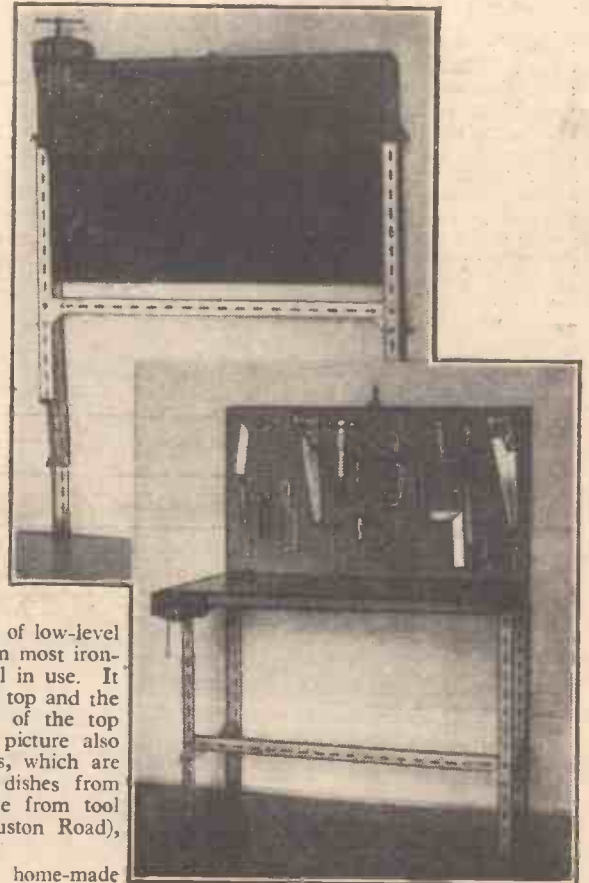


Fig. 2.—Two views of the junior work bench.

table top and Rite-angle construction iron. This is obtainable in small quantities from Booth & Co. (England), Ltd., 34, St. James's Street, S.W.1 (similar material made by Dexion, "Handy Angle," etc., could be used, but may be difficult to obtain in under 100ft. parcels). The wood-work vice cost about 21s. at the local ironmongers.—E. ROSENSTIEL (S.W.15).

Cow Byre Roof Lights

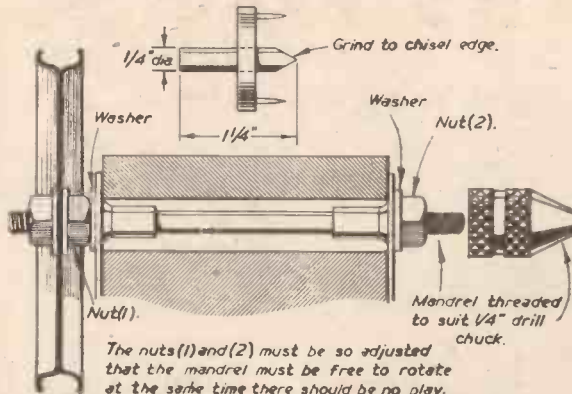
SIR,—In your July issue of PRACTICAL MECHANICS, Mr. J. Hughes requests information on roof lights for a cow byre. May I suggest he uses corrugated Perspex for this purpose? It can be obtained with corrugations of the same pitch as the asbestos and therefore can be built into the roof in the same way as the asbestos and will be absolutely weatherproof by virtue of the fact that it will overlap in the same way as the asbestos sheet. The supplier of Mr. Hughes' asbestos may be able to supply the Perspex also, as it is widely used for this purpose.—J. E. HOLMES (High Wycombe).

SIMPLE LATHE IMPROVEMENTS

SIR,—I have made the lathe described in the junior section of the *PRACTICAL MECHANICS* (May, 1957, issue). It has been running smoothly and I have been making use of it. However, I would like to give a few suggestions which enable the worker to use the lathe as a horizontal drilling machine, at the same time not disturbing its excellent wood-working qualities.

First of all the chuck described is removed. Next the mandrel is threaded to suit a $\frac{1}{4}$ in. hand drill chuck, the length of the thread being as long as the chuck. Then a nut, having the same threads as the chuck, is screwed on as far as it will go, but before doing this a washer is slipped in between the nut and the face of the bearing. After tightening up the nut the chuck is screwed in position. Then it is seen that the threads on the other side of the mandrel nearly reach the face of the bearing. Then the pulley may be fixed in the same way as described in the article.

The nut and bolt in the tailstock are removed and the work to be drilled clamped to the upright block in the tailstock. The appropriate drill is then chucked and the tailstock is slid along the runway. After



The nuts (1) and (2) must be so adjusted that the mandrel must be free to rotate at the same time there should be no play.

Our Indian reader's lathe improvements.

making sure that the work has been correctly centred the motor is started and then pressure is applied on the tailstock from behind.

The chuck described in the article may be provided with a small piece of metal rod $1\frac{1}{2}$ in. long in the hole previously drilled for the mandrel. The end of this is then ground to a chisel point (see inset).

To work with wood the nut and bolt for the tailstock is replaced and the modified chuck is held in the drill chuck and thenceforth used as a lathe.—V. SIDDHARTHAN (New Delhi, India).

A MODEL VILLAGE



A view of the model village.

SIR,—You may be interested to have photographs of our model village. In it there are many unusual features, including a castle, Tenfold Farm, St. Agrippa's Church, a lock and weir on the stream and an aerodrome with model planes. Some of the smaller features include a cricket match on the green, boats on the river and cars, etc., in the streets.—MODEL VILLAGES LTD. (Margate).

[One of the photographs is reproduced on the left.—ED.]

Moulding and Vulcanising Rubber

SIR,—I should like to answer Mr. J. McCaffrey (Information Sought, July issue), regarding moulding and vulcanising rubber. He does not state the purpose for which he requires this rubber and whether the end product should be hard like ebonite or a permanently soft rubber. If the former, I should advise him to obtain dental rubber (black, maroon or red) from The Dental Manufacturing Co. Ltd., Brook House, Portland Street, W.1. This can be moulded in plaster casts, but requires a "vulcaniser" (a pressure cooker capable of taking at least 105 p.s.i.) which might be obtained through a dental technician or laboratory. Very satisfactory hard castings can now be made in plaster moulds from self-hardening methyl-methacrylate resins, also obtainable through

the dental trade. For permanently soft "rubber," this is also available (but perhaps expensive) as a dental rubber, but excellent permanently pliable materials are marketed as dental impression materials under various trade names. "Lastic 55," e.g., can be obtained white or tinted and is essentially a silicone "rubber," supplied in a tube, together with a setting liquid. No equipment is required except a kitchen knife and, say, a tile for mixing the paste with the liquid.—E. ROSENSTIEL (S.W.15).

Dye for Perspex

SIR,—On page 510 of July, 1957, issue, you publish a reply headed "No Dye for Perspex," and I think you may be interested to know that I have a booklet entitled "Fabrikit—Instructional Manual," published by Plastics (Manchester) Ltd., at

1s. 6d., in which detailed instructions are given for dyeing clear Perspex. It is stated that a full colour range is available.

Also, I think that T. Jones is referring to brooches made from clear Perspex, which is engraved from the back to form flowers, leaves, etc., and he requires to colour these engraved parts—if that is so, it can be done very simply by applying Winsor and Newton's Transparent Glass painting colours—which immediately disperse through the engraved parts of the Perspex, giving a very pleasing effect. Perhaps this is not technically a "dye," but I think this is what he has seen and wants to copy.—H. W. CROUCHER (W.4).

SIR,—On page 510 of your July, 1957, issue you stated that "there is no dye for treating finished Perspex. The resin is usually coloured before casting or forming into the articles required. A transparent dyeing process has been evolved by various firms, as, for example, the 'Lustrex' process by Monsanto Chemical Co., Ltd."

Lustrex is the trade name given to a range of polystyrene plastic moulding materials manufactured by Monsanto. The dye process to which you refer is probably a technique known as dry colouring, which was developed for the use of moulders who might wish to work with colourless crystals and make small coloured batches as and when required. It is not, in any sense, adaptable to the requirements of amateur craftsmen, nor is it applicable to Perspex, which is a product of Imperial Chemical Industries Limited, and is chemically unrelated to polystyrene.

You may also like to know that the address of this company is Monsanto House, 10-18, Victoria Street, London, S.W.1.—MONSANTO CHEMICALS, LTD.

Sharpening Circular Saws

SIR,—With regard to Mr. James Vose's very excellent article on the sharpening of circular saws (July and August issues) I would like to bring to his notice that a saw doctor, many years ago, told me always to reverse the saw when "jointing" or stoning, as he called it, as it will save accidents, the action of the teeth then will have the effect of pushing the stone back into the hands of the operator rather than drawing it into the teeth, and surely if a spindle becomes that distorted to upset the "truth" of a saw it would be wise to rectify the fault!—F. BARTLETT (Dorset).

CHESS TABLE

(Concluded from page 568)

The column is cut to an octagon to within $1\frac{1}{2}$ in. of the top which is left square so as not to interfere with the joint. The underside of the feet is shaped with bowsaw, spokeshave and chisel and the upper surfaces bevelled as shown in Fig. 3.

Finishing

Clean up all the pieces with a fine-set smoothing plane and glasspaper and glue the halving joint between the feet, also the top joint. When the glue has set, level off the top and bottom of the halving joint and glue the column into the base, using wedges to strengthen the joint if necessary. Clean off the end of the tenon and the top joint and polish the stand. The board can now be fixed with four $1\frac{1}{2}$ in. countersunk screws up through the rails about 1 in. from each end.

"STAR" FIRST QUALITY EXTENSION LADDERS 5/- DOWN

Clear Columbian Pine (no knots) with Hardwood Rungs at 9in. centres. Tie Rods suitably spaced. Wrought iron rust-proof fittings.

5/- deposit and 6 monthly payments. **CASH 6 mthly.**
 Closed Extended PRICE p/mts.
 8ft. 14ft. £4/10- 16/9
 10ft. 18ft. £5/10- 20/-
 12ft. 21ft. £6/18- 25/6
 14ft. 25ft. £8/ 5- 31/-
 16ft. 29ft. £9/15- 36/-

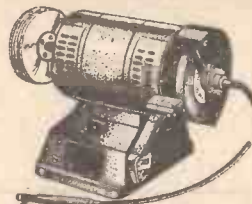
CARRIAGE PAID. SEND NOW!
 Other sizes and types available.
PARK LINES LTD. (X28)
 717/719, Seven Sisters Road,
 London, N.15. STA 9211-3

GAMAGES

TOOLS FOR THE HOUSEHOLDER & MECHANIC

'SEWTRIC' GRINDER POLISHER

For grinding, polishing, sharpening, milling, carving, burring, engraving and cleaning on Metal, Wood, Glass, Plastics, Stone, etc. 1/6 h.p. 220/250 volts universal mains A.C./D.C. For 5 speeds from 2,500 to 6,000 r.p.m. Complete with 4 in. Grinding Wheel and a 4 in. Calico Buff.



£8/10

20/3

Or 9 Monthly Payments of Flexible shaft 50/- extra.
 Carr. & Pkg. 5/- in Eng. and Wales. Scotland 7/6.

SPECIAL SCREWCUTTING BACK GEARED PRECISION LATHE



3 3/8 in. x 16 1/2 in. approx.

Today's Finest Value! £33

Or Nine Monthly Payments of 78/10
 Carr. & Pkg. 13/9 Eng. & W. plus 30/- for Crates, returnable

Brief details: Swing in gap of 3 1/2 in. model, 8 1/2 in. 10 change wheels. Equipment includes: Faceplate, Catchplate and Extra Backplate in rough screwed to fit mandrel nose. 16 1/2 in. approx. between centres.

'FERROUS' ELECTRIC ARC WELDING PLANT

If you are interested in joining or reinforcing Mild Steel, Wrought or Malleable Iron THIS IS AN OUTFIT YOU CANNOT BE WITHOUT. 230 A.C. mains for 5 amp. plug. For welding material of any thickness by repeat runs after preparation if necessary. Uses 14 s.w.g. electrodes. Air cooled. Robustly constructed and fitted with neat handles for portability. Size 15 in. x 12 in. x 10 in. high. Weight 80lb.



Send for FREE Tool list.

£23/10 Or 9 Payments of 55/9

Carr. & Pkg. outside 50 miles of Holborn, in Eng. & W., 15/- Scot. 22/6. Send for Illustrated leaflet.

GAMAGES, HOLBORN, E.C.1. HOLborn 8484. Open Thursday 7 p.m.

FREE POCKET MANUAL

"How to fit STEAM TRAPS"

Unique guide to the correct selection and installation of steam traps for mains drainage, heating systems, process steam units of all kinds; including best condensate-lifting installations. Concise directions: clear illustrations. Copies free on request to:

SPIRAX-SARCO LTD.
 (TECHNICAL DEPT.), Cheltenham, Glos.

GOVERNMENT

SURPLUS BARGAINS

TRIPODS. Unused, 38" long, only 5 lb. wt. Immensely strong. Carrying sling. Brass cap easily adapted to camera, etc., etc. Each 12/6, carriage 3/6.
LOW VOLTAGE MOTORS with REDUCTION GEAR. approx. 4/1 (24-45-90) 6-12 v. D.C., 1 amp., ea. 15/-, post 1/8.
MOTOR ONLY as above (dimensions 3" x 2" x 2") ea. 10/-, post 1/-.
BATTERY CHARGING TRANSFORMERS. 10 v. & 16 v. A.C. (for 6 & 12 v. charging at 1 amp.), ea. 17/6, post 1/-.
RECTIFIERS to suit above, ea. 7/6, post 3d.
 (These transformers & rectifiers will run the above low voltage motors.)
BLOWER MOTORS. 24 v. D.C. Provide sufficient draught for Car Heater on 6 v. (12 v. preferably controlled by variable resistance), ea. 25/-, post 1/6.
VARIABLE RESISTANCES to suit for 12 v., ea. 3/6, post 6d.
MOTORS. 200/250 v. A.C./D.C. P.H.P. approx. 80 watts. High speed. 1 shaft. (Converted ex R.A.F. motor generator—power about equal to sewing machine motor.) Useful addition to workshop, ea. 30/-, post 2/3.
 Send 3d. stamps for list of other Motors, Transformers, Pumps, Lamps, Switches, etc., etc.

MILLIGANS

34, Harford Street, Liverpool, 3. Money Back Guarantee.

You Can Become a **HANDICRAFTS TEACHER**

Experience not essential

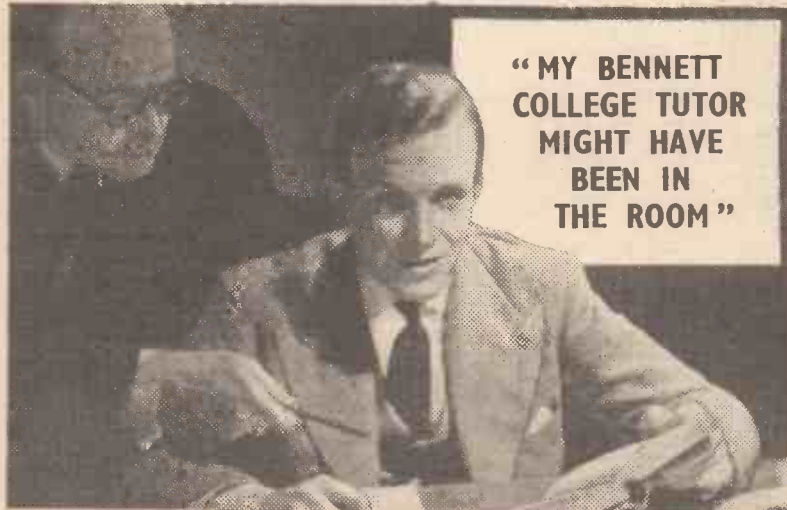
Men who enjoy making things in wood or metal can turn their hobby into a permanent and interesting career. Short hours, long holidays and security in a job you would really enjoy can be yours if you become a Handicrafts Teacher. Let us send you details of the easiest and quickest way to get the necessary qualification.

We definitely guarantee "NO PASS—NO FEE"

If you would like to know about our unique method of preparing you for one of these appointments write to-day, and we will send you an informative 144-page Handbook—FREE and without obligation. Mark your letter "Handicrafts Teacher."

BIET BRITISH INSTITUTE OF ENGINEERING TECHNOLOGY

591, College House, 29-31 Wright's Lane, London, W.8.



"MY BENNETT COLLEGE TUTOR MIGHT HAVE BEEN IN THE ROOM"

PERSONAL POSTAL TUITION

Every Bennett College student enjoys this friendly, intimate coaching right through his Course. A few of the Courses are listed opposite. Tell us your subject. We will send you The Bennett College Prospectus and the famous FREE book "Train your mind to SUCCESS." This will show you how you can advance to a better, finer future by Personal Postal Tuition. Fill in and post the coupon today.

WHAT CAREER DO YOU WANT?

- | | | | |
|-----------------|--------------------|--------------------|-------------------------|
| Architecture | Locomotive Eng. | Surveying | Languages |
| Building | Machine Design | Telecommunications | Mathematics |
| Carpentry | Mechanical Eng. | Television | Modern Business Methods |
| Commercial Art | Motor Engineering | Textiles | |
| Diesel Engines | Plumbing | | Police Subjects |
| Draughtsmanship | Power Station Eng. | Book-keeping | Salesmanship |
| Electrical Eng. | Quantity Surveying | English | Shorthand |
| Electric Wiring | Radio Engineering | Geography | Short Story Writing |
| Forestry | Sanitary Science | Journalism | and many others |

OR WHY NOT OBTAIN A QUALIFICATION?

- | | | | |
|---------------|-----------------|------------|------------|
| A.M.I.C.E. | A.M.I.Struct.E. | A.A.C.C.A. | A.C.C.S. |
| A.M.I.Mech.E. | A.M.I.Mun.E. | A.C.W.A. | A.R.I.C.S. |
| A.R.I.B.A. | A.M.S.E. | A.C.I.S. | A.A.I. |

GENERAL CERTIFICATE of EDUCATION & R.S.A. Exams.

TO THE FAMOUS

BENNETT COLLEGE

(Dept. 1.76 PT) SHEFFIELD

Please send me the Prospectus on..... and my free copy of "Train your mind to SUCCESS."

NAME

ADDRESS

TOWN

AGE (if under 21)..... Please write in BLOCK letters

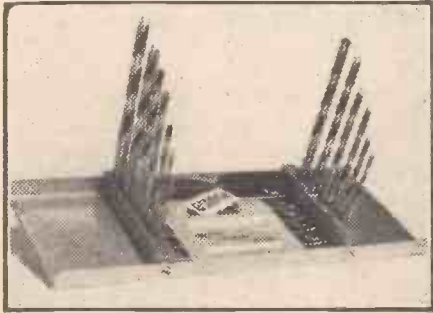
Post this coupon NOW!

TRADE NOTES

A Review of New Tools, Equipment, etc.

Mushet Drill Packs

AS can be seen from the illustration this is a convenient way of buying and storing drills. There are four sets available:



The Mushet drill pack.

the high-speed steel "Jobber" set of 13 drills ranging in 1/64in. steps from 1/16in. to 1/2in.; a carbon steel set of the same number and sizes; a high-speed steel stub length set of the same sizes and number of drills. The fourth set is of high-speed steel for tapping and clearance for B.A. threads.

Each of the four drill sets is packed in a polished metal container of cigarette case size. Opening the covers erects the drills, forming a useful bench stand giving instant selection by clearly marked sizes on the case. The manufacturers are Samuel Osborn & Co., Ltd., Clyde Steel Works, Sheffield.

Selecta Power Tools Film

SELECTA POWER TOOLS LTD. have now issued a 16mm. film of the Homemaster, which shows the whole of the working operations of this versatile unit including several pictures of finished work which can be made with it. The film is available on loan for instructional and staff purposes and application for it should be

made to: Advertising and Publicity Department, Selecta Power Tools Ltd., 116, Victoria Road, Willesden, London, N.W.10.

Microtest Magnetic Vee Block

A NEW permanent magnetic vee block is to be introduced by the firm of William Urquhart, 1023-1027 Garratt Lane, London, S.W.17, as an extension of the existing "Microtest" range.

With the switch on the "off" position the work can be quickly and accurately positioned. A simple touch of the switch and the work is held rigidly in that position, and in addition the block itself is held accurately on the machine or marking-off table. When maximum holding power is required the blocks can be mounted on a magnetic work table or chuck. When it is necessary to alter the position of the block but not the workpiece the switch is turned off, but the work is still held with sufficient power for the block to be turned to any new position.

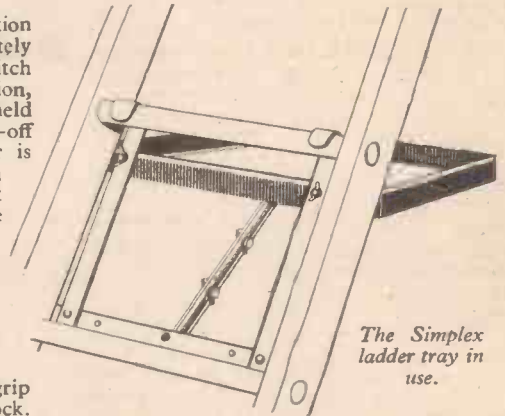
The absence of clamps of any description affords unrestricted access to the work at all times. The powerful magnets provide an absolutely uniform grip over the whole working surface of the block.

The blocks can be used for drilling, marking off, grinding, etc., and coolants, however copious, cannot adversely affect them.

The material of the block is case hardened steel and all surfaces are precision ground to a high standard of workmanship. They can be located on all faces except that incorporating the switch. The sides are ground parallel to each other and at right angles to the end faces and the 90 deg. vee is centrally positioned. The size is 3 1/4in. high X 3in. long X 2 1/4in. wide and the weight is 6 1/2lb.

Simplex Ladder Tray

THE device shown in the sketch below is intended to speed up all jobs involving ladder work and to give increased safety on the job. The ladder tray can be readily adjusted to suit any width or size of ladder and the struts fit to the side of the ladder out of the way. The angle of the tray is adjustable for any position of the ladder and, when in the fixed position, whether



The Simplex ladder tray in use.

empty or full, it may be moved safely when the ladder is repositioned. To fix in position the tray is merely hooked on as shown in the sketch. The sides of the tray are 1 1/2in. deep and it weighs 5lb.; it will carry up to 50lb. in weight. It is of all metal construction and is finished in cellulose. The retail price is 27s. 6d. The Simplex ladder tray is made by Simplex Products, Lamberts Yard, Tipping Street, Altringham, Cheshire.

"Joy" Products

MESSRS. TURNBRIDGE LTD., London, S.W.17, the makers of "Joy" Plastic Cement, manufacture a list of other products under the same trade name and these include plastic wood, French polish, wood dyes, transparent varnish, tile cement and numerous special purpose paints and enamels. Also included in their list is a substance for resurfacing real and imitation leather. The latest addition to the list is Joy Bath Enamel.

New Soldering Flux

THIS flux, which is being marketed by Hiscox (Chemical) Div., 43, Bannerman Road, Bristol, 5, has been used for many years in industry, and is now to become available for general distribution. It is being marketed under the name "Tinflo." Among the properties claimed for "Tinflo" is that a soldering iron can be tinned, whatever its condition, merely by dipping it in the flux and that an ordinary hacksaw blade held in a flame can be tinned by "Tinflo" without any previous preparation.

A sample and leaflet are available for 2s., post free, and a 4oz. plastic bottle of "Tinflo" costs 2s. 3d., the 1/2 pint size costs 5s.

New Telephone Number

MESSRS. DUKE AND CO., 621, Romford Road, London, E.12, have advised us that their telephone number has been changed. It is now Ilford 6001-3.

Golmet Step-stool

A NEW step-stool has been produced by Golmet Ltd., of Virginia Park, Caerphilly, Glam., which is completely folding. The ingenious design allows it to be folded into a depth of only 3in.

The stool, when opened, is a convenient kitchen stool and a further simple improvement transforms it into a rigid and safe miniature step-ladder having two treads and a top platform measuring 14in. x 10in., which is at a height of 22in. from the ground (see the illustration).

The top is covered with Vynide, which is washable, stain-resistant, and available in red, green, blue or yellow. Foam upholstery is used which makes the seat comfortable and prevents damage to the covering material. The treads are of wood, grooved to prevent slipping and finished with a lacquer stain.

The legs are of 3/4in. tubular steel, stove-enamelled and the feet protected with rubber ends. Colour combinations are white frames



The Golmet step-stool.

with red, blue, green or yellow seats. The step-stool retails at 72s. 9d. inclusive of purchase tax.

Your Queries Answered

Water Filter

MY only water supply is from a well, the water being delivered by a semi-rotary pump to a gravity tank supplying the house.

The water from this well contains a very fine sand, which, when used for washing, discolours the clothes.

Can you advise me as to the best method of making up a filter, in the pipe line, or through another tank between the pump and the gravity tank, which will allow the water to filter at about the rate of 3 galls. per hour?—E. Symes (Romsey).

THE fact that your well water discolours clothes which are washed in it suggests that either the water itself or the suspended sand which it contains is contaminated with iron as an impurity.

You can make up a simple filter which will remove all the sand and the suspended iron particles.

Support directly on the existing house supply tank a similar tank but of smaller dimensions, the lower aperture of which is fitted with a galvanised outlet pipe reaching down into the supply tank underneath.

Place on the floor of this upper tank one layer of fine sacking. On this place a three or four inch layer of selected coke particles of average $\frac{1}{16}$ in. diameter size. Over this place another sacking layer. Then, over this latter layer place a layer of a mixture of $\frac{1}{16}$ in. coke particles and coke dust. Finally, place a third and upper sacking layer and a layer of very coarse coke particles. The upper layer should reach about half-way up the tank, and the total thickness of the layers should be about 10 in. or 12 in. All the coke, of course, should have been carefully washed beforehand. Water from the well is pumped into this upper filter-tank, from which it discharges into the lower supply tank. Since the well water contains fine sand, this will gradually block up the coke layers and will reduce the speed of filtration. Eventually, the filter tank will have to be cleaned out and recharged along the same lines again, but at the rate of filtration which you require a well-made filter tank should last for about a year before its renewal is called for. It is not advisable to use a filtering medium finer or less porous than coke on account of the very fine sand in the water which would speedily choke it and render it inoperative.

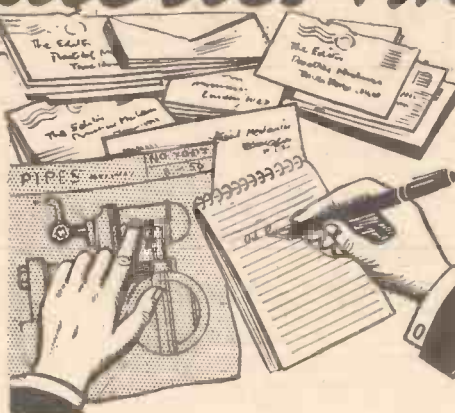
Remember, of course, that this filter will not remove dissolved substances from the water. Nor will it remove bacteria. It should, however, render the water quite suitable for washing purposes.

Sealing Sandstone

AFTER brushing the interior of a small sandstone building to give the stone a new face, I found that dust still lurked in the atmosphere.

Can you recommend some preparation or treatment which would halt this deterioration of the stone?—H. Lynn (Glasgow, S.E.).

SANDSTONE (some varieties more than others) is a very soft, loose, friable type of stone, which is easily abraded to powder. Consequently, after abrasion, it will always present a surface which is "loose" and which dusts readily. To a certain extent, you can seal the surface of the stone by brushing over it a solution of



QUERY SERVICE 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.

glue or gelatine (10 parts) in hot water (90 parts), but this treatment will not be very satisfactory. A much better and really permanent, although rather expensive, method is to brush over the stonework a

THE P.M. BLUE-PRINT SERVICE

- 12FT. ALL-WOOD CANOE. New Series. No. 1, 4s.*
- 10-WATT MOTOR. New Series. No. 2, 4s.*
- COMPRESSED-AIR MODEL AERO ENGINE. New Series. No. 3, 5s. 6d.*
- AIR RESERVOIR FOR COMPRESSED AIR AERO ENGINE. New Series. No. 3a, 1s. 6d.
- "SPORTS" PEDAL CAR. New Series. No. 4, 5s. 6d.*
- F. J. CANN'S FLASH STEAM PLANT. New Series. No. 5, 5s. 6d.*
- SYNCHRONOUS ELECTRIC CLOCK. New Series. No. 6, 5s. 6d.*
- ELECTRIC DOOR-CHIME. No. 7, 4s.*
- ASTRONOMICAL TELESCOPE. New Series. Refractor. Object glass 3in. diam. Magnification x 80. No. 8 (2 sheets), 7s. 6d.*
- CANVAS CANOE. New Series. No. 9, 4s.*
- DIASCOPE. New Series. No. 10, 4s.*
- EPISCOPE. New Series. No. 11, 4s.*
- PANTOGRAPH. New Series. No. 12, 2s.*
- COMPRESSED-AIR PAINT SPRAYING PLANT. New Series. No. 13, 8s.*
- MASTER BATTERY CLOCK.* Blue-prints (2 sheets), 4s. Art board dial for above clock, 1s. 6d.
- OUTBOARD SPEEDBOAT. 11s. per set of three sheets.
- LIGHTWEIGHT MODEL MONOPLANE. Full-size blue-print, 4s.
- P.M. TRAILER CARAVAN. Complete set, 11s.*
- P.M. BATTERY SLAVE CLOCK, 2s. 6d.
- "PRACTICAL TELEVISION" RECEIVER (3 sheets), 11s.
- P.M. CABIN HIGHWING MONOPLANE. 1s. 6d.*
- P.M. TAPE RECORDER.* (2 sheets), 5s. 6d.

The above blue-prints are obtainable, post free, from Messrs. George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

An * denotes constructional details are available free with the blue-prints.

solution of hydrolysed ethyl silicate which enters the pores of the stonework and deposits imperishable silica therein, this latter material acting as a permanent bond for the loose particles of stone. If the job is an important one we would strongly recommend this treatment, to which end you should apply for a ready-to-use solution of hydrolysed ethyl silicate from Silicaseal, Ltd., Westgate Hill Grange, Newcastle-on-Tyne, 4.

Protective Lacquer for Furniture

I AM having some tables and stools made for use in a canteen where the workers often have dirty, greasy or oily clothing. The furniture is to be made of beech, and I wonder if you can suggest a durable oil and grease-resistant finish for the furniture, and also one which can easily be cleaned.—H. Littlefair (E. Yorks).

ORDINARY clear cellulose lacquer might be suitable for your purpose. Such a film would be resistant to dirt, grease and oil, and it could be kept in good condition simply by rubbing over with a damp cloth. We cannot tell you definitely whether a cellulose paint would meet all your requirements. You might, however, apply to Messrs. Nobles & Hoare Ltd., Wexham Road, Slough, Bucks, who are specialists in cellulose lacquers, or, alternatively, to Messrs. Pinchin, Johnson Ltd., 4, Carlton Gardens, London, S.W.1, for particulars of any cellulose lacquers which they may have suitable for your requirements.

Another method would be to paint the wood surfaces with a solution of polymethyl methacrylate which is an almost colourless solution obtainable from Vinyl Products Ltd., Butter Hill, Carshalton, Surrey. This gives a hard, clear film which is highly resistant to dirt, grease and various cleaning materials, but which is soluble in benzene and toluene. This material can be applied by brush or spray. Two coats should be quite sufficient on the bare wood surface, no undercoat being necessary. The same, of course, would apply to a cellulose lacquer.

Blackening Aluminium: Softening H.S. Steel

PLEASE tell me how to blacken aluminium fittings to a matt finish and also how to soften H.S. steel sufficiently to enable it to be cut with a hacksaw, and how to reharden it?—J. Houfe (Leeds, 11).

FOR blackening aluminium, make up the following solution:—Potassium permanganate 1½ oz., Nitric acid ½ oz., Copper nitrate 4oz., Water 1 gallon.

Immerse the work in the above solution at 175°F for 30 minutes; then rinse, dry and lacquer.

A much better way is to use the method of black nickel deposition, for which the following electrolytic bath is required:—Nickel ammonium sulphate 8oz., Zinc sulphate ½ oz., Water 1 gallon.

The work to be black nickelled is made the cathode of the bath. A strip of nickel is made the anode. Plate at ordinary temperature, using an E.M.F. of 1 volt at 1-2 amperes per square foot of surface to be plated.

High-speed steel cannot be softened sufficiently for your purpose. The best you can do is to heat it to white heat and then allow it to cool slowly. To reharden it, the steel is again heated to whiteness and quenched by dropping into cold water.

Note, however, that the material does not respond to these treatments in the manner of ordinary mild steel.

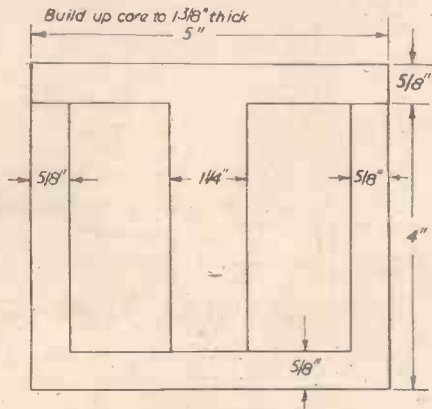
Battery Charger

PLEASE tell me how to make a super battery charger for 2-6-12v., at 4 amps., with ammeter, visual indicator and sliding resistance.—W. Allen-Simpson (Bishop's Stortford).

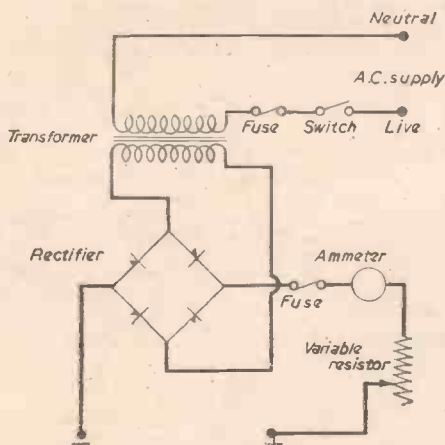
YOU could use a metal rectifier which is suitable for an input of about 16 volts and an output of about 4 amps. The rectifier should be fed from a transformer with a variable resistor connected between the rectifier and the battery.

For use on a 230 volt 50 cycle supply the core of the transformer could be built of Stalloy stampings approx. 0.014in. thick, to the dimensions given below, the stampings being lightly insulated on one side.

A bobbin or former, through which the stampings will afterwards be threaded, should be wound with the primary coil having 1,150 turns of 24 s.w.g. enamelled wire with a layer of thin paper wrapped round each layer of wire. Over the primary should be wound a layer of leatheroid, about 0.064in. thick, before winding on the secondary coil, having 90 turns of 15 s.w.g. D.S.C.



Stalloy stamping dimensions.



Battery charger circuit.

wire. A tapping can be brought out at the 50th turn, if required, in order to reduce the waste of power in heat at the control resistance when charging batteries of six or lower volts.

When assembling the core the insulated sides of the stampings should all face the same way, adjacent layers of stampings being reversed so that the joints in one layer are covered by the next layer. The stampings should be tightly packed and clamped so as to avoid vibration.

The sliding resistor could consist of about

8ft. of 19 s.w.g. nickel-chrome resistance wire.

Microscope Lenses

I AM making a microscope with eyepieces consisting of 2 plano-convex lenses, arranged as a Ramsden eyepiece, the focus being 1in. and diameter 18 mm. I wish to know the diameter of the stop which I take is necessary in between these lenses. If I use a single lens for the objective, do I need any other stops in between the eyepiece and object lens?

Is the object always illuminated from below or can it be done from an angle downwards?—R. E. Clarke (Suffolk).

YOU seem to be under some misapprehension as regards microscope eyepieces. The orthodox eyepiece is of the well-known Huyghenian type which comprises two plano-convex lenses with the plane surfaces turned towards the eye and separated by a distance equal to half the sum of their focal-lengths, and having a stop, or diaphragm midway between the lenses. The diameter of the stop is about two-thirds that of the lenses, or even, with good lenses, a little more than this.

The Ramsden eyepiece, on the other hand, has two plano-convex lenses, but its field glass lens (the lens farthest from the eye) is placed convex side upwards, whilst its eye lens is mounted convex side downwards.

The Ramsden eyepiece is merely used to measure the size of the magnified image. It is usually known as the "micrometer eyepiece," and is not as suitable for normal microscope use as the Huyghenian eyepiece. For a discussion of these two types of eyepiece, see any modern textbook of microscopy.

You cannot effectively use a single lens as a microscope objective, because this will lead to low-magnification and a great amount of distortion, as well as of various kinds of aberration. The average microscope objective contains at least four separate glasses, some cemented, others uncemented, and sometimes even more.

The average microscope tube contains one fixed stop of large diameter towards the upper end of the tube, its exact position varying with the length of the tube. It is not, however, absolutely necessary.

Lighting coming from below the microscope stage and actually through the object is called "transmitted" lighting. It is the normal mode for all transparent objects. What is known as "reflected lighting" is that which is directed from above the object and directly on to it from various angles. This includes side-lighting, oblique-lighting, etc.

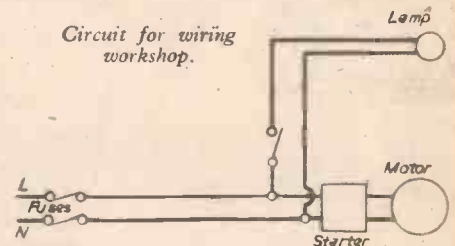
It is quite as effective as transmitted lighting, although it has usually to be of greater intensity than the latter. It is a necessity in the case of opaque objects, such as metal sections, mineral specimens and the various natural history objects which are not flattened out and rendered transparent by chemical treatment before being permanently mounted on the microscope slide.

Workshop Wiring

I HAVE a small wooden-built workshop in my garden, about 30 yards from the house. I wish to install electric light and a power point to drive a 3 1/2 in. lathe powered by a 1/2 h.p. motor. The mains are 250v., A.C. Could you inform me whether I shall have to lead my lines through conduit, or overhead. What sort of switches I shall need for the lathe motor, etc.?—T. E. Lockley (Birmingham).

WE would advise you to use twin lead-sheathed rubber insulated cable between the house and shed, this cable being protected from mechanical damage where necessary. If practicable we would suggest that you bury the cable at least two feet in the ground, with tiles or other protection above the cable. The metallic sheathing of the cable should be connected by means of a substantial copper conductor (not less than 14 s.w.g.) to a good earthing point such as a main cold water pipe.

A pair of fuses should be connected on the house or feed side of the cable to protect the cable. Assuming that the motor is designed for direct-on-line starting we would suggest that you control it by means of a "Startet" starter with bi-metal over-current trip, push button operated, as supplied by the Midland Electric Manufacturing Co. Ltd., of Reddings Lane, Tyseley, Birmingham. You should obtain permission for the extension from the local Electricity Authority.



Information Sought

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

Hand Capacity Organ

PLEASE send me details of the circuit for the construction of a hand capacity organ.

I am most interested in the oscillator part of the circuit as the amplifier presents no difficulty.—IAN COTTERILL (Stockport).

Making a Pricker-roller

PLEASE advise me how to make a pricker-roller for aerating a bowling-green.—O. H. BRIGDEN (Southampton).

Aquatic Electric Fence

I HAVE read somewhere about an electric fence for fish. (Similar idea to the electric sheep fence.) Could you tell me how to make one?—G. MURTON (Andover).

Bottle Drying Apparatus

I WOULD like very much to build a strong piece of electrically-heated drying apparatus for bottles.

Can you help?—H. O. THWAITES (Wales).

Spirit Duplicator

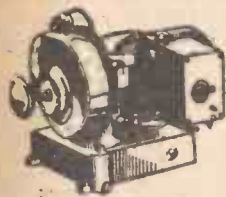
IS there a simple method of duplication using duplicating carbons to make the master copy and methyl alcohol or some similar spirit to run off the copies?—ROBERT LEITHEAD (Scotland).

Accordion Blower

I WISH to construct an electrically-controlled blower to fit my accordion.

Could you assist me in any way?—J. H. LANE (S.W.15).

WATSON'S SPECIAL OFFERS



CHORE HORSE
12/15v.
300w.
£18.10.0
Carr. 15/-

Fine Generating Sets ready for use. Also Briggs and Stratton to same specification. £18.10.0. Carr. 15/-. Both sets slightly used, tested and with Three Months "Same-as-Makers" Guarantee.

EMERY WHEELS. 8in. diam. 9/16in. x 1in. bore medium grade best quality. Price, 10/- each. Post 2/-.

GEAR PUMPS. Beautifully made, will deal with a large volume of liquid. Inlet 3/4in. Outlet 3/4in. 30/- each. Post 3/-.

D.3. TELEPHONE CABLE. Approx. 1/3 mile on steel drums single strand P.V.C. covered also extremely useful for many fencing purposes, etc., 12/6 per coil. Carriage 3/6.



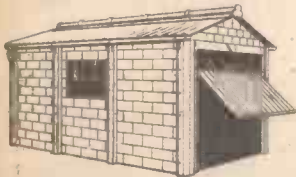
29/6
Post 2/6

MAGSLIPS. These are extremely useful for all kinds of remote control by using two units 2in. diam. Designed for operating on 50 v. A.C. ALSO AVAILABLE 2in. Magstrip Indicator Units, suitable for light indicating purposes, 12/6 each. Post 1/6.

DUAL GAUGES. 2 1/2in. 0-24 Pressure. 0-6 Vacuum. Price 6/6. Post 1/4.

EX R.A.F. TOOL BOXES. Size 14in. x 9in. x 8in. Dovetailed and metal bound, 9/6 each. Carr. 2/6. LARGER SIZE 24in. x 12in. x 10in. Price, 13/6. Carr. 3/6. Hundreds of other Bargains available. Send 6d. Stamp for Illustrated List.

EASTERN MOTORS
ALDEBURGH, SUFFOLK Phone 51.



A PERMANENT, YET PORTABLE, KEYSTONE GARAGE is GUARANTEED

Keystone Sectional Concrete Buildings are weather and fireproof and easily erected. A Permanent Structure for as long as you wish and easily dismantled for removal. No foundations or sealing compounds are required, and all buildings can be enlarged at any time.

The Keystone range includes single, double and multiple garages: Tool and Garden Sheds; Time Offices, etc. Up to 15' width by any length. Over 150 models available.

KEYSTONE UP-AND-OVER DOOR
The Garage illustrated has one fitted. Strong Aluminium on Steel Frame. Fit one to your present garage. Made to measure in two weeks.

An illustrated booklet is available giving all prices and H.P. facilities.

Free delivery over a wide area. You will be pleased with a Keystone Building.

W. TIBBETTS AND SONS
No 34, BARFORD ST. MICHAEL, OXON
Tel.: Deddington 238

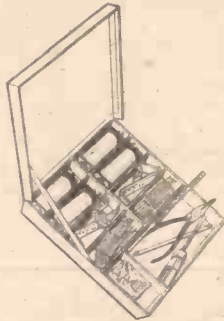
SHIP IN BOTTLE KITS

CUTTY SARK ... 5/6
THREE MAST BARQUE ... 6/-
PHANTOM CLIPPER ... 6/-

plus 6d. post and packing.

COOPERCRAFT (PM), SHIPDHAM, NORFOLK

ARE YOU ELECTRONICALLY MINDED ? ?



If so this Relay Kit will interest you ! !

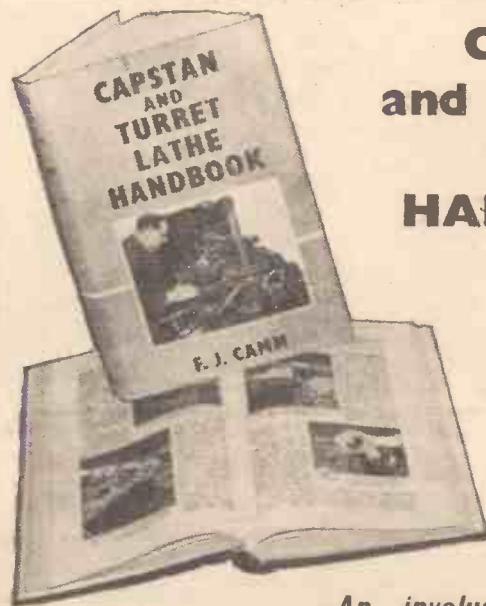
Will make up 2 complete P.O. type relays, with various interchangeable contact banks. Supplied complete with tools for assembling and adjusting.

£5/13/6 post paid.

Cash with order or C.O.D., or £1/3/6 Deposit and 5 monthly payments of £1.

KAYE ELECTRICAL MANUFACTURING CO. (P.M.), HAVELOCK WORKS, HAVELOCK PLACE, HARROW, MIDDX.

For your practical reference library



CAPSTAN and TURRET LATHE HANDBOOK

by F. J. Camm

• 378

illustrations

• 350

pages

An invaluable guide for tool-setters and operators

AN instruction manual on the setting and operation of the two most important machines used in mass production. Written by that well-known engineer, Mr. F. J. Camm, it will be found of great value to the beginner, as well as the experienced operator.

CONTENTS

Capstan and Turret Lathe Construction . Turret Stops and Tool Location . Spirit-Level Readings and Cutting Speeds . Feed Speeds and Cutting Tools . Steel Bar Production . Carbide-Tipped Tools . Turning with the Roller Box and the Box Tool . Radial and Tangential Box Tools . Setting the Coventry Diehead . Producing Rough Threads . Tap Grinding and Setting . Use of Reamers and Broaches . Speeds and Feeds for Twist Drills . Producing Holes on the Capstan Lathe . Boring Operations . Chucks and Fixtures . Methods of Piloting . Cutting Compounds . Forming to Fine Limits and Spherical Boring . Forming Steadies and Form Gauges . High Speed Cutting . Thread Cutting . Knurling, Forming and Parting . Facing and Recessing . Tool Layouts.

Published by NEWNES 25s. net

ORDER FORM

Please send me C.O.D. 1 copy of F. J. Camm's CAPSTAN & TURRET LATHE HANDBOOK (25s. net)

Name

Address

FROM ALL BOOK SELLERS

... or in case of difficulty use this C.O.D. Order Form.

Simply complete and post this order form to GEORGE NEWNES, LTD., Tower House, Southampton Street, London, W.C.2. Send no money now, just pay on delivery plus the normal C.O.D. postal charges. (If you prefer not to pay charges, simply send a postal order for 26s.)



WOODWORKERS MAKE YOUR OWN SAW BENCH

By fitting the S.G.S Ball Bearing Circular Saw Unit

Empire Unit (illus.) takes up to 12in. dia. Saw.

Price £3/- including p. & p.

Empress Unit takes up to 20in. diameter Saw.

Price £5/5/- including p. & p.

These units are fitted with high-speed ball bearings.

Also supplied with 3/4in. Drill Chucks 13/- extra. Any size made to order.

Trade and Export Enquiries invited. Send for Lists.

S.G.S. ENGINEERS
OLD COSTESSEY, NORWICH
Tel.: Costessey 327

SPECIAL OFFER

G.E.C., B.T.H. & WESTINGHOUSE GERMANIUM CRYSTAL DIODES

1/- each. Postage 3d.

Diagrams and three Crystal Set Circuits Free with each Diode.

A large purchase of these fully GUARANTEED diodes from the manufacturers enables us to make this attractive offer

COPPER INSTRUMENT WIRE ENAMELLED, TINNED, LITZ, COTTON AND SILK COVERED

All gauges available

B.A. SCREWS, NUTS, WASHERS. soldering tags, eyelets and rivets.

EBONITE AND BAKELITE PANELS. TUENOL ROD, PAXOLIN TYPE COIL FORMERS AND TUBES. ALL DIAMETERS.

Latest Radio Publications. SEND STAMP FOR LISTS

CRYSTAL SET

INCORPORATING THE SILICON CRYSTAL VALVE

Adjustable Iron Cored Coil

RECEPTION GUARANTEED

Polished wood cabinet, 15/- post 1/3. A REAL CRYSTAL SET NOT A TOY

POST RADIO SUPPLIES
33 Bourne Gardens, London, E.4

ADEPT SHAPERS for Hand or Power operation

Particulars on receipt of stamp.

F. W. PORTASS MACHINE TOOLS, LTD.,
Adept Works, 141a, Nicholson Rd., Heeley, Sheffield, 8.

GALPIN'S

ELECTRICAL STORES

408 HIGH STREET, LEWISHAM, S.E.13.

Tel.: Lee Green 0309. Nr. Lewisham Hospital.

TERMS CASH WITH ORDER (No C.O.D.)

All Goods sent on 7 days' approval against cash.

P.M. EXTENSION SPEAKERS. 8in., 3 ohm coil, in first-class condition. 10/- post 1/6.

EX-GOVT. ROTARY CONVERTORS 24 volts D.C. Input 50 volts 50 cycles, 1 phase at 450 watts. OUTPUT (complete with Step Up Transformer) from 50 volts to 230 volts, £13/10/- each or CONVERTOR only £9/10/- each.

EX-NAVAL ROTARY CONVERTORS. 110 volts D.C. Input. Output 230 volts 50 cycles 1 phase 250 watts capable of 50 per cent. overload, in good condition, guaranteed weight approx. 110 lb., £13/10/- each.

1/2 H.P. D.C. MOTORS. 110 volts, 3,000 r.p.m., new, large size, 35/-; starters to suit N.V.R., 25/-.

ASSORTED RESISTANCES. Wire ends, all new, plain, wire, silver and gold tipped. 12/6 per 100.

THREE PHASE TRANSFORMER. 2,000 watts, double wound, 110-220 and 440 volts. Any combination of connections. New, £25.

LARGE METER movements, fairly low F.S.D. average 6 in. deflection, very high quality, 7/6. P.P. 1/6.

MOVING COIL meters, all 2 to 3 in. dia., damaged cases or glasses, 3 for 10/-, guaranteed one sound meter; 6 for 18/-, two sound meters, no junk, all are, or suitable for, M/A meters.

MAINS TRANSFORMERS all 200/250 volts primaries (New) Heavy duty Output combination of 0/5/12/18/24/30/36 volts 4/5 amps., 38/6 each. Ditto 6/8 amps., 51/6 each. Ditto 15 amps. Output, 75/- each. Another with combination of 0/6/12/18/24 volts 6/8 amps., 51/6 each. Ditto 10/12 amps., 58/6 each. Ditto 25/30 amps. Output, 85/- each.

MEDIUM SPOT WELDER TRANSFORMERS. Input 200/250 volts. OUTPUT combination of 0/2/4/6/8/10/12 volts at 50/70 amps., £6/7/6 each. Ditto 120/150 amps. Output, £8/10/- each.

ELECTRIC LIGHT or POWER CREDIT METERS, 10 amp. load, 25/-; 20 amp. load, 47/6; 30 amp. load, 57/6. All carriage paid.

PREPAYMENT 1/2-SLOT METERS, Set at 2d. per unit. 10 amp. load, £4/2/6; 20 amp. load, £5/2/6 each. Carriage paid. Fully guaranteed.

PREPAYMENT METERS, 6d. slot only. Set at 4d. per unit. 5 amp. load only, 50/- each. Carriage paid

AUTO WOUND Voltage changer TRANSFORMERS. Tapped 0/110/200/230/250 volts 200 watts, 48/6 each; 350 watts, 57/6 each; 500 watts, 76/6 each; 1,000 watts, £6/5/- each; 2,000 watts, £11; 3,000 watts. £15 c/p.

GOOD FILM for cutting, Panchromatic, very fast. Clearance Prices, all 5 1/2 in. wide 24 ft., 5/-; 47 ft. 7/6. Large reduction for quantities.

P.O. COUNTERS, 9999, 400 ohms, 7/6. Post free

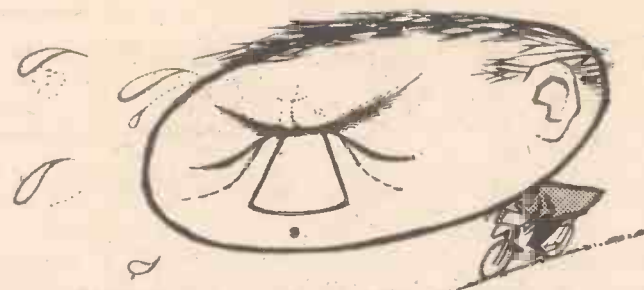
ROTARY CONVERTORS. Input 24 volts D.C. Output 50 or 100 volts A.C. 500 cycles 1 phase at 300 watts, £8/10/- each.

SELENIUM RECTIFIERS. Full wave, bridge connected, 6 or 12 v. output, 2 1/2 amps., 15/6; 4 amps., 25/-; Transformers to suit either, 25/-.

Any TRANSFORMERS made to order within 7 days from date of order. Numerous other items in stock. Please ask for quotation.

Clients in Eire & Northern Ireland, please ask for quotation as to carriage charges. The above charges only apply to England.

Open all day Saturday. Splendid odd bargains for visitors



Do you pedal Downhill..?

—or do you replace the ball-bearings

B.M.B. "Ballpaks"

are clean and easy to handle. Each Ballpak contains more than sufficient high grade steel balls of the right size for hubs, pedals, brackets or head. Happy effortless cycling depends on maintenance—which includes regular replacement of ball-bearings.

B.M.B. Ballpaks are obtainable from Cycle dealers everywhere. Price 1/2 each



TRADE NOTICE. Genuine B.M.B. Ballpaks bear the famous Trade Mark and contain precision made steel balls only.

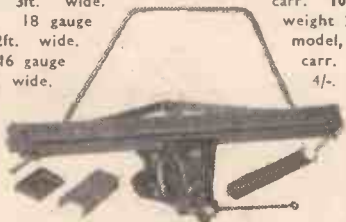
B.M.B. (Sales) Ltd HIGH STREET · CRAWLEY · SUSSEX

PARKER'S SHEET METAL FOLDING MACHINES. HEAVY VICE MODELS

No. 1 (illustrated) Capacity. 18 gauge mild steel x 3ft. wide. 3ft. model, weight 56lb., £6/5/-, carr. 10/-. 2ft. model, weight 22lb., 65/-.

No. 2 Capacity. 18 gauge mild steel x 2ft. wide. 18in. model, weight 18lb., 65/-, carr. on small models 4/-. If with attachments, 5/6.

No. 3 Capacity. 16 gauge mild steel x 18in. wide. Attachment angle for 3ft., 3/6 per ft. Small models 2/- per foot.



Machines guaranteed. Send for details.

A. B. PARKER WHEATCROFT WORKS, WELLINGTON STREET, BATLEY, YORKS. Tel.: Batley 426. MANCHESTER OFFICE AND SHOWROOMS: 2, SUSSEX ST.

T.V. WITHOUT MAINS

PLUS D.C. LIGHTING AT THE FLICK OF A SWITCH SPECIAL A.C./D.C. CHOREHORSE (AS SUPPLIED TO B.C.) PETROL/T.V.O SELF-STARTING



50% BELOW LIST

AIR COMPRESSORS AND ACCESSORIES
Compressed air equipment to professional standards, compressors only £5.17.6 upwards. Complete Stationary and Portable Plant from £29.17.6 to £134. Full range of Air Receivers Spray Guns and all Accessories. Teddington Engineering Co., Ltd., 29-31, High Street, Teddington, Middx. KINGSTON 1193

BATTERY CHARGERS



Output up to 22 v. 10 amps controlled by two 4-position rotary switches for fine and coarse control. Input 200/250 v. A.C. 50 cy., fused for A.C. & D.C., clear, scaled ammeter. Brand new, £17.10.0, carriage 15/-.

VACUUM PUMP. Brand New. 7 cu. ft. per min. 10 lbs. per sq. in. at 1,200 r.p.m. Rotary Vane type. 22/6 each, post 2/9.

VOLTMETERS for A.C. Mains 50 cy. reading 0 to 300 volts with clear 5in. dial only, 60/-; 2 1/2in. Flush, 25/-; 0/15 volts A.C./D.C. 2 1/2in. Flush, 15/6, post 1/6.

AMMETERS.—2in. Flush Moving Coil D.C., 50-0-50, 12/6 ea. 2 1/2in. Flush Moving Iron D.C. 0/25, 7/6 each, post 1/6.

CIRCUIT TESTER in wood case 9in. x 6in. x 4in. 2 1/2in. Flush round meter 50 milliamperes, basic movement 10 mA., with leads, 10 ohm pot., provision for 1.5 v. batt. Ideal for conversion. 17/6, post 2/6.

PORTABLE BLOWER.—200/250 v. A.C./D.C. 300 watts with switch and leads. 1 1/2in. outlet, £5. Carriage 7/6.



BULKHEAD FITTING. 9in. diam., flat tripod type, suitable for lamps up to 100 watt, complete with pushbar switch lamp-holder. Ideal for farm buildings, garages, greenhouses, etc. Brand new, 17/6, post 2/6.

CHARTBOARDS.—With pantograph arm, perspex scale, protractor head as used in the R.A.F. for navigation purposes, 17in. square. Brand new, will make a useful drawing board, 25/-, post 3/-.

VENT-AXIA FANS, EXTRACTION OR INTAKE.—Brand New. Silent running 230/250 volt A.C., 130/-, 12 volt D.C., 90/-, post 3/-.

ROTARY CONVERTER.—Input 24 v. D.C. Output 230 v. A.C. 50 cycles 100 Watt, 92/6; also available in metal case with switch, 105/-, carriage 7/6.

TELEPHONE SOUND POWERED. No batteries required. Just connect with twin flex for clear speech. Transmitter/Receiver Units, 4/6 ea. Twin Flex, 4/4d. yd. Post 1/-, if 2 units are connected in series and one used for speaking and one for listening, perfect 2-way conversation can be made.

GEARED MOTOR for the model maker, small and very powerful, 12/24 volt D.C., 4/8 r.p.m., 35/- post 2/6.



TELEPHONE SETS. MODERN DESK TYPE.—£8.17.6 per pair complete.

WALL TYPE also available. 2 complete units £5. Batteries 5/6. Twin Wire 5d. per yd.

MOTOR.—12 volt D.C., 1 1/2in. x 2in. approx. 3,000 r.p.m. with speed regulator in end cap. A precision job, 12/6, post 1/6.

TERMINAL BLOCKS.—2-way fully protected No. 5C/430, 4/- doz., 50 for 15/-, or 100 25/-, 3-way, 8/- doz., 300 for 50, post 1/6.

VARIABLE RESISTANCE.—160 ohms, 2 amps. on 10in. Twin Ceramic formers with control handle. Suitable for dimming, etc., 35/-, post 2/6. Also 500 ohms 1.5 amp Log, 50/-.

CROSS POINTER METER with 2 separate 100 microamp movements. Brand New, 22/6, post 2/-.

VOLTMETERS, D.C.—0-20, 0-40 or 0-300, 2 1/2in. Flush, 13/6 each, post 1/6.

CHARGING RECTIFIERS.—Full Wave Bridge 12 volts 2 amps, 13/6, 4 amps, 22/6, 2 amp. Transformers, 24/-, 4 amp. 27/3, post 2/-.

BALL RACES.—No. EE2, 1in. x 1in., 2/6, 7/8in. x 5/16in., 3/- ea.; 1in. x 3/8in., 3/6 ea. Less 6d. ea. in doz. lots, post free.

THRUST RACES.—13/16in. x 3/8in., 1/6, 15/- doz., post free.

A.C. MOTOR.—230 volts, 50 cy., 1/50th h.p., 3,000 r.p.m. Series with governor, 60/-, post, 3/-.

A.C. MOTOR. 1 third h.p., 1,425 r.p.m., 1 shaft, Ball Bearings, 220/230 volts, continuous rating. Brand New, £6.10.0, carriage 10/-.

WILCO ELECTRONICS

Dept. P.M., 204 LOWER ADDISCOMBE ROAD, CROYDON



VOL. XXV

SEPTEMBER, 1957

No. 422

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

WHAT I THINK By F. J. C.

The Falling Market

THE announcement by one of the leading firms that they propose to discontinue the manufacture of bicycles should cause the industry to take stock of the position and to consider whether the continued drop in the sales of bicycles is likely to be arrested and is but a reflection of the present economic position. Has the market reached absorption point? Is the competition of the moped and the scooter likely to increase to a point where the bicycle as we know it, will become as archaic as the bone-shaker? Are bicycle prices too high? Has there been too much concentration on sport? Has design stagnated? These questions and many others require immediate consideration if the industry is not to decline. It has grown to its present large proportions over a period of more than sixty years, and as a health-giving pastime, cycling is unequalled. The industry, itself, however, has always been somewhat hidebound, and is evidenced by the fact that there are so few journals devoted to cycling. This is because of the attitude of the manufacturers towards the press and there can be little surprise that cycling has such a bad press. The trade itself exerts a stranglehold on its members who may not advertise in any journal not approved by the union. This has been the position for the past 57 years, and the rule was introduced to protect the trade against back-street publications which were appealing for advertisements on the strength of circulations which in some cases amounted to only a few hundred. In the early part of this century there were over 57 weekly and monthly journals devoted to cycling. When the slump set in in the early part of the present century, the trade was not in a position to support such a large number of periodicals and the manufacturers, through their union, made the rule that journals must receive approval before they could appeal for advertisements. It is very wise for any industry to protect itself against back-street publishing houses, but it is quite another thing to prevent reputable publishers from starting cycling journals, for that is what their rule amounts to. Where an industry has a very small press, that industry must become impoverished. It becomes "dead." A reasonable number of journals brings publicity and it is also effective in keeping the journals themselves up to scratch. Competition in journalism is a good thing, both for the journals and for the industries

they serve. An industry which regards publicity as an unclean thing must eventually decline.

The overstressing of cycling sport in existing publications is perhaps another contributory cause. We suggest that the industry should embark upon a campaign which appeals to the widest public, not the noisy and very small minority who are interested in time trials, track racing, and international events. No more than 50,000 cyclists in this country are interested in cycle sport.

Perhaps another cause is that the control of cycling has been allowed to drift into the hands of those who are now too old to adjust themselves to the changing times and require the sport and the pastime run as it was in their youth. They have indeed become the proprietors of it, and have bitterly resented and opposed, sometimes by questionable means, any attempt to lift cycling out of the 1890 rut. The industry has tended to listen too much to the vapourings of the N.C.U. and the largely Yorkshire-controlled C.T.C. Massed-start racing for example, was undoubtedly wanted. It was widely reported in the press, where hole-and-corner time trials were not, because of the asinine rule concerning prior publicity. In spite, however, of the organised opposition, the form of racing introduced by the B.L.R.C. has ousted time trials and track racing in popularity. Cycling politics require a new look, and require new blood.

Without Comment

HERE is a quotation from the programme of the Fifth Annual Dunsmore Century Road Race which was run in June this year.

"Once again, independent riders are competing in Rugby Velo's Dunsmore Century Race, for it is recognised that the encouragement and development in size of this category is essential if British cycle racing standards are to be improved. For years the sole supporter of the internationally recognised independent class has been the British League of Racing Cyclists. The R.T.T.C. and its sycophantic companion, the N.C.U., have long opposed the widely accepted situation wherein the semi-professionals may compete, in certain races, against amateurs. The amateur has been forcibly protected, under threat of his own suspension or of being declared a "non-amateur", from racing against these riders, however keen he may have been to experience the higher standard of competition. Whilst placing difficulties in the way of the independents, these bodies have turned a blind eye towards the surreptitious trade sponsorship of many of their "amateurs", some of whom have been favoured with selection for the World Championships and Olympic Games.

"The N.C.U. recently announced its intention of permitting the mixing of categories not, it is felt, due to a genuine interest in the future of the sport, but rather in a partial attempt to avert imminent liquidation. Only a few months ago this organisation was able to dangle the tempting carrot of Olympic selection before the amateurs and many of them sacrificed self-respect for expediency, smothered the inclination to do what they felt was right and refrained from competing against the independents. The analogy of the carrot cannot be developed, however, for, though the poor donkey usually receives its reward at the end of the road, few aspiring cyclists achieved their ambition. The carrot has gone and its successor will not attain maturity for another four years—can this explain the Union's *volte-face*?

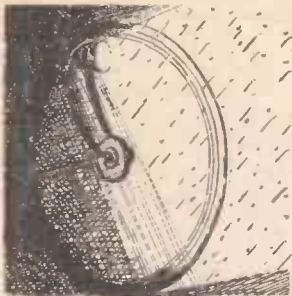
"Whether the N.C.U. is an aged chameleon in the process of altering its hue, or whether, like the leopard, it can never really change its spots, remains to be seen, but there is no doubt that its subservience to the R.T.T.C. is now a thing of the past. In the last few weeks that organisation, too, has, under pressure, renounced its shibboleth and has decided to adopt a sane and reasonable view of the situation. This is welcome news for it means that there will now be no sanctions against those amateurs who have entered for to-day's race; a debt of gratitude is owed to their predecessors who have demonstrated a far greater interest in the well-being of the sport than those officials who have, in the past, blocked all plans for its advancement. Their reward will, it is hoped, be a sport of which its supporters can be proud, not the unknown pastime under which guise cycle racing has continued for so long."



GORDON RANDALL Ludlow, Salop, looking down Broad Street.

Prepare Your Lamps for Winter

Instructions for Overhauling and Installing Battery and Dynamo Lighting



DURING the summer months, many people take off their cycle lamps altogether and store them ready for replacement in the autumn. At this time others replace battery lamps used during the summer months with a more powerful dynamo lighting set. Whatever the arrangement, work is usually necessary on the lamps about September.

The battery lamp and the dynamo light-



Fig. 1.—A typical battery head lamp made by Ever Ready.

ing set mentioned are the two most used types of lighting. The oil lamp is seldom seen now due to the disadvantages of it producing but a poor light and its need for frequent cleaning. Its main advantage was its economy in use.

The acetylene lamp, on the other hand, gave a very good light, but was rather troublesome in use. To-day this type of lamp is seldom seen.

The Battery Lamp

This is one of the most popular forms of lighting and a typical front lamp is shown in Fig. 1. When overhauling these lamps (front and rear), the bulbs should be tested

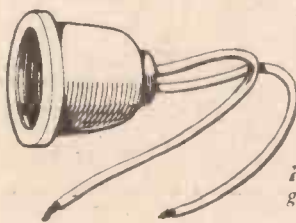


Fig. 2.—A handy gadget for battery testing.

first and a good method of doing this is to use the device shown in Fig. 2. This was made by cutting a screwed socket and two ends of flex from a string of holders of the type used for holding fairy lamps. It is used by screwing in the bulb to be tested

and touching the battery contacts with the bared ends of the wires. Make sure that correctly rated bulbs are used; for the front lamp a 2.5 volt, .2 or .3 amp., and for the rear lamp a 1.5 volt, .15 amp. A lamp is subject to considerable vibration in use so make sure that the bulb is screwed tightly into place and locked by means of the three-armed tinplate locking washer. Make sure that all the contacts are clean and that the spring strip contacts of the battery are bearing firmly against the back of the bulb and the switch respectively.

When lamps are stored or not used for some time, always remove the batteries. Old cells deteriorate, the zinc case becomes perforated and the highly corrosive contents escape into the lamp. Once this has happened, the lamp never seems to work as efficiently again.

The battery lamp usually fits quite tightly on its bracket, held in place by a spring plate, but sometimes it works loose and either rattles badly or develops a tendency to jump off. This difficulty can be solved in two ways. A strap passed round the lamp enables it to be removed easily, but holds it tightly in place while riding. The other method which is more permanent, but even more secure is shown in Fig. 4. A hole is drilled through the back of the lamp case and a bolt passed through it after it has been placed on the bracket. It is locked on the outside by means of a washer and nut. Make sure before drilling the hole that its position will coincide with a cut-away portion of the lamp bracket.

It is possible to run a small rear lamp from the battery of the front lamp, but when



Fig. 3.—A typical dynamo head lamp made by Lucas.

the wiring involved and the compactness of the modern rear battery lamp are considered, the idea becomes hardly worth while.

Dynamo Lighting

This lighting is the most efficient type of all and is becoming more and more popular. A typical dynamo head lamp is shown in Fig. 3. Fixing one of these sets is not difficult, but its efficiency can be very much improved if it is done carefully and correctly. The most important item is the dynamo itself. This is usually clamped on the rear seat stays of the cycle, the position of the

dynamo being adjustable at one or more points. By means of these adjustments the dynamo should be positioned so that its centre line points directly at the centre of the rear hub. The spinner is held on to the tyre by means of a spring and its distance from the tyre should be adjusted so that it neither bears too hard nor too lightly. It is important, too, to ensure that as much of the serrated side of the spinner or driving pulley as possible bears on the tyre.

The Circuit

The most common circuit used is that shown in Fig. 5. The wires from both bulbs are carried to the contact terminal at the bottom of the dynamo and the earth

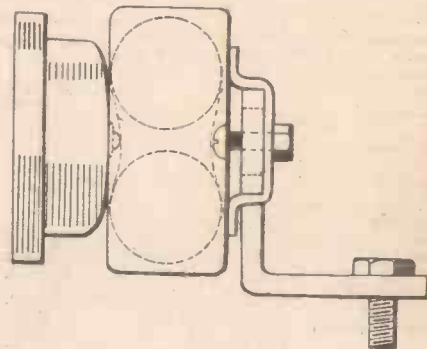


Fig. 4.—Using a nut and bolt to secure lamp.

return is made by earthing all three components to the cycle frame. There are many ways of doing this; the front lamp can be earthed by clamping a wire under the lamp bracket screw and the dynamo and rear lamp earthing wires held by a piece of insulation tape to a bared patch of metal on the seat stay. Some dynamo lighting sets are equipped with pointed screws on the fixing brackets and these can be screwed into the metal of the frame to achieve an efficient earth. Probably the best method of earthing, however, is to use a length of twin flex. One end is connected from the bulb to dynamo as shown and the other from the earthing terminal on the lamp to the terminal on the dynamo mounting bracket or some other convenient point.

The bulbs used are usually 6v., .5 amp., or .45 amp. for the front lamp and 6v. .04 amp. for the rear lamp, but the makers' instructions should always be followed on this point.

The most usual cause of dynamo circuit failure is faulty connections, and these should be checked frequently and kept clean. Always carry spare bulbs of the correct rating for both front and rear lamps.

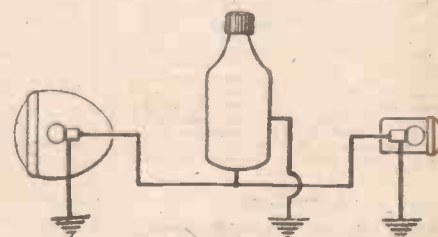


Fig. 5.—The most common cycle dynamo circuit. The lamps are connected in parallel with the dynamo.

24 v. Blower Motors as used for Hedge Trimmer, 18/9. 10K6/115 12-24 volts as used for car heater, 30/-.

Transformers. Input 200/240 v. Sec-tapped 3-4.5-6-8-9-10-12-15-18-20-24-30 volts at 2 amps., 22/9, 17-11.5 volts at 5 amps., 22/9, 17-11.5 volts at 1 1/2 amps., 16/9, 7.3 volts, 2 amps., 8/6. 12 months guarantee. Input 240, Output 16 v. 1 amp. 13/6. Also Output 200 v. 30 mA, and 6.3 v. 1 1/2 amp., 13/6. 25% Booster Transformers for T.V. Tubes, 13/6.

Selenium Rectifiers F.V.V. 12-6 volt, 100 mA, 4/-, 1 A., 8/6, 3 A., 12/6, 4 A., 17/6, 6 A., 30/-, 16 A., 53/-, 250 v. 100 mA-H., W., 10/6, 300 mA., 18/-.

Miniature 12 or 6 v. Relays. 10 amp. Silver Contacts. SM, DM or SM and B, SCO, 9/3.

M/c Microphones with matched transformer, 15/9.

Chrome Vanadium H.S. Steel Twist Drills. Sets of 9, 1/16in. to 3/4in., 3/9. Sets of 7, full size, 6/-, Sets of 13, 10/-, All in wallets.

12 v. Ultra violet bulbs, A.C. or D.C. 5/-, Rheostats, 12 v. 1 A., 2/6, 12 v. 5 A., 10/6, New 6 v. or 12 v. Vibrators, 4 Pin, 8/9, Fishing Rod Aerials. Sets of 3, 9/-, Plus 1/9 Rail Charge. Bases 6/-.

Uniselector Switches 50 point 3 bank 50 v. D.C., 26/-, 12 v. 25P, 3B, 26/-, Miniature Model Motors. 12 v. 180 mA., D.C. 2in. x 1 1/2in., 11/-.

New 24in. "T" Square. Ex M.O.S., 6/6. Chrome Car Extension Aerials, 1ft. to 4ft., 13/6.

Nine Nickel Batteries. Practically everlasting. 1.2 v. 2.5 A., 2 1/2in. x 3in., 6/-, Ideal for models.

12/24 v. A.C./D.C. Reversible Motors-1in. x 1/2in., Spindle 2 1/2in. x 1 1/2in., 15/6.

Relays. We can supply any D.C. voltage and Contact Combination All Carriage Paid in U.K. Lists Sent on Request.

THE RADIO & ELECTRICAL MART
309, Harrow Rd., Wembley, Middx.
Nr. The Triangle,
Telephone: WEMBLEY 6655.

ALL STEEL "54" DRAWER UNIT

DRAWER SIZE
11 1/2" long, 5" wide,
3" high.

OVERALL SIZE
42" high, 36" wide,
12" deep.

Each drawer perforated with one free divider, or plain-sided.

Extra dividers 4d. each. 54 cards free.

£16.16

DELIVERED FREE UK
Delivery from stock



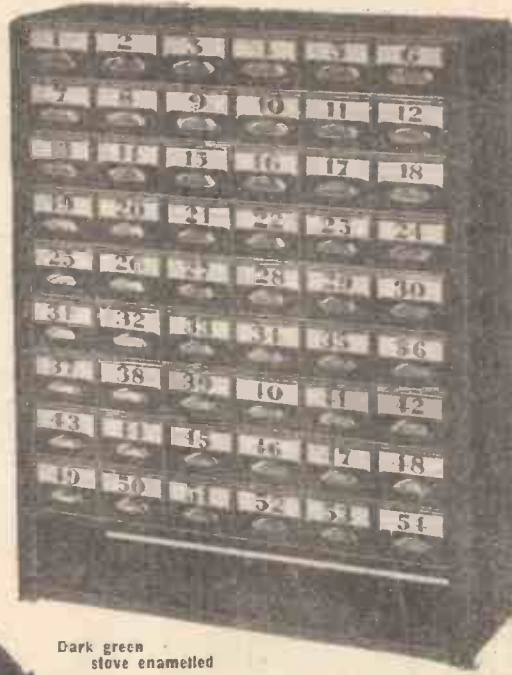
Dark green stove enamel

SEND FOR SAMPLE DRAWER WITHOUT OBLIGATION

N. C. BROWN, LIMITED

GREEN LANE WING

HEYWOOD, LANCs. Tel. 69018 (3 lines)



NEW CABLES & FITTINGS

TOUGH RUBBER CABLES

| | per yd. | 25 yds. | 50 yds. | 100 yds. |
|---------------|---------|---------|---------|----------|
| 1/44 Twin | 84d. | 15/- | 27/3 | 53/6 |
| 3/044 3-core | 114d. | 21/- | 38/6 | 75/6 |
| 2/029 Twin | 11d. | 19/6 | 35/- | 68/6 |
| 2/029 T. & E. | 104d. | 23/6 | 42/- | 82/6 |
| 1/029 Twin | 11d. | 31/6 | 56/6 | 111/6 |
| 7/029 T. & E. | 1/9 | 38/6 | 70/6 | 139/- |
| 7/044 Twin | 2/8 | 60/- | 106/- | 210/- |

Twin Lead, 50 yds., 3/029, 69/3; 7/029, 110/9.
VIR, 50 yds., 3/029, 15/9; 7/029, 25/3. Earth Wire, 100ft., 7/029, 12/6; 7/029, 7/9. Twin PVC Transp. 702, 50 yds., 10/-.
Twisted, 25 yds., 12/6; 50 yds., 22/6. TRS, VIR, Lead Cables of all sizes. Holders, C.G., 8/-, Batten, doz. 12/-, Roses, Brown, 8/-, White, doz., 10/-, Jnc. Boxes, Sm., 11/-, Lgc., doz., 13/-, Switches, 1-way, 15/-, 2-way, doz., 24/-, White Switches, 1-way, 24/-, 2-way, doz., 30/-, Flush Switches, 1-way, 18/-, 2-way, doz., 24/-, Ceiling Cord, doz., 1-way, 5/-, 2-way, 6/-, 2 amp. 3-pin Sw. plugs and tops, ea., 3/-, 5 amp. 3-pin Sw. plugs and tops, ea., 5/6, 15 amp. 3-pin, ditto, A.C. only, ea., 6/-, Wood Blocks, 3 x 4, 5/-, 3 1/2 x 1, 7/6; 3 x 3 x 1, 6/6; 5 1/2 x 3 1/2, doz., 8/-, White, 3 x 1, 6/-, 3 1/2 x 7/-, 4 x 1, 9/-, Cable Clips, Sm., 2/9; Med., grs., 3/3, 15 amp. D.P. Insulated Sw. fuse, 9/8, 21 amp. Ironclad 2-way 15A. Spltr., 13/6, 20/-, Carbon Bulbs, 20 v. 16 C.P., doz., 20/-, Immersion Heaters, 3 Kw., 65/-, Single Car Cable, 10 yds., 3/-; 100 yds., 25/-, Conduit and Fittings, tin and tin, Industrial Reflectors, Tubular Heaters, Fluorescent Fittings, Time Switches, and all electrical equipment. Full lists on request. Single items supplied. Satisfaction guaranteed. Terms: Cash with order; carriage paid if over £4; orders of £20 or over less 5 per cent. discount. Open daily, 11am-5pm, 9 to 6; Thurs. 9 to 1. Callers welcome.

LONDON
WHOLESALE WAREHOUSE

165 (PM), QUEENS ROAD
PECKHAM, S.E.15

Tel.: NEW Cross 7543 or 0860.

IMPELLOR PUMP, 29/6. 4ft. 3in. long, 2in. dia.; 24 v. will work off 12 v. D.C. Ideal for bilge pumps or for transferring fuel or water to header tanks. Pump is self cooled by liquid passing through. Carr. 4/6.

COMPASS, 19/6. Ex A.M. Azimuth No. 4. 6in. dia. P. & P. 3/6.

COMPASS, 19/6. Ex A.M. Type P.4a. 6 1/2in. dia. P. & P. 3/6.

INSULATING TAPE, 1/6. (75ft. x 1/2in. wide) finest quality, large roll in sealed metal container. P. & P. 9d. (Post on 6 tins 2/-).

SIMULATOR UNIT, 29/6. 6 valves. Brand new, with telescopic aerial. V.H.F. Many clients tell us they have successfully converted to walky-talky. Instruction booklet FREE with each order. P. & P. 3/6.

MORSE TAPPERS, 9d. X.W.D. P. & P. 6d.; 6 for 3/6. Post. 2/6.

VOLUME CONTROLS, 2/6 doz. Asst.; Volume and Tone controls, stripped from working chassis. P. & P. 2/-.

HEADPHONES, 1/9. Single earphone and band. C.L.R. Ideal crystal sets. Ext.; on radio, etc. P. & P. 1/3.

TORCH LANTERNS, 6d. X.W.D. Incl. 2 bulbs. Uses 800 battery. Space urgently required. 1 doz., minimum sample order. P. & P. 3/-, Crate of 48 with 22 bulbs extra, 22/- (118 bulbs in all). Carr. 10/-.

CHASSIS, 1/-. 6 or 8 valves, latest type, midjet valve design for A.M. or F.M. Brand new. Cadmium plated on heavy s.w.g. steel. Size 1 1/2in. x 7 1/2in. x 2 1/2in. P. & P. 1/6, 4 for 4/-. Post. 3/-, 12 for 10/-. Carr. 5/-.

COIL PACK SETS, 3/9. This bargain includes 3 band coil pack, pair 465 I.F.s. and standard 2 gang condenser, printed dial. P. & P. 2/3.

MAINS TRANSFORMERS

350-0-350 v. 80 m.a. 4 v., 4 v. heaters. 200-250 v. prim. ... 3/9

350-0-350 v. 80 m.a. 4 v. 12 v. heaters. 200-250 v. prim. ... 2/9

280-0-280 v. 80 m.a. 6 v. 2 a., 4 v. 2 a., 4 v. 2 a. 200-250 v. prim. Drop through, half shrouded ... 5/9

425-0-425 v. 5 v. at 6 a., 6.3 v. at 12 a., 6.3 v. at 6 a. 200-250 v. screened primary. (P. & P. 2/6) ... 17/6

0-200-250 v. heater transformer. 4 v. at 2 1/2 amp. (P. & P. 1/9) ... 8/9

0-200-250 v. heater transformer. 12 v. at 1 1/2 amp. (P. & P. 1/9) ... 8/9

O.P. TRANSFORMERS, 1/3. Standard size 2-5 ohms. Post 1/-, 20 for £1. P. & P. on 20, 5/6.

DUKE & CO.

621/3, ROMFORD ROAD, MANOR PARK, E.12. ILF. 6001-3

(Note new Phone Nos.)

Liverpool Street to Manor Park Stn., 10 mins.—FREE catalog.

5,000 High Speed Slitting Saws and Slotting Cutters, 2 1/4" diam. 5/8" bore, 0.045", 0.051", 0.057", 0.064" thick, 3/9 each. 2 3/4" dia., 1" bore, 0.027", 0.036", 0.049", 0.051", 0.056", 0.064", 0.072", 0.080", thick, 3/9 each. 3" dia., 1" bore, 3/64", 5/64", 5/32" thick, 6/- each. 3 1/2" dia., 1" bore, 1/32", 3/64", 9/64", 5/32", 11/64" thick, 7/6 each. 4" dia., 1" hole, 3/64", 5/64", 7/64", 7/32" thick, 8/6 each. 5" dia., 1" bore, 5/64" thick, 12/6 each.

3,000 High Speed Toolbits, ground finish, slightly below 3/8" square, 3" long, actual present day value 47/- per doz. A most useful bargain, 25/- per doz. 13/6 half doz., 2/6 each.

500 Whitworth Screwing Tackle Sets with bright polished steel die-stock, dies 2" dia., cutting 9/16", 5/8", 3/4", 7/8", 1" Whit., 50/- per set. Also B.S.F. ditto, 50/- per set. Only a third of real value.

1,000 High Speed Side and Face Cutters, 2 1/2" dia., 1" hole, 1/4", 3/8", 1/2" thick, 15/- each. 3" dia., 1" hole, 1/2", 5/8" thick, 20/- each. 3 1/2" dia., 1" hole, 3/8", 3/4" thick, 25/- each. 4" dia., 7/8", 1" thick, 1" hole, 22 each. 5" dia., 1" hole, 1/2", 3/4" thick, 50/- each.

1,000 U.S. Long Straight Shank Twist Drills approx. 1/16" and 3/32" dia., both 4 3/4" long, 2/6 pair. Approx. 3/16" and 3/8" dia., 6" and 7" long, 5/- the two, 9/64" dia., 10" long, 3/6 each. Approx. 13/64" dia., 10" long, 4/6 each. Approx. 15/64" dia., 9 1/2" long, 4/6 each. 3/8" dia., 11" long, 10/- each.

200 H.S. Spot Facing Cutters 1 1/4" dia., 1 1/4" dia. Detachable pilot, No. 2 M.T. shank. An essential tool for facing bolt holes on castings. Worth 46/-, Gift 12/6 each.

1,000 U.S. Inserted Blades Expanding Reamers, 2 1/2", 2 3/2", 16/-, 1 1/16"-3/4", 17/8", 27/32", 15/16", 18/8", 7/8"-31/32", 15/8", 15/16", 20/-, 31/32"-1 1/8", 22/8", 1 1/16"-1 3/16", 27/8", 1 3/16"-1 11/32", 32/8" each.

500 Sets Hex. Die Nuts, Sizes 1/4", 5/16", 3/8", 7/16", and 1/2" Whit., B.S.F., American Car thread or 26 brass thread. These sets are in a neat case. Present day value over 30/- per set, to clear 15/- per set any thread. Two sets 25/6, four sets 55/-. Also 5/8" and 3/4" in Whit. and B.S.F. only, 5/8", 5/- each; 3/4", 6/- each, 10/- per pair.

1,000 U.S. Morse Taper Shank End Mills, No. 1 shank 1/4" 5/-, 3/8" 6/-, 1/2" 6/8, also No. 2 shank, 3/16" 10/-, 5/8" 11/-, 3/4" 12/-, 7/8" 12/-, 15/16" 15/-. Also straight shank H.S. 5/16" 3/6, 3/8" 4/-, 1/2" 5/-, 3/4" 7/8, 7/8" 10/-, 1 1/2" 12/6 each.

Special Clearance, H.S. taper pin reamers, sizes 4, 5, 6, 7, 9, 17/8 the lot, worth 25/-.

All items brand new. £1 orders post paid, except overseas.

2,000 Small H.S. Twist Drills, approx. 1/32", 3/32", 4/- doz. approx.; 9/32"-1/8", 2/6 per doz. approx.; 9/32"-15/32", 8/- for 10/-.

3,000 Circular Split Dies 1" dia. cutting 1/2", 5/16", 3/8", 7/16", 1/8" Whit., B.S.F., also brass thread, 26 brass thread. All sizes and American N.S. 12/- per set of 5 sizes, 2 sets 22/6, 4 sets 42/6.

Tap to suit 12/6 per set, either taper or second or plug. 1" dia. stocks 6/- each.

1,000 Hand Reamers, 5/16", 3/6 each, 5/8", 4/9 each.

1,000 High Speed Parting Off Tool Blades, Eclipse brand; 1 1/16" x 3/32" x 5" long, 5/- each; 13/16" x 1/16" x 6" long, 5/- each; 13/16" x 3/32" x 6" long, 6/- each.

7,000 Pratt & Whitney, circular split dies, superior quality precision ground cutting edges, 13/16" dia. Suitable for machine or hand use. Sizes: 2, 4, 5, 6 B.A., 8/6 per set, 13/16" die stock, 3/6 each.

5,000 Ball Races, 1 1/8" bore, 3/8" o.d., 1/8" thick, 4/- pair; 1 1/4" bore, 3/4" o.d., 7/32" thick, 4/- pair; 6 mm. bore, 19 mm. o.d., 6 mm. thick, 4/- pair; 3 mm. bore, 22 mm. o.d., 8 mm. thick, 4/- pair; 3/8" bore, 7/8" o.d., 7/32" thick, 5/- pair, 3/16" bore, 1 1/2" o.d., 5/32" thick, 4/- pair.

2,000 Files 4" 6" good assortment, 106 doz. also toolmakers' needle files ass., 12/6 doz.

Metal Marking Punches sizes 3/32", 1/8" and 1/4". Figures, 8/6 per set, letters, 25/- per set, any size.

2,000 Straight Shank End Mills, size 1/8", 5/32", 3/16", 7/32", 1/4", 5/16". list price 30/- set, 15/- set, also 3/8", 7/16", 1/2" ditto, 12/6 set.

500 H.S. 80° Countersinks, body 1/2" dia. Gift 5/- each.

1,000 Bevel Wood Chisels, handled, 1 1/4", 5/16", 3/8", 1/2", 5/8", 3/4", 7/8", 1". Actual value 37/6. Gift 25/- set.

200 Cast Steel Circular Saws for Wood 4", dia., 6/- each; 5", 10/-; 7", 13/6; 10", 18/-; 12", 24/-.

100 Semic High Speed Centre Drills, Slcombe brand 5/16" body dia., 3/32" point, 1/8 each, 16/6 per doz.

20,000 Small High Speed Milling Cutters, various shapes and styles. We want to clear these quickly. 12 assorted, 15/-.

J. BURKE

192 Baslow Road, Totley, Sheffield

Inspection Only at Rear 36 Fitzwilliam St., Sheffield.



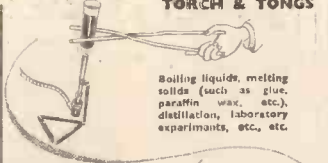
THE BUSBY BURNER
ON THE "BUNSEN" PRINCIPLE
(Complete with a pair of TONGS)

The ideal GIFT
for the practical
HOUSEHOLDER.

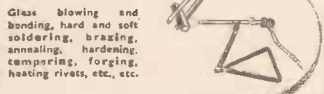
CASH PRICE
5/9

Suitable for Schools, Workshops.

TORCH & TONGS



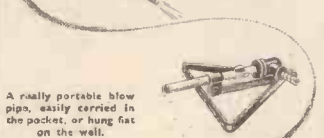
Boiling liquids, melting solids (such as glue, paraffin wax, etc.), distillation, laboratory experiments, etc., etc.



Glass blowing and bending, hard and soft soldering, brazing, annealing, hardening, tempering, forging, heating rivets, etc., etc.



Paint stripping, annealing panels to remove dents, wiping (soldering) joints in pipes, brazing and soldering of large parts, etc., etc.



A really portable blow pipe, easily carried in the pocket, or hung flat on the wall.

Obtainable from local framers or direct from makers on receipt of P.O. 6/- (including postage).

BUSBY & COMPANY LIMITED
BUSCO WORKS, PRICE STREET, BIRMINGHAM
Phone: ASTON CROSS 5696/7

LEARN A LANGUAGE THIS WINTER

By the Pelman Method

THE problem of learning a Foreign Language in half the usual time has been solved. The Pelman method enables you to learn French, German, Italian and Spanish without translation.

By the Pelman system you learn French in French, German in German, Spanish in Spanish, and Italian in Italian. English is not used at all. Yet the method is so simple that even a child can follow it.

Grammatical complexities are eliminated. You pick up the grammar almost unconsciously as you go along. There are no classes to attend. The whole of the instruction is given through the post.

Send for the Free Book

The Pelman method of learning languages is explained in four little books, one for each language:

FRENCH GERMAN SPANISH ITALIAN

(Also Courses in Afrikaans and Urdu)

You can have a copy of any one of these books, together with a specimen lesson, gratis and post free, by writing for it to-day.

WELbeck 1411

POST THIS FREE COUPON TO-DAY

Pelman Languages Institute,
130, Norfolk Mansions, Wigmore St.,
London, W.1.

Please send details of Pelman method of learning:

French, German, Spanish, Italian
(Cross out three of these)

Name.....

Address.....

PELMAN (OVERSEAS) INSTITUTES:
Delhi, Melbourne, Durban, Paris, Amsterdam.

BERNARDS OFFER:—4 VALVE SUPERHET BATTERY PORTABLE RECEIVER



CAN BE OBTAINED COMPLETE WITH BATTERIES

£8.19.6

IN KIT FORM LESS BATTERIES

£7.7.0 Including Postage

BATTERIES CAN BE SUPPLIED SEPARATELY AT 11/6

- LONG AND MEDIUM WAVE
- LARGE ELLIPTICAL SPEAKER
- LATEST TYPE LOW-CONSUMPTION MINIATURE VALVES

SEND TO:—

BERNARDS ELECTRICAL INDUSTRIES LTD.
99, KINGSLEY RD., HOUNSLOW, MIDDLESEX

GENUINE EX-ARMY BRAND NEW, DOUBLE TEXTURE WATERPROOF D.R. COATS

Genuinely offered at half the actual cost price! A superb 100 per cent. heavy double texture waterproof motor cyclist's coat, popular fawn shade, extra long. The Rolls-Royce of them all. Often imitated but never equalled — for goodness' sake get the real thing now while you have a chance. Genuine Brand New Ex-Army Dispatch Riders' coat. Sizes 36-42, only £4.10.0, post, etc., 3/-, or sent for £1 deposit, balance by 9 fortnightly payments of 8/9. 44 & 46 10/- extra. New Officers' D.R. Boots. Sizes: 5, 6, 7, 12 & 13, 42/-, post 2/6. LISTS, WATCHES, BINOCULARS, TERMS.



1000 YARD DRUMS Assault Cable WIRE

terrific Breaking Point
Genuine combat field service telephone communication wire on a drum. Rustless as it is PVC covered. Numerous uses include fencing gardens and fields, baling goods and heavy parcels, tough suspension lines for all purposes. Use instead of roping—neater, stronger and almost everlasting. Fixes almost anything. An essential article to have about the place. 1,000 yard drum, terrific breaking point, only 9/6d., carriage, etc., 3/6. Case of 6 carriage free. A Government surplus article that must have cost pounds to make, and our price is cheaper than string! Send quickly. LISTS CLOTHING, WATCHES, TARPAULINS, ETC. TERMS.

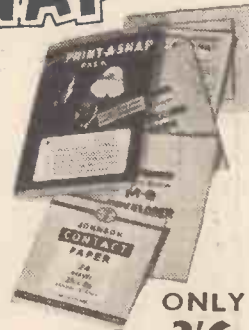


HEADQUARTER and GENERAL SUPPLIES LTD.

(DEPT. PMC/22), 196-200, COLDHARBOUR LANE, LOUGHBOROUGH JUNCTION, LONDON, S.E.5. Open all Saturday, 1 p.m. Wednesday.

JOHNSON PRINT-A-SNAP PACK

With the Johnson Print-a-Snap pack you can make prints of the family's favourite pictures in a few minutes. No special skill is needed and you can work in any dimly-lit room. You use your own negatives, new or old, and you'll be astounded at the wonderful results you get. Costing only 3/6, post free, the Print-a-Snap pack contains full instructions, printing paper, chemicals and all you need to make 16 2½ x 3½ in. prints or 24 2½ x 2½ in. prints. Printing snap-shots at home is a fascinating and rewarding pastime and is the first big step towards taking up photography as a serious hobby. Why not start TODAY.



ONLY 3/6 POST FREE

Complete the coupon below, send it off with a postal order for 3/6 and you will get this amazing photographic kit plus a FREE BOOKLET on developing and printing, and a Johnson Outfits Leaflet.

BY RETURN POST!

TO: Johnsons of Hendon Ltd. (Dept. 20), Hendon Way, London, N.W.4
Please forward by return of post the Print-a-Snap Pack for 2½ x 3½ in. or 2½ x 2½ in. negatives (ring round size required), plus your FREE BOOKLET on photographic printing, and the Johnson Outfits Leaflet.

NAME.....
ADDRESS.....

(Block capitals please)

I enclose P.O. for 3/6 (made out to Johnsons of Hendon Ltd, and crossed & Co.).

HIGHSTONE UTILITIES

EX-R.A.F. 2-valve (2 volt) Microphone Amplifiers, as used in "plane inter com" in self-contained metal case; can be used to make up deal, aid outfit, intercom- munication system or with crystal set, complete with valves and fitting instructions. 20/-, post 2/6. Useful wooden box with partitions to hold amplifier, 2/- extra. Ditto, less valves, 10/-. Hand Micro- phones, with switch in handle, intercom- munication system or with crystal set, complete with valves and fitting instructions. moving coil, 8/6. All post 1/4. Mask type with switch 3/6, post 6d. Throat Mikes 5/-, post 7d. Mike buttons (carbon) 2/-. Moving coil 3/6. Both post 4d.
Soldering Irons.—Our new streamlined Iron is fitted with a pencil bit, 200/250 v. 50 watts, 11/6. Standard Iron with adjustable bit, 200/250 v. 60 watts, 13/6. Heavy Duty Iron, 150 watts, 18/6. All post 1/-. These Irons are guaranteed, and all parts are replaceable.
Meters.—20 amp. 2in. m/c, 8/6; 20 v. 2in. m/c, 8/-; 150 v. 2in. m/c, 10/-; 3.5 amp. 2in. T.C. 6/-; 4 amp. 2in. T.C. in case with switch, 9/6; 100 mA. 2in. m/c. 7/6. All post extra. Meter Movements Units with 2-500 microamps, 9/-, post 18/-.
Bell Transformers.—These guaranteed transformers work from any A.C. mains giving 3, 5 or 8 volts output at 1 amp. operate bulb, buzzer or bell. Will supply light in bedroom or larder, etc. 9/-. Similar Transformer but output of 4, 8 or 12 volts 12/-; Both post 1/-. B.E.L.S for use with either the above or batteries, 6/-, post 6d. BUZZERS, 4/-, post 6d.
Sparkling Plug Neon Testers, with vest pocket clip, 3/3, or with gauge, 3/6, post 3d. S.R.C. Neon Indicator Lamps, for use on mains to show "live" side of switches, etc., 2/6, post 4d. Neon Indicator, complete with condenser, pencil type, with vest pocket clip, 7/6, post 6d.
Crystal Sets. Our latest model is a real radio receiver, fitted with a permanent crystal detector. Have a set in your own room, 12/6, post 8d. Spare Permanent Detectors, 2/- each. When ordered separately, 2/6; with clips and screws, 2/10, post 3d. Headphones, brand new, S. G. Brown G.E.C., etc., 23/- and super-sensitive, 30/- a pair. Headphones in Good Order, 9/-. Better Quality 7/6 and 10/-. Balanced Armature Type (very sensitive), 13/6. All post 1/6. New Single Ear-pieces, 3/6. Bal. armature type, 4/6 (two of these will make an intercom. Set). EX-R.A.F. ear-piece, 2/6, post 4d. (All Headphones listed are suitable for use with our Crystal Sets). Money refunded if not completely satisfied.

HIGHSTONE UTILITIES

58, NEW WANLEAD, LONDON, E.11
New illustrated List sent on request with 2d. stamp and S.A.E. Letters only.

Wireless Set, No. 17. A complete transmitter receiver. Only 120 v. H.T. and 2 v. L.T. needed. New. Complete instruction book with each unit, with handmie and earphones. Ideal for scouts. 44/6 m/c's. Price 39/6. Carriage 5/6.
One-Valve Amplifier, No. A.1271. Contains V.B.56. Two trans., Pot., 5 Condensers, 7 Resistors. In metal box. Can modify for player unit. 3/6, post 2/3.
Nife Cells. New. Superior to lead-acid type. Almost indestructible, voltage 1.2 to 1.5 (fully charged). Size 3" x 2 1/2" x 1" approx. 7/6 each, post 1/-. 75/- dozen/carr. 3/6.
U.S.A. Transceivers. R.T.34. 17 valves, generator. New, perfect condition. £3. carriage 4/6.
Throat Mikes. New, boxed, British, complete with straps, cord and jack. 3/6, post 1/-. 36/- dozen.
Test Prods. New. 2ft. P.V.C., black prods, wander plugs, beautifully made. 3/6, post 6d. 36/- dozen.
Speedometers with Reset. By Jaeger. 0-90 m.p.h. New. Half-moon shape, fitting size 7 1/4" x 3 1/4", chromed beautiful condition. price 25/-. List price about £7/10/- Bargain, post 2/6.
P.O. Type Relays. All 3,000 type. Coils from 5 ohms to 3,000 ohms, up to 18 Blade assemblies. 5/6 to 10/6 each, post 3d.
Battery Chargers. New, our own make input 200/250, output 6 or 12 v. at 1 amp. trans. and rectifier mounted on wood base, ready for us, 29/6, post 2/-.
Intercom. Sets. Sound powered. Consists of two balanced armature earpiece micro- phones, 20" twin flex, all new equipment, suitable baby alarms, remote radio listening, car to caravan, communication, etc. Price 12.6, post 1/-.
Miniature Electric Motors. New Ex. R.A.F. Tape recording type. 12.24 volts D.C. Fitted reduction gear, final speed 200 r.p.m., famous maker. Size 2 1/4" x 1 1/4". Suitable locos, research, price 15/-, post 1/-.
Battery charging M/c Voltmeter Tester. New in case. 3-0-3 and 30-0-30 volts, test prods included. 2/6, post 1/6.
Rear Car Lamp Assembly. By Lucas. New. Suit Humber 1956 or modern similar types, trailers, specials. Contains red glass for rear light, double filament lamps for braking, lower section plain reversing, including leads housed in alum die cast case, dimensions 11" long x 3". Fraction of real cost. Price 30/- per pair, post 2/6. Send 6d. for new list. All communications to:

THE SCIENTIFIC INSTRUMENT CO.

16, Holly Road, Quinton, Birmingham, 32
Callers welcomed at Showrooms,
353, Bearwood Road, Smethwick.

Follow the **FLUXITE** way to Easy Soldering



No. 7. APPLYING THE IRON

Apply bit charged with solder to the hole previously smeared with FLUXITE.

The solder will flow as soon as the surrounding surface is heated to the melting point of the solder.

FLUXITE is the household world for a flux that is famous throughout the world for its absolute reliability. In factory, workshop and in the home FLUXITE has become indispensable. It has no equal. It has been the choice of Government works, leading manufacturers, engineers and mechanics for over 40 years.

FLUXITE
SIMPLIFIES ALL SOLDERING

Fluxite Limited, Bermondsey Street, London, S.E.1.

THE "MINOR" 10 in 1

UNIVERSAL WOODWORKER



The "MINOR" lathe carrying a battery of three useful machines, any one of which may be operated without removing the others. ALL powered by ONE sturdy electric motor.



Showing the tilting saw-table with mortiser and planer ready for use. 7 in. saw with $2\frac{1}{8}$ in. cut. FINE, MEDIUM & COARSE SAWS AVAILABLE.



A view of the 4 in. planer with saw and mortiser ready for use.



Combination table being used for panel cutting. Easily adjustable for varying lengths.



Spindle moulding. Cutter block takes the place of the circular saw.



Combination table in use with sanding disc. This table has many uses.



Combination table in use with slot mortiser. Mortises from $\frac{1}{4}$ in. to $\frac{3}{8}$ in.

Announcement—See us at the 5th INTERNATIONAL HANDICRAFTS, HOMECRAFTS AND HOBBIES EXHIBITION, EARLS COURT, SEPTEMBER 19-28, STAND 50. Daily Demonstrations, Film Shows.

How To Get The Best From Your Woodworking Machine.

Send Stamp NOW for illustrated brochures to :

CORONET TOOL CO., Dept. PM, Mansfield Rd., DERBY

Over 75 years experience and world-wide reputation for quality

THORNTON

DRAWING INSTRUMENTS

MINERVA SERIES PROFESSIONAL QUALITY
TECHSET SERIES STANDARD QUALITY
KINWEST SERIES SCHOOL QUALITY

JAYWESS SERIES
STUDENT QUALITY

Write for illustrated leaflets and address of your nearest stockist to:

A.G. THORNTON LTD.
P.O. BOX 3, WYTHENSHAW, MANCHESTER

MANUFACTURERS OF FIRST QUALITY DRAWING INSTRUMENTS
P.L.C. SLIDE RULES AND DRAWING EQUIPMENT

Free Guide — SUCCESS IN ENGINEERING

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

BUILDING AND STRUCTURAL

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

GENERAL, LOCAL GOVERNMENT, ETC.

| | |
|----------------------------|---------------------------|
| Gen. Cert. of Education | Common. Prelim. Exam. |
| Book-keeping (all stages) | A.C.I.S., A.C.C.S. |
| College of Preceptors | A.C.W.A. (Costing) |
| Woodwork Teacher | School Attendance Officer |
| Metalwork Teacher | Health Inspector |
| Housing Manager (A.I.Hsg.) | 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 SEVENTY YEARS OF CONTINUOUS SUCCESS ★

NATIONAL INSTITUTE OF ENGINEERING

(In association with CHAMBERS COLLEGE—Founded 1885)
(Dept. 29)

148, HOLBORN, LONDON, E.C.1

SOUTH AFRICA: E.C.S.A., P.O. BOX NO. 8417, JOHANNESBURG
AUSTRALIA: P.O. BOX NO. 4570, MELBOURNE

FOUNDED 1885 - FOREMOST TODAY

132-PAGE BOOK FREE!
SEND FOR YOUR COPY

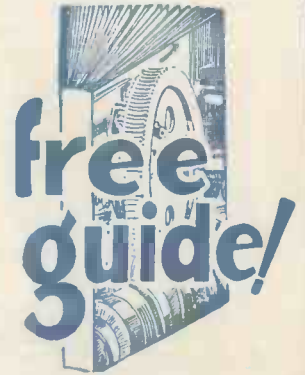
This remarkable FREE GUIDE explains:

- ★ 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.S.H.,
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

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

The subject of examination in which I am especially interested is

To be filled in where you already have a special preference.
(2d. stamp only required if unsealed envelope used.)



(Place a cross against the branches in which you are interested.)